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A MONOGRAPH

OF THE

MOLLUSCA FROM THE GREAT OOLITE,

CHIEFLY FROM

MINCHINHAMPTON

AND

THE COAST OF YORKSHIRE.

BY

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PART II.

BIVALVES.

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PART II.
BIVALVES.

UPON a general review of the Oolitic Lamellibranchiate Mollusks, it will be found that a very large proportion consists of shells whose hinges may be arranged under one or other of the following two groups, each of which has various generic modifications. The first consists of a lengthened hinge plate, having a parallel series of transverse or oblique teeth, as exemplified by *Arca*, with its sub-genera *Cucullæa*, *Nucula*, *Leda*, *Macrodon*, *Isoarca*, *Limopsis*. The second kind of hinge is altogether destitute of teeth, and comprises the several genera of fossil *Myadæ*, as *Pholadomya*, &c., *Mytilus* with *Modiola*, *Lithodomus*, *Pinna*, *Trichites*, and *Thracia*. Deducting these, together with the forms whose hinge possesses only a ligamentary fossa, as *Lima*, *Pecten*, *Hinnites*, *Plicatula*, and those in which the ligament is inserted in distinct pits, as *Gervillia*, *Perna*, &c., it will be found that shells with hinge teeth constitute only a minority, and that the great family of the *Veneridæ*, though numerous with respect to individuals and number of species, pertains only to few genera. Experience has led us to distrust many generic names which have been given to these fossils, as *Pullastra*, *Donax*, *Tellina*, *Amphidesma*, *Chama*, *Lutraria*, *Sanguinolaria*, *Mactra*, *Gastrochæna*, and *Spondylus*; *Panopea* is also a genus to which a very heterogeneous assemblage of testacea has been referred; *Plagiostoma* has by common consent fallen from the list of genera, the Oolitic species being now referred to *Lima*. Nor has it in any one instance been ascertained that any of the Oolitic bivalves have spoon-shaped processes corresponding to those of the recent *Mya* and *Lutraria*. The shelly beds of the Great Oolite appear to have been accumulated in a sea not sufficiently tranquil to become the habitat of the *Myadæ*; the entire family were gregarious, but in the shelly Oolite we rarely discover a single valve of *Arcomya*, *Ceromya*, or of *Homomya*, the other genera of *Myadæ* being absent altogether. The crypts of *Lithodomus* prove that genus to have existed in great profusion, although it is very rare that the shells are found in the perforations themselves, neither can they be

detected in the substance of the valves of *Trichites*, although few shells of that genus, or of the adult specimens of *Crassina*, can be found, which are not bored or even honey-combed by their perforations, a fact which should teach us that the numbers of fossil specimens do not afford in every instance a sure indication of their former actual numbers. The *Trigoniæ*, which hold so important a position in the Oolitic testacea, are represented in the shelly beds by a great profusion of individuals; nevertheless, these beds do not appear to have possessed conditions favorable to the development of the several species; three occur abundantly in their earliest stage of growth, but in proportion as they increase in size, their numbers diminish, so that adult specimens are comparatively rare. In the species referred to *Pteroperna* (a sub-genus of *Avicula*), will be found some interesting forms serving to connect *Avicula* and *Pterinea* with the *Polyodontæ*, the hinge being somewhat identical with that of *Macrodon*; it occupies a conspicuous position in the Oolitic system. Another new generic form which remains to be exemplified is *Tancredia*, (*Hettangia*, Terquem;) although of small dimensions, and destitute of ornament or remarkable figure, it is nevertheless the genus which, by the constantly recurring force of numbers, most strongly dwells upon the recollection of those who have with their own hands cleaved the shelly beds of the Great Oolite.

On the other hand, in the muddy deposits which are associated with the Great Oolite, the family of *Myadæ* were tolerably abundant, if we may judge from the numerous species of *Pholadomya*, *Panopæa*, and its allied genera, *Pleuromya*, *Arcomya*, *Homomya*, which are found in the beds of indurated marl, intercalated with or overlying some portions of the shelly Oolite, throughout an extensive area; whilst many of the shells, the *Pholadomya* especially, retain the normal position in which they appear to have lived.

BIVALVIA, *Linn.*—LAMELLIBRANCHIATA, *Blainv.*

OSTREA, *Linnaeus*, 1758.

General Character. Shell adherent, inequivalve, foliaceous, irregular; umbones separated, slightly diverging; ligament internal, placed in a deep grooved trigonal pit, beneath the umbones. Muscular impression nearly central.

OSTREA RUGOSA, *Goldf.* Tab. I, fig. 4.

OSTREA RUGOSA, *Goldf.* Petref., tab. 72, fig. 10.

Testâ ovatâ, valvâ inferiore profundâ concentricè rugosâ, margine inferiore plicato; superiore subconvexâ, undulatâ-rugosâ.

Shell ovate; inferior valve deep, with concentric rugose plications, the lower margin plicated; the upper valve slightly convex, rugose, and undulated.

The typical form of this shell, which we have provisionally referred to *O. rugosa*, *Goldf.*, has a considerable resemblance to *O. acuminata*; but the attached surface is

usually much larger, and the entire form is more irregular; it may be regarded as forming a passage between the crescentric figure of that shell and the less oblique species, with radiately plicated surfaces and margins; it was eminently gregarious, and most abundant upon the flaggy beds or tile stones of the Forest Marble; in the shelly beds of the Great Oolite it is much less common, and the specimens are usually small.

Localities. The vicinity of Tetbury and Cirencester in the Forest Marble; Minchinhampton Common in the Great Oolite.

OSTREA ACUMINATA, Sow. Tab. I, fig. 1, 1a.

OSTREA ACUMINATA, Sow. Min. Conch., t. 135, f. 2 not 3, 1816.

— — Roemer. Verst. Oolith., ii, p. 25, t. 18, f. 16.

— — Bronn. Leth. Geog., p. 192.

Testá ovato-elongatá, interdum subcrescenticá; valvâ inferiore convexa, umbone obliquo, acuminato; valvâ superiore subplaná, ovatá, tenui.

Shell ovately elongated, frequently subcrescentric, with concentric plications; umbones oblique, acuminate; the smaller valve flattened, thin, ovate.

This little species exhibits a full share of the varieties of form proper to the genus; in the marls and subordinate beds of hard rag in the Fuller's-earth, the valves constitute a considerable portion of the entire deposit, and in the shelly beds of the Great Oolite it occurs in great profusion; in France and the Jura it occupies a similar position, and in equal prominence.

Localities. Bath, Minchinhampton, and numerous other localities throughout the course of the Fuller's-earth and Great Oolite.

OSTREA COSTATA, Sow. Tab. I, fig. 5, 5a.

OSTREA COSTATA, Sow. Min. Conch., t. 488, f. 3, 1825.

— — Goldf. Petref., t. 72, f. 8.

— — Bronn. Leth. Geog., p. 190, t. 18, f. 18, 1851.

— — Deshayes. Traité Element., t. 53, f. 10—12, 1850.

KNORRII, (Voltz.) Zieten Wurt., lx, t. 45, f. 2.

Testá parvulá, obliquá, ovali, valvâ inferiore profundá costatá; umbone affixo, costis dichotomis radiatá; superiore planá subradiatá.

Shell small orbicular, or obliquely oval, the attached valve deep with numerous branched and somewhat rounded ribs, upper valve flat, margin undulated.

Mr. Sowerby remarks that the "branching, rounded ribs upon the under surface define this neat little oyster." It is one of the miniature productions of the Ancliff Limestone.

Localities. In the Cornbrash and Forest Marble of Wiltshire and Somerset; and in the Great Oolite of Ancliff, Wiltshire, and in Gloucestershire.

OSTREA GREGAREA, Sow., var. Tab. I, fig. 2, 2a.

OSTREA GREGAREA, Sow. Min. Con., t. 111, f. 1 and 3, 1815.

— — Goldf. Petref., t. 74, f. 2.

— — Bronn. Leth. Geog., p. 188, t. 18, f. 16, 1851.

— PALMETTA, Sow. Min. Con., t. 111, f. 2?

Testá crassá, ellipticá, incurvatá costatá, valvá inferiore sub-carinatá, affixá, superiore convexo-planá, costis numerosis, rugosis, subacutis radiantibus vel distichis.

Shell oblong, irregular, curved, costated, with unequal convex valves, the beaks slightly produced and incurved; costæ numerous, rugose, diverging.

The specimens figured, are referred to the *O. gregarea*, Sow., a social species which occurs abundantly in the Coralline Oolite of Westbrook, Wiltshire, and near Weymouth in Dorsetshire. The shells referred to this species in the Great Oolite are not generally in good condition, and vary in form and plaiting; some specimens presenting the characters of *O. solitaria*, Sow., others resembling the young state of *O. flabelloides*, Lamarck.

Localities. Minchinhampton, and in the Oolite of Lincolnshire; Stonesfield, Oxfordshire.

OSTREA SUBRUGULOSA. Tab. I, fig. 6, 6a.

? Var. of OSTREA ACUMINATA, Sow.

Testá subtrigoná, incurvá, concentricè rugosá; valvá inferiore convexá, sulcis furcatis irregulariter radiantibus ornatá; valvá superiore sub-planá; apicè obliquo sub-acuto.

A somewhat trigonal incurved shell, concentrically imbricated or rugose, and with irregular diverging small furrows on the convex valve; the umbone incurved and obtuse; smaller valve flat and nearly smooth.

A very common and characteristic species of the upper portions of the Great Oolite in Northamptonshire and Lincolnshire, where it occurs in sandy and clayey beds, which may probably represent the Forest Marble. It bears a general resemblance to the *O. acuminata*, Sow., of which it may prove to be only a variety from difference of habitat, but is distinguished by the more convex form and furrowed surface of the larger valve.

Localities. In the Oolite of Kingsthorpe, Thrapston, Oundle, &c., Northamptonshire; and near Stamford, Lincolnshire.

OSTREA SOWERBYI. Tab. I, fig. 3, 3a.

OSTREA ACUMINATA, Sow. Min. Con., t. 135, f. 3 not 2.

Testá depressá, elongatá, curvatá rugosá, concentricè lamellosá; valvá inferiore sub-convexá, superiore planá; umbone obtuso.

A depressed elongated and slightly-curved shell, marked by concentric lamellæ at distant intervals. The umbones are nearly equal in size, broad, and obtuse. The larger valve is rather convex; the smaller valve flat, or sometimes a little concave.

This species is considered to be distinct from the *O. acuminata*, which is more regular, symmetrical, and incurved. It is very abundant in certain marly deposits belonging to the upper portion of the Great Oolite in Northamptonshire.

Localities. Sharnbrook and near Bedford; Blisworth, Kingsthorpe, Yardley and Aynhoe, Northamptonshire; Sapperton, Gloucestershire.

Sub-Genus—EXOXYRA.

Shell with the umbones involute.

EXOXYRA AURIFORMIS, *Goldfuss*. Tab. I, fig. 7.

EXOXYRA AURIFORMIS, *Goldfuss*. Petref., t. 86, f. 5.

— — *Buckman*. In Geol. of Cheltenham, p. 69.

? OSTREA OBSCURA. *Sow.* Min. Con., t. 488, f. 2?

Testá ovato-suborbiculari depressá, valvá minore planá, inferiore subconica; umbonibus minutis involutis; laminis concentricis tenuissimis irregularibus.

Shell ovately-orbicular, depressed, the smaller valve flattened, the larger subconical with a large adhering surface; umbones very small and involute; laminæ of growth concentrical, very delicate, and irregular.

This pretty species is sufficiently distinct from the contemporaneous species; it was collected by Professor J. Buckman, in a bed of yellow clay at Sevenhampton Common, and he has kindly placed it at our disposal.

Locality. Sevenhampton Common near Cheltenham.

PLACUNOPSIS. *Nov. Gen.*

Testá suborbiculari, inæquivalvis, irregulari, tenui, non-auriculatá; valvá majore convexá, subobliquá, umbone depresso, submarginali; lineis radiantibus undulatis ornatá; margine cardinali brevi subrecto. Valvá minore planá integrá, interdum affixá. Cardo dentibus nullis, foveá parvâ transversâ internâ. Impressio musculari magno (biloba)? elliptica, subcentrali.

Shell suborbicular, inequivalve, irregular, very thin, without ears; the larger valve convex, rather oblique, its umbo depressed and submarginal, the surface ornamented with undulated radiating lines; hinge-margin short, nearly straight. The smaller valve is flat, destitute of any foramen, and not unfrequently is affixed by its surface to other bodies. Hinge without teeth, with a small mesial transverse internal groove to contain the ligament. Muscular impression large (bilobed?), elliptical, subcentral.

This genus in its figure and character of the surface presents a considerable resemblance, both to *Anomia* and *Placuna*, but although possessing certain features of affinity to each of these forms, it is not the less separated from them by other characters of some importance. It is so irregular, that scarcely two specimens have exactly the same figure, so that the longer diameter may be either lateral or otherwise; notwithstanding this irregularity, however, it will be observed that the posterior or left side of the convex valve

is more produced, and has more convexity than the other; the substance of the test is papyraceous, and the surface of the convex valve often displays markings, which prove that for a considerable period these shells were attached to other bivalves by the surface of the flat valve, but that valve has never actually been observed attached, and it is very commonly preserved with the outer surface destitute of any traces of having been adherent. Judging therefore from the varying dimensions of the specimens, it does not appear that it adhered at any particular stage of its growth, but that it was only occasionally attached. From *Placuna* it is distinguished by the absence of internal diverging teeth; it is never auriculated, as in *Posidonia*, and the position of the hinge groove is very different; in *Posidonia* it forms a depression in the hinge plate, lengthened laterally, but in our genus it is transverse. The form occurs throughout the Oolitic rocks of England, exemplified by several species, which have usually been referred either to *Anomia* or to *Placuna*,—an erosion which not unfrequently occurs at the thinnest part of the valves where the muscular impression is situated, having apparently been mistaken for the foramen of an *Anomia*.

PLACUNOPSIS JURENSIS, Roem. Sp. Tab. I, fig. 8, *8a b*.

PLACUNA JURENSIS, Roemer. Verst. Nord. Deutsch. Ool., p. 16, t. 16, f. 4.

ANOMIA JURENSIS, Morris. Cat. Brit. Fos., p. 105, 1843.

Testá orbicularis, irregulari, papyraceá, sublamellosá; valvâ convexâ, umbone obtuso, depresso, submarginali; lineis radiantibus nodosis, laminis concentricis impressis. Valvâ alterâ planatâ, umbone parvo depresso, lineis radiantibus undatis et tenuissimis.

Shell orbicular, irregular, very delicate, somewhat lamellöse; convex valve with the umbo, submarginal, obtuse, and depressed; radiating lines knotted, fine, numerous, waved and irregularly impressed with the concentric laminæ. The other valve flattened or irregularly concave, its umbo small and depressed, the surface ornamented with numerous irregular radiating knotted lines.

In numerous instances this species attached itself by the flat valve to *Pectens*, *Limæ*, and *Trigonia*, whose characteristic markings although scarcely, if ever, indicated on the interior of either valve, appear distinctly impressed upon the outer surface of the convex valve, almost obliterating the ornamented structure proper to the valve, so that the surface of the *Placunopsis* seems like a delicate tissue or veil spread over the *Trigonia* or *Pecten*. What renders this fact the more remarkable is, that the species of *Lima*, *Pecten*, and *Trigonia*, are very abundant, and are invariably found free from other attached shells. The valves of this delicate shell are abundant in the shelly beds of the Great Oolite, and occur likewise, though more rarely, in the Fuller's-earth and Inferior Oolite of Gloucestershire; but care is required to detach specimens, as it breaks with any trifling concussion.

Localities. Minchinhampton Common and Bisley Common in the Great Oolite.
Leckhampton Hill and Nailsworth in the Inferior Oolite.

PLACUNOPSIS SOCIALIS. Tab. I, fig. 9, 9a.

Testá parvá ovato-orbiculari, valvis valde inæqualibus et irregularibus, lineis radiantibus subtilissimis confertis; plicis concentricis paucis irregularibus.

Shell small, ovately orbicular, with the valves very unequal and irregular; the umbones are marginal but very depressed, and scarcely distinguishable; the surface is covered with extremely fine densely arranged radiating lines, which are commonly visible under a magnifier upon the convex valve, and very rarely in the flat valve; the concentric plications are few, strongly marked and irregular.

This little shell is usually coloured with tints varying from lake to indigo and brown; it occurs throughout all the shelly beds of the Great Oolite in the Minchinhampton district; and towards the middle of the series in the soft shelly Oolite or oven stone, it is peculiarly abundant and gregarious, the largest specimens having a diameter of about 7 lines; although it does not exhibit any marks of having been attached or compressed, the figure of the valves is even more irregular than in *P. Jurensis*.

Localities. Minchinhampton and Bisley Commons.

PLACUNOPSIS ORNATUS. Tab. I, fig. 11, 11a.

Testá parvá, ovato-orbiculari subplaná, fragili, umbonibus sub-marginalibus depressis, costulis radiantibus numerosis equalibus et regularibus, aliisque interstitialibus tenuissimis, costulis spinis fistulosis, numerosis, depressis ornatis.

Shell small, ovately orbicular, transverse, compressed, irregular, very thin; umbones sub-marginal, depressed, radiating costæ elevated, rounded, numerous, equal and regular, with interstitial and very fine striæ; the costæ are ornamented with numerous depressed fistulous spines.

The radiating costæ are elevated and undulated, and the numerous depressed fistulous spines which ornament them render it a pretty object under the magnifier; the character of the surface altogether is very similar to that of *Ostrea spondyloides*, (Schloth, Goldfuss, t. 72, fig. 5.) but that species pertains to the *Muschelkalk*. The other valve has not been recognised.

Locality. Minchinhampton Common.

PLACUNOPSIS RADIAN. Tab. I, fig. 10.

Testá parvá sub-orbiculatá, umbone parvá, depresso, sub-marginali, lined carinis subrectá; costulis radiantibus rotundis distantibus et fistulosis, interstitialibus lævigatis; plicis concentricis distantibus.

Shell small, sub-orbicular; umbo small, depressed, sub-marginal, hinge line nearly straight; radiating costæ rounded, elevated, rather irregular, distant, with fistulous plications upon their surfaces; the interstitial spaces are smooth; the concentric plications are few and distant; the general convexity of the shell is moderate, but the convex valve is unknown: not unfrequently near to the border a second series of costæ commence, but

which have no particular reference to the size of the shell. The large distant radiating costæ will distinguish this from *P. ornatus*, to which it is nearly allied.

Locality. Minchinhampton Common, where it occurs rarely in the soft shelly Oolite beneath the planking.

PECTEN, *Lamarck*.

PECTEN, *Rumphius, Chemn., Bolten, &c.*

JANIRA, *Schum, D'Orb.*

NEITHEA, *Drouet.*

Gen. Char. Shell regular, inequivalve, inequilateral, eared, hinge margin straight, surface with radiating ribs, lines or other elevations: hinge destitute of teeth, but having a central triangular pit containing the cartilage, muscular impressions one in each valve, large, sub-central.

PECTEN VAGANS, *Sow.* Tab. I, fig. 12, 12a.

PECTEN VAGANS, *Sow.* Min. Con., t. 543, figs. 3, 4, 5, 1826.

— SULCATUS, *Young and Bird.* Geol. Yorks. 333, t. 9, f. 9.

Testá ovatá sub-compressá, sub-æquivalvi, lamellis imbricatá, costis raris regularibus (10—11), *valvæ sinistra angustis, squamis squamosis magnis, regularibus; dextræ costis latis confertim lamello-imbricatis; auriculis magnis inæqualibus lineatis.*

Shell ovate, rather flattened, nearly equivalve, with imbricated lamellæ; costæ few, regular (10—11), and narrow, with regular elevated squamous folds in the left valve; the right valve undulated with wide depressed costæ crossed by densely arranged imbricated lamellæ; auricles large, unequal, lineated.

This shell, although so very abundant and well known, has nevertheless been confounded with another very distinct species by Goldfuss, tab. 90, fig. 8, where an elongated and convex shell, with few squamous costæ, has unfortunately received this appellation; this latter shell, which is from the Lias of Bavaria, has only a remote resemblance to *Pecten vagans*. The costæ of the left valve are regular, symmetrical, and have the elevated plicæ upon their surface regularly and rather closely arranged, the interstitial spaces are narrow and slightly impressed with the plications; the surface of the other valve is nearly destitute of costæ, and exhibits them faintly only and near to the border. It is rare in the Upper Ragstones of the Inferior Oolite, but very abundant throughout the Fuller's-earth and Great Oolite, and is usually accompanied by *Ostrea acuminata* and *Avicula echinata*. It occurs also in the Cornbrash near Chippenham, Wiltshire.

PECTEN WOODWARDII. Tab. I, fig. 20.

Testá æquivalvi suborbiculari, convexá, auriculis magnis inæqualibus, tenuissimé striatis; costis magnis radiantibus rotundis arcuatim divergentibus (circa 40 in ambitu), interstiis angustis conformibus.

Shell equivalve, suborbicular, convex; auricles large, unequal, and finely striated; costæ large rounded, radiately diverging (about 40 in the circumference), interstitial spaces narrow and conformable.

The anterior auricle is very large, the posterior one small; the costæ are regular, rounded, and closely arranged, the convexity of the valves is so considerable that the diameter through both is nearly equal to the lateral diameter. The general aspect is sufficiently distinct from all the associated species; *Pecten arcuatus*, which has the costæ similarly disposed, has a figure much less convex and orbicular, and the interstitial spaces are punctated.

Locality. This species is not unfrequently found in the white stone of Bussage and Eastcombs, bordering upon Bisley Common, and we are not aware that it has been found at any other locality.

The name from Mr. S. P. Woodward, of the British Museum, to whom it is dedicated.

PECTEN PEREGRINUS. Tab. I, fig. 14.

? Var. of PECTEN VAGANS, Sow.

Testá inæquivalvi, ovato-orbiculari, auriculis magnis inæqualibus costellatis; valvâ sinistrâ subplanâ, costis radiantibus angustis, plicatis (circa 9), intervallis inæqualibus, nonnunquam costulis interstitialibus evanescentibus hinc et inde dispositis. Valvâ dextrâ convexâ lamellis tenuissimis concentricis imbricatis, et sulcis magnis radiantibus (circa 10).

Shell inequivalve, ovately orbicular, auricles large, unequal and costellated; left valve rather flattened, radiating costæ (about 9) arranged at irregular distances, narrow, nearly equal, with small and irregular plications; there are likewise two or three small interstitial lines or elevations upon the anterior side of the valve. Right valve convex, with very fine concentric and imbricated lamellæ; radiating sulcations (about 10) large and rather irregular.

The irregular distances at which the four anterior costæ of the left valve are placed, their narrow figure and small plications, will serve to distinguish it from *Pecten vagans*, the great convexity and obliquity of the other valve will equally distinguish it from *Pecten fibrosus*. It occurs somewhat rarely in the shelly beds of the Great Oolite.

Localities. Minchinhampton and Bisley Commons.

PECTEN RETIFERUS. Tab. I, fig. 15, 15a.

Testá ovato-orbiculari, convexo-planâ, auriculis magnis subæqualibus reticulatis; lineis radiantibus elatis numerosis, irregularibus, aliis concentricis et elatis paucioribus decussatis.

Shell ovately orbicular, moderately convex, auricles large, nearly equal and reticulated; with radiating lines, elevated, numerous and somewhat irregular, crossed by others elevated and rounded but of unequal size and more distant.

The surface is crossbarred and somewhat rugose, the concentric lines in the more

advanced stage of growth being very prominent, unequal, rather irregular, and commonly covered with adherent shells; some slight undulations or irregularities are visible upon both descriptions of lines; young individuals are more depressed and ovate, their lines are very regular and distinct. It occurs not uncommonly in the planking beds throughout the Minchinhampton district, but the surfaces of the valves are frequently much obscured by adherent shells and adventitious matter entangled in the crossbarred surface. Height, 23 lines; lateral diameter, 21 lines.

Localities. Minchinhampton and Bisley Commons.

PECTEN HEMICOSTATUS. Tab. I, fig. 16.

? Var. of PECTEN VAGANS, Sow.

Testá ovato-orbiculari inæquivalvi subæquilatérá, valvá sinistrá convexá, lineis radiantibus irregularibus et lamellis concentricis crebris ornatá; ætate adulto costis radiantibus magnis (5) distantibus plicis magnis instructis; intervallis latis, costulis minoribus interdum evanescentibus. Valvá dextrá depressá, lamellis concentricis crebris, interdum interruptis, et sulcis radiantibus leviter impressis. Auriculis magnis inæqualibus, costellatis.

Shell inequivalve, nearly equilateral, ovately orbicular, the left valve convex, with numerous irregular radiating lines crossed by closely arranged concentric lamellæ; the adult condition has the valve more convex, with five large elevated plicated and distantly arranged radiating costæ; the intervals are wide, each having a supplementary costa more or less distinctly marked. The right valve is much more flattened, with concentric densely arranged lamellæ, sometimes interrupted, and a few radiating sulcations, which are so faintly impressed, that they are only visible near to the lower border. Auricles large, unequal, and costellated.

The surface of the convex valve in progress of growth undergoes a striking change; in the young state it is beautifully reticulated, but has no indications of the costæ which afterwards distinguish it; the adult shells have a form more convex, with five prominent radiating costæ, of which those at the sides are the smaller; the costæ have a few large irregular plications; it is only shells of the largest size that have a supplementary costa in each of the interstitial spaces. The imbricated lamellæ of the right valve are more prominent than those of *Pecten vagans*, and the sulcations are much less strongly impressed, so that they can only be discovered by a close examination. It occurs not unfrequently in the shelly beds of the formation; but, from the general coarseness of the deposit, the more delicate features of the surface are rarely preserved. The right valve is delicate, and few specimens have been distinguished.

Locality. The Minchinhampton district of the Great Oolite, throughout the shelly beds.

PECTEN PERSONATUS, Goldf. ? Tab. I, fig. 17.

? PECTEN PERSONATUS, Goldfuss. Petref., p. 75, t. 99, fig. 5.

Testá inæquivalvi, æquilaterali, sub-orbiculari, convexo-planâ, pellucidâ, interné (12—14) costatâ; valvâ sinistrâ costis externis minutis crebris lineis concentricis decussatis; dextrâ lævi, auriculis inæqualibus obtusangulis costatis. (Goldfuss.)

Shell inequivalve, equilateral, sub-orbicular, slightly convex, pellucid, its inner surface having costæ (12—14), left valve with very numerous external irregular radiating costæ, decussated by closely arranged concentric lines; the right valve smooth, its auricles unequal, obtusely angulated and costated.

It is only when the matrix consists of very fine sediment that the surface markings of this small and delicate shell can be distinguished; it is consequently rarely obtained. The specimens recorded by Goldfuss were found in the Inferior (*eisenschüssigen*) Oolite of Grafenburg and Besançon.

This species differs somewhat from the figure of Goldfuss, in having the longitudinal striation on the ears more prominent.

Localities. Minchinhampton and Bisley Commons in the Great Oolite; it occurs also in the Inferior Oolite of the same district.

PECTEN ARCUATUS, Sow. Tab. I, fig. 18.

PECTEN ARCUATUS, Sow. Min. Con., t. 205, f. 5—7, 1818.

— — ? Goldfuss. Petref., p. 50, t. 91, f. 6.

? Var. of PECTEN LENS, Sow., fide Bronn and Phillips.

Testá ovato-orbiculari, convexo-planâ, æquivalvi, costellis radiantibus confertis, arcuatim divergentibus, hinc inde dichotomis, striis interstitialibus punctatis; auriculis inæqualibus costellatis.

Shell ovately orbicular, slightly convex, equivalve, with radiating, depressed little ribs closely arranged, diverging with a curvature and sometimes dichotomous, the interstitial spaces punctuated; auricles unequal, ribbed.

The radiating ribs are moderately broad, but much depressed, and undulate rather irregularly where they are crossed by the few concentric folds of growth. This species occurs rarely in the shelly beds of the Great Oolite.

Localities. Bussage or Bisley Common; Stonesfield, Oxfordshire.

PECTEN LENS, Sow. Tab. II, fig. 1, 1a.

PECTEN LENS, Sow. Min. Con., t. 205, f. 2, 3, 1818.

— — Goldfuss. Petref., p. 49, t. 91, f. 3.

— — Zieten. Wurt., p. 69, t. 52, f. 6.

— — D'Orb. In Murch. Russia, &c., ii, p. 476, t. 42, f. 1, 2.

— — Quenstedt. Wurt., pp. 337, 538, 544.

— — Bronn. Leth. Geog., p. 206, t. 19, f. 7.

? PECTEN ANNULATUS, Sow. Min. Con., t. 542, f. 1.

— — Goldfuss. Petref., p. 49, t. 91, f. 2.

Testá obliquá, ovato-orbiculari, plano-convexá, sub-æquivalvi, reticulatá, lineis confertis concentricis et radiantibus arcuatim divergentibus, hinc inde furcatis; auriculis inæqualibus reticulatis.

Shell oblique, ovately orbicular, moderately convex, equivalve, radiating lines narrow, closely arranged, irregular, curving outwards, the interstitial spaces densely punctated or reticulated, occasionally bifurcated; concentric lines irregular; auricles unequal and reticulated.

There does not seem to be any sufficient or constant character which will enable us to separate this species from the *Pecten annulatus* of the Mineral Conchology and of Goldfuss; both have occasionally a certain degree of obliquity; the radiating lines of both are reticulated and bifurcated, becoming almost evanescent in the ultimate stage of growth; in the latter condition, the concentric elevated lines become constant, are much more prominent than the radiating lines, and do not furnish any peculiar or characteristic feature, we are therefore inclined to reunite the two species, and regard the annulated form to be merely a variety of the present one. Next to the *Pecten vagans*, this ranks as the most abundant *Pecten* of the Great Oolite, its vertical range is likewise remarkable, as it is found throughout the rocks of the entire Oolitic system; but attains its greatest development of size in the Coralline Oolite of Malton.

Localities. Wherever the Great Oolite is fossiliferous.

PECTEN ANNULATUS, Sow. Tab. I, fig. 13.

? Var. of PECTEN LENS.

PECTEN ANNULATUS, Sow. Min. Con., t. 542, f. 1, 1826.

— — Goldfuss. Petref., t. 91, f. 2.

— OBSCURUS, Sow. Min. Con., t. 205, f. 1.?

Testá ovato-orbiculari, sub-æquivalvi, convexo-planá, striis radiantibus subtilissimis, inæqualibus arcuatim divergentibus, lineis aut lamellis concentricis distantibus interruptis; auriculis inæqualibus striatis.

Shell ovately orbicular, nearly equivalve, rather depressed, radiating striations very fine, unequal, densely arranged, and diverging, the striations are broken and interrupted by prominent concentric lamellæ, which are rather distantly arranged; auricles unequal, striated.

The apical portion of the shell is destitute of the concentric lamellæ, which commence abruptly and continue to the lower border of the shell. It occurs commonly in the Cornbrash, Forest Marble, and in the upper portion of the Great Oolite; but is not found in the shelly beds of the Michinhampton district.

Localities. Near Cirencester, and at Sapperton Tunnel, Gloucestershire; in the upper beds of the Great Oolite, at Blisworth, Kingsthorpe, and other places in Northamptonshire and Lincolnshire; it occurs also in the Stonesfield Slate.

PECTEN CLATHRATUS, *Roemer*. Tab. I, fig. 19, 19a.

PECTEN CLATHRATUS, *Roemer*. Verst. Nordd. Oolith., t. 13, f. 9, 1836.

Testá ovato-orbiculari sub-æquivalvi, tenui plano-convexá; auriculis magnis inæqualibus, valvâ sinistrâ convexiorâ; lineis radiantibus granulosis crebris inæqualibus et irregularibus, lineis concentricis obsoletis decussatis. Valvâ dextrâ lineis radiantibus remotioribus et irregularibus, lineis concentricis clathrato-nodosis.

Shell ovately orbicular, subæquivalve, thin, rather flattened, auricles very large, unequal, and striated; left valve moderately convex, with radiating densely arranged granulated lines, irregular and unequal, crossed by very obscure closely arranged concentric lines, for the most part obsolete. Right valve more flattened, radiating lines more remote, but unequal and irregular, nodose where they are crossed by regular and distinct lines constituting a finely cancellated surface.

This very delicate and elegant species has the anterior auricles remarkably large; the right valve varies very considerably in the close arrangement of the radiating lines, and in their prominence; the concentric lines are very irregular, unequal, and uncertain in their prominence, so that many specimens which appear shining and smooth to the unassisted vision, disclose, under a magnifier, a very perfect and distinctly ornamented surface. Its entire aspect is sufficiently characteristic to render it easily distinguishable from contemporaneous species.

Height, 18 lines; lateral diameter, 16 lines.

Localities. Minchinhampton and Bisley Commons, in the shelly beds of the formation.

HINNITES, *De France*, 1831.

Gen. Char. Shell ovate, sometimes oblique, irregular, inequivalve; umbones depressed, approximate; auricles unequal, posterior auricle small, sometimes nearly obsolete, anterior auricle produced; left valve convex, right valve flattened, delicate, adherent. Hinge straight without teeth, with a mesial trigonal fossa, as in *Pecten*. The surface is ornamented with radiating, imbricated, or nodulated costæ.

There is usually some degree of obliquity in the valves; the convex valve is never adherent, the other constantly so, which together with its extreme delicacy will account for it having been so rarely discovered.

The shells of this genus have been described as *Spondylus* by Goldfuss, but they are really very distinct from that genus; the extreme delicacy and irregularity of the valves would lead us to the distinction, irrespective of the hinge characters which are equally distinct from those of *Spondylus*.

The finest examples of this genus are found in the Inferior Oolite, both in number, dimensions, and variety of ornament.

HINNITES VELATUS, Goldf., Sp. Tab. II, fig. 2.

PECTEN VELATUS, Goldfuss. Petref., t. 90, f. 2.

— — Roemer. Verst., p. 67.

SPONDYLUS VELATUS, Goldfuss. Petref., t. 105, f. 4.

Testá ovato-orbiculari convexá, auriculá anticá magná costellatá, posticá parvâ, sub-obsoletâ; costellis radiantibus (circa 30) nodulosis, subæqualibus, distantibus; interstitialibus lineatis; lineis nodulosis irregularibus. Valvâ dextrâ planatâ costellis lineisque ornatâ.

Shell ovately orbicular, rather oblique, convex, anterior auricle large, posterior small, nearly obsolete, radiating little costæ (about 30 in the circumference) nodulated, nearly equal, and distantly arranged; the interstitial spaces have unequal and irregular nodulated lines, from one to three, being contained in each space. The right valve is flattened and ornamented in a manner similar to the other.

This species would appear to have a considerable range, both stratigraphically and geographically; it occurs in the shelly freestone beds of the Inferior Oolite, in the Fullers-earth, Great Oolite, Forest Marble, and Cornbrash.

Localities. Leckhampton Hill, the Sapperton Railway Tunnel, the entire Minchinhampton district of the Great Oolite, and in Northamptonshire and Lincolnshire.

HINNITES TEGULATUS. Tab. II, fig. 3, 3a.

Testá ovato-orbiculari convexâ; valvâ sinistrâ auriculá anticá magnâ; posticâ subnullâ; costellis radiantibus (32—34) tenuibus, regularibus transversé plicatis; plicis vel tegulis concentricis crebris subæqualibus interruptis.

Shell ovately orbicular convex, the left valve with a large posterior auricle, anterior auricle obsolete; radiating little ribs (32 to 34 in the circumference,) fine, regular, and transversely plicated; plications concentric nearly equal, closely arranged but occasionally interrupted.

The radiating little ribs are delicate, regularly arranged, and impressed by the concentric plications, they are prominent about the middle of the valve, and become finer towards the sides; the right valve is unknown. The figure presents an approximation to that of *H. velatus*, but it appears to have more convexity and less obliquity; moreover the character of the surface, with its fine regular distinct radiating ribs, is very different from the irregularity observable in the other species. Height, 10 lines; lateral diameter, 8 lines.

Locality. Minchinhampton Common. Rare.

PLICATULA. Lamarck, 1801.

Gen. Char. Shell adherent, inequivalve, irregular, not eared, umbones terminal and pointed, no external area; ventral margin rounded, and more or less plicated. Hinge with two large diverging cardinal teeth in each valve, the teeth are striated laterally, and there is a conical fossa between them to receive the ligament, which is almost internal.

PLICATULA TUBERCULOSA. Tab. II, fig. 4.

Testá ovato-orbiculari subobliquá, convexo-planá tuberculis obtusis numerosis in lineis radiantibus feré dispositis; umbonibus lævigatis sine tuberculis.

Shell very irregular, ovately orbicular, rather oblique, and depressed with numerous obtuse tubercles, for the most part disposed in radiating imperfect lines, umbonal extremity smooth, destitute of tubercles.

The round blunt warty tubercles have an aspect very different from the spines, either fistulous or pointed, with which the *Plicatulae*, are for the most part furnished. The tubercles usually increase in size towards the ventral border of the valve, but in a very irregular manner, which, together with the very unequal and irregular surface of the valve, produces a very confused appearance; thus it happens that no two specimens can be found which nearly resemble each other; occasionally, the tubercles may be discovered approximating to the fistulous character; the margins of the valves are plicated in a very irregular manner. It is somewhat rare, but occurs in several of the shelly beds.

The two diameters across the valves are nearly equal, and rarely exceed 10 lines.

Localities. Minchinhampton and Bisley Commons.

PLICATULA FISTULOSA. Tab. II, fig. 5.

Testá ovato-orbiculari depressá, costulis fistulosis radiantibus irregularibus interstitialibus profundis.

Shell ovately orbicular depressed, costæ radiating irregular, with numerous irregular prominent fistulous spines; interstitial spaces deep.

About 12 or 13 costæ are distributed around the circumference of the valve; owing to the delicacy of the test, it is very rarely that a perfect specimen can be obtained.

Locality. Minchinhampton Common.

AVICULA, *Lam.* 1801.

Gen. Char. Shell inequivalve, eared, base transverse, straight, its extremities produced and forming auricles, left valve convex, umbone prominent; right valve smaller, flattened, its umbone depressed, and nearly obsolete. Hinge linear with a small indistinct tooth in each valve beneath the umbones, and a lengthened marginal ligamentiferous area. One rounded subcentral muscular impression in each valve, with a series of smaller ones in a line near the umbones.

AVICULA COSTATA, *Sow.* Tab. II, fig. 6, 6a.

AVICULA COSTATA, *Sow.* Min. Con. t. 244, f. 1, 1819.

— — *Smith.* Strat. Syst., pp. 67, 81.

— — *Ib.* Strata Ident. Clay over the Upper Oolite, f. 8.

Testá convexá oblique-ovată, auriculis parvis subæqualibus, umbonibus prominulis, costis (circa 18), radiantibus equalibus rotundis, distantibus, interstitiis planis, latis et lævigatis.

Shell convex obliquely ovate, auricles small, nearly equal, umbones prominent, costæ (about 18), radiating, equal, rounded and distant, the interstitial spaces flattened, wide and smooth.

This shell, so characteristic of the Bradford clay of Wiltshire, occurs very rarely in the shelly beds of the Great Oolite, and these are of very diminutive size.

Locality. Minchinhampton Common.

AVICULA ECHINATA, Sow. Tab. II, figs. 7, 7a.

AVICULA ECHINATA, Sow. Min. Con., t. 243, 1819.

— — Smith. Strat. Syst., p. 67.

— — Ib. Strata Ident., p. 26; Cornbrash Plate, f. 8.

? Var. AVICULA TEGULATA, Goldfuss. Petref., ii, p. 132, t. 121, f. 6.

Testá ovato-obliquá, auriculis equalibus parvis, valvá sinistrá convexá costulis radiantibus numerosis, aliis minoribus interstitialibus alternatis, et lineis transversis decussatis nodis formante. Valvá alterá subplaná, lævigatá, lineis radiantibus tenuissimis subobsoletis.

Shell ovately oblique, auricles equal and small; left valve convex, with numerous radiating ribs, alternating with a smaller series in the interstitial spaces, and decussated by transverse, rather distant, regular lines, which form little knots as they pass over the costæ; the knots are more elevated, and closely arranged upon the anterior side of the shell. The other valve is nearly flat, smooth, with very fine distant and rather indistinct radiating lines.

This species is moderately common in the shelly beds of the Great Oolite, but the valves are always disunited, and its state of preservation very inferior to specimens obtained from the clay beds of the Fullers-earth, the Bradford Clay, or the Cornbrash, for its vertical range is very considerable.

Localities. Wherever the Great Oolite is shelly. Other geological positions are the Fullers-earth clays, of the Cotteswolds; likewise in the clays of the Cornbrash, the Forest marble, and the Bradford clay of Wiltshire; and also at Pavingham and other places in Bedfordshire.

Sub-Genus—PTEROPERNA.

Testá subæquivalvi inæquilaterá, utraque latere alátá, alá anticá brevi, posticá productá, et marginatá.

Margo cardinalis rectis, plus minusve obliquis, areá ligamenti interná, elongatá, margini externi parallelá.

Cardo dentibus infra umbonem numerosis angustis parallelis et minutis antrorsum vergentibus et costis posticis elongatis margine cardinali parallelis.

Umbones anteriores parvi depressi. Impressiones musculares duæ, in utraque valvis anticis parvis, posticis magnis ellipticis.

Facies externa sulco longitudinali elongato, sub-marginem cardinalem sitam.

Shell nearly equivalve, inequilateral, both extremities winged, anterior wing short, posterior elongated, its extremity margined.

Hinge margin straight, more or less oblique, ligamental area internal, and nearly parallel with the external margin. Hinge with numerous very small parallel teeth placed beneath the umbones near to the anterior extremity of the shell, and one or two posterior or internal costæ, which are elongated and extend posteriorly nearly parallel with the hinge margin. Umbones anterior, small and depressed. Muscular impressions two in each valve, of which the anterior or byssal are very small; the posterior expanded, elliptical, and not strongly marked. External surface either ornamented or plain, having an elongated longitudinal groove extending posteriorly to the umbo, and parallel with the hinge margin in each valve.

This remarkable Oolitic form replaces and represents the genus *Pterinea* of the Palæozoic formations; its affinities to that genus are so evident, that it is necessary to inquire whether *Pteroperna* should be arranged as a sub-genus of *Pterinea* only, or is entitled to rank as a distinct genus. The principal distinguishing features are internal. In *Pterinea* the posterior elongated accessory ribs or teeth proceed obliquely downwards towards the inferior and posterior extremity of the valves, as far as the border of the large posterior muscular impression, at the anterior side of which they terminate abruptly; the muscular impression is angular, and extends upwards nearly to the hinge margin posteriorly. In *Pteroperna*, on the other hand, the posterior costæ extend along the inner surface of the hinge margin, almost parallel with it, and are consequently placed upon the hinge plate above the muscular impression, which is rounded or elliptical, and placed lower or more nearly to the middle of the posterior surface. As minor points of distinction it may be mentioned, that in *Pterinea* the anterior teeth vary in number from two to four only; but in our typical shell, *Pteroperna costatula*, they are not less than sixteen, and are so minute that they scarcely occupy a greater longitudinal space than those of *Pterinea*. Externally our genus possesses a characteristic feature very convenient for the Palæontologist, who is rarely able to refer to the hinge, and which readily serves to distinguish it both from *Pterinea* and *Avicula*; we allude to the elongated posterior groove, which is always visible upon the surface, and of which the other two forms are destitute. Regarding, therefore, the position of the internal ligamental groove and accessory costæ, together with the form and position of the posterior muscular impression as indicating a corresponding difference in the structure of the animal, when compared with those parts of *Pterinea*, we consider ourselves justified in considering the Oolitic form as a genus distinct from but nearly allied to *Pterinea*.

Pteroperna also presents considerable analogy to the recent genus, *Malleus*.

PTEROPERNA COSTATULA, *Deslongchamps*, sp. Tab. II, figs. 8, 8a, 13, 13a.

GERVILLIA COSTATULA, *Deslongchamps*. Mém. Soc. Linn. du Calvados, 1824; tom. i, t. v, figs. 3—5.

AVICULA POLYODON? *Buvignier*. Mém. Soc. Philomath. Verdun, 1845, pl. iv, fig. 16.

Testá obliquá, lined cardinali recto, elongato, postico valde producto et emarginato, valvá sinistrá modico convexo, valvá dextrá subplaná, umbone depresso, latere postico in utraque valvá curvato aut excavato.

In ætate juniore, valvá sinistrá convexo-brevi, costulis radiantibus (6—8) elatis, acutis subundulatis, et inæqualibus cum lineis transversis interstitialibus regularibus et tenuissimis.

In ætate adulto, valvá sinistrá sine costulis aut striis cum laminis incrementi paucis, distantibus. Valvá dextrá semper lævigatá.

Shell oblique, hinge line straight, elongated, very much produced posteriorly and emarginated, left valve moderately convex, right valve more flattened, the umbo depressed; posterior side in each valve curved, its margin concave.

This species occurs under the following conditions of growth:—

In the young state, the left valve is very convex and short, having radiating costæ (6—8) elevated, acute, slightly waved and unequal, the interstitial spaces with regular, transverse, fine, closely arranged lines.

In the adult state, the left valve is without costæ or striæ, having only a few distant lines of growth. Were instances wanting to exemplify the advantage which is derived from the inspection of a large number of specimens in every stage of growth, undoubtedly the present species might be selected for such a purpose, the two extremes of growth presenting an aspect so dissimilar, that until numerous examples of every intermediate grade had been obtained, we hesitated with respect to their specific distinctness or identity; minute specimens occur in great numbers, having a length of only three or four lines; in these the costæ are always very prominent, the number of costæ vary from 6 to 8, they occupy only the middle portion of the valve, the sides being plain. The costæ continue distinct, but less conspicuous, when the shell has attained a diameter of 16 or 18 lines, but the costæ have then become waved, irregular, and unequal; beyond these dimensions, the valve is either plain, or has only faint indications of costæ, crossed and interrupted by laminæ of growth; but even in the ultimate stage of growth, when the hinge line has attained the length of five inches or upwards, and the test has acquired a considerable degree of thickness, the left valve has never so smooth a surface as the other, the last faint indication of its having previously possessed a sculptured surface. The specimens figured by M. Deslongchamps and M. Buvignier have only a very remote resemblance to each other, and tend to illustrate the foregoing remarks; *Gervillia costatula* is stated by the former author to have only four or five costæ, but the smaller number is probably owing to the less perfect state of the specimen, or to accident; in the

young state, the shell is thin and delicate, more especially the right valve; the latter is consequently comparatively rare; and M. Deslongchamps had not recognised it in Normandy, when he published his description of *Gervillia costatula* in 1824; at that period so few species of *Gervillia* were known, that the *usual* character of the surface could not be considered as ascertained, nor likewise the limits to which any variation in the hinge was restricted; but now that a considerable number are recorded, it will be found that in few instances where the hinge of *Gervillia* has been disclosed has a sculptured surface been coincident with it: the hinge of *Gervillia costatula* given by M. Deslongchamps, differs somewhat from our own, and from the figure of M. Buvignier; but as it is still more unlike the hinge of *Gervillia*, we might from the hinge alone conclude that it had been incorrectly allocated. The shell figured by M. Buvignier, though very imperfect, is readily recognised as our own species in the ultimate stage of growth, and having a degree of obliquity greater than is usual. It occurs in all the shelly beds of the Minchinhampton district, but specimens of the ultimate stage of growth have only been obtained in the planking of Minchinhampton Common. The same species, or one nearly allied to it, has also been procured, rarely, in the free-stone beds of the Inferior Oolite in the same district.

Localities. Minchinhampton; Ranville near Caen, Normandy; St. Mihiel, France.

PTEROPERNA PYGMEA, *Dunker*, Sp. Tab. II, fig. 11, 11a.

AVICULA PYGMEA, *Koch and Dunker*. Norddeuts. Ool. Versteinerungen, t. 3, f. 6.

Testá parvá, subæquivalvis, ovato-obliquá, concentricè idque obsoletè striatá; alá anticá rotundatá, sinuatá, posticá excavatá; umbonibus prominulis.

Shell small, subæquivalve, ovately oblique, concentrically, but obsoletely striated; anterior wing rounded and produced, its lower border sinuated, posterior wing excavated by a longitudinal furrow; umbones rather large and prominent, rising higher than the hinge line.

The right valve has a somewhat flatter surface than the other, and exhibits very slight traces of one or two longitudinal costæ; the transverse lines are not usually preserved, and are visible only upon a portion of one of our specimens.

Locality. It occurs somewhat rarely in the soft Oolite which overlies the Weatherstone Beds at Minchinhampton Common.

PTEROPERNA EMARGINATA. Tab. II, fig. 10.

Testá subplaná, ovato-elongatá et obliquá, valvá sinistrá lævigatá, striis concentricis subobsoletis; alá anticá parvá, posticá emarginatá. Valvá dextrá ignotá.

Shell rather flattened, ovately elongated, and oblique; left valve smooth, with concentric and nearly obsolete striæ; anterior wing small and pointed, posterior emarginated. Right valve unknown.

The degree of obliquity and flatness is much greater than in the associated species, and the anterior wing is smaller; some traces of an elongated groove are visible upon the posterior wing of the left valve.

Locality. Minchinhampton Common, where it is very rare, and occurs in the bed of soft shelly Oolite which overlies the Weatherstones.

GERVILLIA, *Defrance*, 1820.

Gen. Char. Shell subæquivalve or inequivalve, inequilateral, elongated, transverse; hinge margin usually straight, lengthened, and oblique; umbones small, oblique, anterior, contiguous, rarely terminal; hinge linear, marginal, with many oblong parallel, but rather distant and irregular pits in each valve, placed transversely to the hinge line; internal hinge teeth parallel, oblique, placed anteriorly, or beneath the transverse sulci.

The increased number of species exhibit characters which render it necessary to arrange them under two sections.

a' Shell subæquivalve, margins of the valves regular.

b' Shell very inequivalve and irregular, more or less contorted; margins of the valves close fitting, but sinuated.

Section *a'* comprises the usual well-known subæquivalve species.

Section *b'* has for examples *G. monotis*, Deslong., *G. Hartmanni*, Goldf., and *G. tortuosa* the *Gastrochæna tortuosa* of Phillips.

Section *a'*.

GERVILLIA ACUTA, *Sow.* Tab. III, fig. 12, 12*a*.

GERVILLIA ACUTA, *Sowerby.* Min. Conch., t. 510, fig. 5, 1826.

— LANCEOLATA, *Goldfuss.* Petref., t. 115, fig. 9.

? — ACUTA, *Phillips.* Geol. York., tab. 9, fig. 36, 1835.

? — SILIQUA, *Deslongchamps.* Mem. Soc. Linn. Calvados., t. 4, 1824.

Testá lanceolatá in vertice convexá, margine cardinali perobliquo depresso, umbonibus angustis acutis foveolis (3) quadratis. (Goldfuss.)

Shell lanceolate, slightly curved, subæquivalve, anterior side moderately convex, posterior side compressed and attenuated; hinge margin very oblique, with three quadrate hinge pits; umbones attenuated, anterior auricle acute and pointed, posterior auricle forming an obtuse angle with the border beneath it; folds of growth irregular, strongly marked. Compared with *Gervillia monotis*, the valves will be found less contorted or more nearly equivalve, the hinge border shorter, and the posterior auricle is not produced as in that species; in common with other species, the right valve is thinner, smoother, and more flattened than the other.

Localities. It occurs in the Stonesfield slate of the Cotteswolds (Buckman). In the slaty Oolite of Collyweston, Northamptonshire.

GERVILLIA SUBCYLINDRICA. Tab. III, fig. 13, 13a, b.

? Var. of GERVILLIA ACUTA, Sow.

Testá subæquivalvi, elongatá, subcylindricá, marginè cardinali majis obliquo; umbone in valvâ sinistrâ obliquo, prominulo, antico; valvæ dextræ umbone depresso, acuto. Cardo foveolis 3 aut 4, dentibus internis tribus obliquis, anticis.

Shell subæquivalve, elongated, subcylindrical; hinge line very oblique, lengthened, and nearly straight; umbo in the left valve oblique, prominent, but not terminal; right valve with the umbo depressed and acute; hinge with three or four marginal pits, and three oblique, anterior, and internal hinge teeth.

Without care this shell may be confounded with *G. aviculodes*, Goldfuss, t. 115, f. 8, but upon comparison the latter shell will be found wider, and the umbones straighter, and more acute; the hinge line also is inclined at a smaller angle, the general figure being less elongated and cylindrical. From *G. siliqua*, Deslongchamps, the very different inclination of the hinge line and straighter form will distinguish it.

Locality. Minchinhampton Common, where it occurs somewhat rarely in the planking.

GERVILLIA BATHONICA. Tab. II, fig. 15.

Testá oblongá, planatá, subæquivalvi, umbonibus terminalibus acutis, margine cardinali recto, obliquo, (plerumque ad angulum 45 gradum inclinantis,) latere antico recto interdum subexcavato, basi curvatá; foveolis (9) oblongis, æqualibus et regularibus; dentibus cardinis interné duobus, obliquis, anticis.

Shell oblong, flattened, subæquivalve; umbones terminal and acute; hinge line straight, oblique, (for the most part inclined at an angle of 45 degrees,) anterior side straight, sometimes rather excavated, base rounded; hinge pits oblong (nine in number), equal and regular; internal hinge teeth two, anterior, and oblique.

The figure varies so considerably, that but for the inspection of a considerable number of examples of all stages of growth, they would probably be separated into at least two species, hardly two specimens, indeed, can be found exactly alike in the figure of the anterior margin, the angle at which the hinge is inclined, the degree of convexity in the valves, or in the general length of the figure.

The terminal position of the umbones together with the straight or even slightly concave figure of the anterior margin gives to it very much the figure of *Perna*, but the large oblique internal teeth in the hinge, and absence of the anterior hiatus or corrugation, effectually separates it from that genus.

Its habits were eminently gregarious, and in certain layers of the white stone at Bussage and Eastcombs, it occurs in great numbers to the exclusion of nearly every other species; but even in these circumstances, the valves are very rarely found in apposition,

and the usual length is about an inch ; it occurs, however, in all the shelly beds of the Minchinhampton district.

In examining approximate species it will be found that the figure is less quadrate than *Perna quadrata*, Phillips ; the terminal umbones separate it from *Gervillia acuta*, Goldfuss ; and from *Perna mytiloides*, Goldfuss, the straightness of the hinge line is a point of distinction.

Locality. Minchinhampton.

GERVILLIA OVATA, Sow., Sp. Tab. II, fig. 12, 12a.

AVICULA OVATA, Sow. Min. Con., t. 512, f. 2, 1826.

Testá ovato-obliquá, convexá et lævigatá, valvâ sinistrâ convexâ, umbone obliquo, mediano, margine cardinali brevi, subrecto, margine antico rotundo; auriculis submellis, valvâ dextrâ plano-convexâ, umbone parvo. Sulcis cardinis externé tribus, magnis, distantibus et irregularibus; dentibus cardinis interni subobsoletis.

Shell ovate, oblique, convex, smooth ; left valve with the umbo oblique, nearly mesial ; hinge line nearly straight, short, the anterior extremity rounded, auricles small ; right valve more flattened, the umbo small ; external sulci of the hinge three, large, wide, distant and irregular ; internal hinge teeth scarcely distinguishable.

The valves are always separated and delicate, the test being usually but imperfectly preserved ; the younger specimens are shorter in proportion, and the hinge line exceeds half the length of the valves ; but in others of large dimensions it is less than half the length. Owing to its delicacy it is seldom that the hinge can be exposed, but independently of this, it entirely wants the anterior hiatus and corrugation which exists in *Avicula* and *Perna*, from the latter genus, indeed, the character of the surface is different, and it does not possess the squamous structure of the *Pernæ*.

Localities. The whole of the Minchinhampton district, in the shelly beds of which it is moderately common, more especially about the middle of the shelly series. Also at Stonesfield, Oxfordshire.

Section b'.

GERVILLIA MONOTIS, Deslongchamps. Tab. II, fig. 14, 14a, b.

GERVILLIA MONOTIS, Deslongchamps. Mem. Soc. Linn. Calvados, tom. i, 1824, t. 5, f. 2.

Testá elongatá, subarcuatá, valvâ sinistrâ convexâ; umbone antico, subterminali; laminis incrementi impressis; valvâ dextrâ planá, interdum concavâ, umbone terminali, depresso et acuto; margine cardinali obliquo in auriculo postico acuto, producto. Cardine foveis (5) subremotis, dentibus interni duobus, magnis, anticis.

Shell elongated, somewhat bow shaped, left valve convex ; umbo anterior, oblique, almost or completely terminal, prominent, and impressed with laminæ of growth ; right

valve flat, sometimes concave, its umbo terminal, depressed, and acute; hinge line very oblique, elongated posteriorly, and produced into an auricle. Hinge with five large and rather remote sulci; internal teeth two, large and anterior, margins of the valves sinuated.

This species forms a link connecting two very dissimilar groups of *Gervillia*; it possesses the characteristics of the second or contorted group in a more modified form than *G. Hartmanni*, Goldfuss, or *G. tortuosa*, the *Gastrochæna tortuosa* of Phillips; these two latter species pertain to the Inferior Oolite, and the present one to the Great Oolite. The degree of contortion varies considerably in individuals; the young specimens have a very lengthened hinge line; the lines of growth are strongly marked upon the left valve, and there are two short obscure ribs diverging from the umbo, these, however, disappeared in the progress of growth, and the posterior extremity became more produced.

The right valve is more delicate, and is found more rarely than the other; the same circumstance occurs likewise in Normandy, where M. Deslongchamps had not seen the right valve when he described this species. It ranks as one of the most abundant and characteristic bivalves of the Great Oolite; it occurs indifferently in all the shelly beds.

Localities. Minchinhampton; Normandy.

GERVILLIA CRASSICOSTA. Tab. II, fig. 9.

Testá valde obliquá, elongatá, convexiusculá, auriculo antico rotundato, postico truncato et brevi; costis radiantibus subundatis, elatis majoribus 8, alternatim minoribus, et cum striis transversis numerosis, indentatis, latero postico elongato: valvá dextrá ignotá.

Shell very oblique, elongated, convex, anterior auricle rounded, posterior auricle short and emarginated; radiating costæ slightly waved, elevated, the larger 8 in number, distant, and alternating with as many smaller, and impressed with numerous rather indistinct transverse striæ: posterior and inferior extremity elongated and slightly acuminate: right valve unknown.

Of this rare species we have only obtained three examples; the hinge border is much shorter than in *Pteroperna costatula*, the posterior wing being but little produced; the whole contour of the shell is very oblique, and the larger costæ are very prominent; the greater degree of obliquity, convexity, and alternation of the costæ, readily serve to distinguish it from *P. costatula*.

Locality. Minchinhampton Common.

GERVILLIA RADIANS. Tab. VI, fig. 10.

Testá magná crassá inæquivalvi valde contortá, valvá sinistrá arcuatá, umbone magno incurvo, valvá dextrá oblique-concavo, umbone depresso; margine cardinali elongato subhorizontali, auriculis prominulis; lateribus lineis radiantibus paucis obscuris; aliis concentricis dense dispositis.

Shell large, very thick, inequivalve, very much contorted, the left valve very convex,

arched, with the umbo large and incurved; right valve oblique and concave, its umbo depressed; hinge margin elongated, nearly horizontal, with prominent auricles; the surface of the convex valve has a few obscure radiating lines decussated by others, which are concentric, irregular, and very densely arranged.

The general aspect has a considerable resemblance to *Gervillia Hartmanni* (Goldfuss), but it is more contorted than that shell; the valves are shorter, the diameter through them is greater, and the hinge line is so much less oblique as to be nearly at right angles to the axis; owing to this figure and the length of the hinge line, the posterior auricle projects considerably.

Locality. Morcot, Rutlandshire.

INOCERAMUS. *Park.* 1811.

INOCERAMUS, CATILLUS, MYTILOIDES, *Brong.*

Gen. Char. Shell inequivalve, sub-equilateral, ovately trigonal, umbones prominent, incurved; hinge straight, nearly horizontal, consisting of a series of transverse parallel teeth in each valve; substance of the test fibro-lamellar.

INOCERAMUS? OBLIQUUS. Tab. VI, fig. 12.

Testá ovato-obliquá subdepressá, subæquivalvi, umbonibus prominulis subæqualibus, margine cardinali brevi obliquo, margine anteriore et inferiore curvato, posteriore subsinuato; lateribus plicis concentricis elatis, angustis inæqualibus et irregularibus, interdum sub-acutis.

Shell ovate, oblique, rather depressed, subæquivalve, umbones prominent, nearly equal, hinge margin short, oblique, anterior and inferior margins gracefully rounded, posterior border slightly sinuated; the sides of the valves concentrically plicated; the plications are elevated and narrow, irregular and unequal, sometimes acute; the substance of the shell is thin. It is more oblique, wider, and less pointed than the *I. cinctus* from the Oolite of Ireland, and more depressed than any other Oolitic species with which we have compared it; the valves are thin, frequently in opposition, and are more or less compressed and distorted; the surface is smooth, shining, and is destitute of any striations.

Length, $2\frac{3}{4}$ inches; breadth, $2\frac{1}{4}$ inches; diameter through both the valves about $1\frac{1}{4}$ inch.

Locality. Morcot, Rutlandshire.

INOCERAMUS FITTONI. Tab. ^{III}~~IV~~, fig. 14.

? INOCERAMUS AMYDALOIDES, *Goldf.* Pet., t. 115, f. 4.

Testá tenui ovato-acutá depressá: margine cardinali obliquo posteriore subrecto; umbonibus subacutis, rugis concentricis inæqualibus et irregularibus.

A somewhat oval, depressed, and thin shell, with the hinge margin oblique, and rather prominent umbones; surface irregularly undulated.

A shell presenting considerable resemblance in form to *I. amygdaloides*, Goldf., but we have only been enabled to compare it with casts of that species which is found in the Lias of Germany.

Locality. Stonesfield, Oxfordshire, where it occurs but rarely.

PERNA, *Brugière*, 1791.

Gen. Char. Shell flattened somewhat irregular, with terminal depressed umbones, hinge linear marginal, with numerous parallel ligamental pits; byssal sinus anterior placed a little beneath the umbones, and slightly gaping, its margins thickened; muscular impression oval and situated rather posteriorly; texture of the shell fibro-lamellar.

PERNA RUGOSA. Tab. III, fig. 1.

? PERNA RUGOSA, Goldf. Petref. 2. t. 108, f. 2.

Testá subquadrata, complanata, rugosa, tenui, umbonibus acutis, lineâ cardinali horizontali; laminis superficiei scabris irregularibus.

Shell subquadrate, flattened, rugose, thin, with acute umbones, hinge line horizontal and of moderate length; laminæ of the surface rough and irregular.

The general figure possesses a considerable resemblance to *P. rugosa*, Munst. (Goldf. Petref., t. 108, fig. 2,) our specimen is, however, more compressed, and the umbones less prominent, the test is also somewhat thin. The tenuity of the test affords a striking contrast to several massive Inferior Oolite species, whose general contour is not very dissimilar.

Locality. Minchinhampton Common, where it occurs very rarely in the bed of coarse planking. The *P. quadrata*, Phil. is probably identical with this species.

LIMA, *Brug.*, 1791.

PLAGIOSTOMA, Sp., Sow.

Gen. Char. Shell subequivalve, inequilateral, oblique, aurited, hinge margin oblique, thickened within, forming a transversely flattened plate, in which and beneath the umbones is a triangular depression, destined to receive a ligament which is partly internal.¹

¹ In an interesting communication read before the Linnean Society of alvados, (December, 1830,) Professor E. Deslongchamps stated the general reasons for uniting the species of *Plagiostoma* to *Lima*. In this memoir, not yet we believe fully published, M. Deslongchamps described seventeen species of *Lima* from the Jurassic strata of Calvados, and arranged them under four sections:—

1. Margins of the valves entire, not serrated, lunule distinct: *L. gigantea, heteromorpha*.
2. Margins of the valves sinuato-dentate, lunule distinct: *L. sulcata, variabilis, radiata, punctata*.
3. Margin of the valves serrated, lunule distinct: *L. elliptica, lucida, pulchella, uniaurita, typus, lævis, semistriata*.
4. Margins of the valves sinuato-angular, no lunule: *L. alternans, duplicata, gibbosa, exigua*.

It may be conveniently divided into the following groups :

- a. Species with the umbones divergent, having between them a triangular area, borders of the valves rounded, lunule distinct and gaping.
- b. Umbones approximate, borders of the valves rounded, lunule small and closed.
- c. Species more flattened and elongated, or chisel shaped, the borders of the valves truncated, lunule gaping, its borders folded backwards.
- d. Umbones approximate, borders of the valves truncated anteriorly, lunule closed.

Our Great Oolite species will be found to contain examples of each of the foregoing groups.

LIMA DUPLICATA, *Sow.*, sp. Tab. III, fig. 6, 6 a.

PLAGIOSTOMA DUPLICATA, *Sow.* Min. Con., t. 559, f. 3, 1827.

? — PECTENOIDES, *Zieten.* Wurt., p. 92, t. 69, f. 2.

LIMA ALTERNICOSTA, *Buvignier.* Geol. de la Meuse, p. 22, t. 18, f. 11—13.

Testâ convexâ oblique-ovatâ, anticè abrupti truncatâ ad cardinem angustatâ, postici rotundatâ, auriculis parvis subæqualibus; costis 25—28 angulatis, carinatis, sulcis conformibus in imo sulcorum costâ minimâ ornatis, costis tenuissime transversè striatis.

Shell convex, obliquely ovate, anterior side abruptly truncate, narrow towards the hinge border, posterior border rounded, auricles small, nearly equal; costæ 25—28, angulated, elevated, the angle being crested with a very fine carina, interstitial spaces wide, conformable, each having a single very fine costa, the costæ and their carinæ are finely and densely striated transversely.

The costæ and sulcations are large upon the middle of the shell and become regularly smaller towards the sides, becoming ultimately only so many fine lines. It is distinguished from *Limea duplicata*, an Inferior Oolite species, by the more oblique form and less elevated and acute costæ. The *Lima alternicosta* of Buvignier, from the Ferruginous Oolite, in the Oxfordian strata of the Department of the Meuse, does not appear to differ from our species in any essential character, except that the figure he has given is somewhat more than usually oblique.

It is one of the most common bivalves in the formation, but it is not often that the fine longitudinal carina upon the costæ is preserved. Height, 14 lines; length, 9 lines.

Localities. The entire Minchinhampton district of the Great Oolite, also in the Bradford Clay, Forest Marble, and Cornbrash of Wiltshire and Gloucestershire.

(c.) LIMA PECTINIFORMIS, *Schloth.* Tab. VI, fig. 9.

OSTRACITES PECTINIFORMIS, *Schloth.* Petref., p. 231, 1820.

OSTREA PECTINIFORMIS, *Zieten.* Wurt., p. 62, t. 47, f. 1.

LIMA PROBOSCIDEA, *Sow.* Min. Con., t. 264, 1821.

— — *Goldfuss.* Petref., p. 88, t. 103, f. 2.

— PECTINIFORMIS, *Bronn.* Leth. Geog., p. 214, t. 19, f. 9, 10, 1851.

Testá convexá suborbiculari subæquilaterali, concentrice lamelloso-rugosá; costis (11—14,) convexis nodosis tubuliferis, canalibus conformibus, auriculis anterioribus sinuosis hiantibus, lunulá nullá. (Goldfuss.)

Shell convex suborbicular, nearly equilateral with concentric rugose lamellæ; costæ (11—14,) convex, with nodose and elevated prominent fistulous plications, interstitial spaces conformable; anterior auricles sinuated and gaping, no lunule.

This shell is well known as a constant fossil of the upper ragstones of the Inferior Oolite; it likewise occurs occasionally in the shelly beds of the Great Oolite, and is always very imperfectly preserved, most commonly, only the outer cast remaining, but it never attains the dimensions of the Inferior Oolite specimens, and would seem therefore to have degenerated both in size and thickness.

Locality. Minchinhampton Common.

(d.) LIMA CARDIIFORMIS, Sow. Tab. III, fig. 2, 2 a.

PLAGIOTOMA CARDIIFORME, Sow. Min. Con., t. 113, f. 3, 1815.

Testá convexá, oblique ovato-orbiculari; anticè truncatá, costis crebris (circa 52—56), convexis æqualibus, canalibus angustis, lineis transversis regularibus crassiusculis, lunulá excavatá.

Shell convex, oblique, ovately orbicular, anterior side truncated, costæ numerous (about 52—56,) convex, equal, the interstitial spaces narrow, with transverse, regular, and prominent lines, lunule excavated.

The shell is moderately lengthened, the longitudinal always exceeding the lateral diameter, the degree of convexity though varying is considerable, the diameter through both the valves being about equal to two thirds of the length of the shell, the umbones are but slightly curved, and the lunule is but moderately excavated, the valves are closed at their anterior borders, or leave when united the least possible fissure, the hinge border slopes obliquely from the umbones on each side, and the auricles are small; the umbones are but slightly separated, the ligamental area being very contracted. The costæ are regularly rounded, and so closely arranged, as to leave the interstitial spaces deep and narrow, the surface (more especially in older specimens,) are rendered rugose by the transverse striæ, but in this feature, and likewise in the elevation of the ribs, there is much variety, but the number of the ribs is very constant, and assists to distinguish it from *Lima notata*, Goldfuss, in which they are much less numerous, and the interstitial spaces considerably wider, and the convexity of the valve is less; in other respects there is a considerable general resemblance between the two forms. This is the most universally distributed *Lima* of the formation, occurring in every variety of rock, whether composed of sandstone, clay, or shelly limestone.

Locality. Minchinhampton and Sapperton.

(c.) LIMA LUCIENSIS, *D'Orbigny*. Tab. III, fig. 4.LIMA LUCIENSIS, *D'Orbigny*. *Prodrome de Paléontologie*, p. 313, 1850.

Testá plano-convexá, oblique elongatá, umbonibus acutis depressis, approximatis, auriculis magnis subæqualibus; costis (10 aut 11) magnis plicatis, interstitialibus conformibus.

Shell compressed or rather convex, obliquely elongated, umbones nearly straight, pointed, and approximated, auricles large, nearly equal and costated longitudinally, the anterior auricle corrugated and gaping. Costæ upon the back of the shell (10 or 11) large, plicated, rounded, with large conformable interstitial spaces.

This species has less obliquity than is usual with the *Limæ*, and this character will always serve to distinguish it from *Lima angusta*, Buvignier, t. 18, f. 27, which occurs in the middle portion of the Inferior Oolite in Gloucestershire, the character of the costæ in that species is very similar but more curved, the shell is always very oblique, its anterior side or lunule being concave. Compared with *Lima substriata*, Goldfuss, our species is much more elongated, has fewer costæ, and has not the distinctly raised murications or plicæ by which the costæ of that species are ornamented. It is somewhat rare, but occurs in several of the shelly beds.

Locality. The Minchinhampton district.

(d.) LIMA GIBBOSA, *Sow.* Tab. III, fig. 7, 7 a.LIMA GIBBOSA, *Sow.* *Min. Con.*, t. 152, 1817.— — *Bronn.* *Leth. Geog.*, 213, t. 19, f. 11, 1851.— — — *Index Palæont.*, p. 645, (not Goldf.?)

Testá convexá ovato-subobliquá, elongatá, fornicatá, umbonibus magnis approximatis, dorso costato; costis (11—13) elevatis acutis, canalibus conformibus; striis tenuissimis, transversis decussatis.

Shell ovate, slightly oblique, convex, elongated, ribbed, umbones large and contiguous, back of the shell with acute, elevated costæ from 11 to 13 in number, with conformable interstitial spaces; the entire surface has very fine transverse striæ.

The sides of the shell are destitute of costæ, the smooth surface being about equal in extent to that which is costated. This species is perfectly distinct from the *Lima gibbosa* of Goldfuss, which is more oblique, the costæ are curved, they extend even upon the posterior sides of the valves, and their number is more than twice as great as in our own or Sowerby's species. In the shelly beds of the Great Oolite it occurs very rarely in single valves, and never equalling half the size which it attains in the Inferior Oolite, but in the seams of clay which are associated with Stonesfield slate, casts are found of the full dimensions, and with the valves in apposition.

Localities. Minchinhampton Common; Ancliff, Wiltshire.

(b.) LIMA SEMICIRCULARIS, Goldf. Tab. III, fig. 3, 3 a.

LIMA SEMICIRCULARIS, Goldfuss. Petref., t. 101, f. 6.

PLAGIOSTOMA SEMICIRCULARIS, Quenstedt. Wurt., p. 477.

Testá convexá, oblique semicirculari, anticè truncatá, costulis crebris æqualibus convexis, canalibus interstitialibus angustioribus concentrice confertim striatis, lunulá plano-concavá.

Shell moderately convex, obliquely semicircular, anterior side straight, truncated, ribs closely arranged, very numerous, convex, the interstitial spaces more narrow, and impressed with very delicate striæ; lunule flattened, or slightly excavated, umbones approximated, pointed, auricles small, hinge border straight.

This species has some general resemblance to young specimens of *Lima cardiformis*, but may be distinguished from it by the more elongated, depressed, and less oblique form, and more especially by the more pointed and depressed umbones, the costæ also, contrary to that species, are often slightly undulated, and the lines of growth form two or three prominent rounded elevations. The average size is about an inch in length. It is moderately abundant in the shelly beds.

Locality. The whole of the Minchinhampton district.

(c.) LIMA OVALIS, Sow. Tab. III, fig. 5, 5 a.

PLAGIOSTOMA OVALIS, Sow. Min. Con., t. 114, f. 3, 1815.

LIMA OVALIS, Goldf. Petref., t. 101, f. 4.

Testá convexá oblique ovatá, anticè truncatá, costulis convexis æqualibus crebris, sulcis interstitialibus transversim lineatis, lunulá concavá.

Shell ovate, moderately convex, umbones pointed, auricles very small, anterior border nearly straight, the side steep and rounded, posterior border curved nearly in a semicircle; costæ convex, but very densely arranged, equal and marked with extremely delicate transverse striæ, the interstitial spaces are very narrow and punctated.

The costæ are equal and waved, but so fine as scarcely to be traced without the aid of a magnifier, the auricles in size are reduced almost to nothing. The general dimensions nearly accord with *Lima semicircularis*, but it is more convex and oblique, the anterior side being more steep and rounded.

Locality. It is not very abundant, but occurs throughout the shelly beds of the formation over the Minchinhampton district, and likewise at Ancliff.

(d.) LIMA IMPRESSA. Tab. III, fig. 8, 8 a.

Testá convexá obliquá, ovato-orbiculari, anticè truncatá, costulis depressis, irregularibus sulcis angustis interstitialibus undulatis, punctis crebris impressis, et striis transversalibus tenuissimis notatis. Striis incrementi paucis distantibus.

Shell convex oblique, ovately-orbicular, anterior side truncated, costæ depressed, of

irregular width, with very narrow and waved interstitial sulcations, which are impressed with densely arranged punctures; the surface of the shell has likewise very fine transverse striæ. Striæ of growth few and distant.

This shell is moderately convex, the lateral and longitudinal diameters are nearly equal, the umbones approximate and the auricles are small, the substance of the test is thin, and the surface, except in young specimens, is usually distorted or crushed, so that it is nearly impossible to obtain a large specimen which has not suffered in the process of fossilization. The longitudinal elevations are so slight as scarcely to be considered costæ, their surfaces are smooth, shining, and so much flattened, as scarcely to impress a sensible convexity to the touch. The numbers of the irregular costæ vary from 40 to 48, they are equally distinct upon every part of the shell, a feature which will always distinguish it from *Lima gigantea*, and analogous species. *Lima læviusculá*, Deshayes, approximates to our species, but is destitute of the dense punctations which mark the interstitial spaces; the interstitial sulcations are likewise evanescent upon the middle of the valves, which is not the case with our shell. *Lima aciculatá*, Goldfuss, approaches this species in the character of its markings, but it is much more flattened, and the costæ are regular and more numerous.

This species is nearly as abundant as the *Lima cardiiformis*, which it everywhere accompanies, but very frequently only in a crushed condition; it is shorter than the other and scarcely so convex.

(d.) LIMA BELLULA. Tab. III, fig. 9.

Testá ovato-obliquá, lævigatá; anticè convexá, abruptè truncatá posticè subcompressá, rotundatá; auriculis parvis inæqualibus; lunulá magná excavatá; superficie striis radiantibus tenuibus, nonnunquam obsoletis; striis anticis distinctis subdistantibus, posticis crebris evanescentibus.

Shell ovate, oblique, smooth; anterior side convex, abruptly truncated; posterior side rather compressed, its margin rounded; auricles small, unequal; lunule large and deeply excavated; the surface is ornamented with very delicate radiating striations, which anteriorly are distinct and rather distantly arranged, posteriorly they become much more closely arranged and are usually indistinct.

The general aspect of this species is shining and smooth, so that it is only upon close examination that it is discovered to have radiating striations; in young specimens these are always more or less visible, but in specimens of advanced growth only a few traces of the anterior striations remain. The concentric lines of growth are usually strongly marked and efface the striations.

With advance of growth some change is observable in the contour of the shell, it becomes more transverse and nearly orbicular.

Specimens from the Great Oolite of Lincolnshire do not attain to one third the linear dimensions of others from the Inferior Oolite of the Minchinhampton district, but it does not occur in the Great Oolite of Gloucestershire.

Localities. Barnack, Northamptonshire; Ponton, Lincolnshire; Culver Hill, on the western side of Minchinhampton Common, in the Inferior Oolite.

PINNA, *Linn.* 1758.

Gen. Char. Shell longitudinal, wedge shaped, acute anteriorly, truncated and gaping posteriorly; umbones straight, terminal and pointed; hinge lateral, linear, and without teeth; ligament marginal, linear, elongated, and partly internal; muscular impressions two, the anterior or byssal one minute, the posterior large. Substance of the shell thin, structure fibro-lamellar, composed of two layers, of which the exterior one is fibrous, the interior lamellar.

PINNA AMPLA, *Sow.*, sp. Tab. IV, fig. 14.

MYTILUS AMPLUS, *Sow.* Min. Con., t. 7, 1812.

PINNA AMPLA, *Goldfuss.* Pet., t. 129, f. 1.

— — *Deshayes.* Lam. An. s. Vert., 2de ed., vii, p. 68, 1836.

— — *Bronn.* Index Palæont., p. 977.

Testá mytiliformi, mediocrè gibbosá, costellatá; costellis irregularibus, subplanis, undulatis, plurimis dichotomis aut confluentis et nodosis, striis transversis crebris et laminis incrementi impressis: umbonibus obtusis plerumque costellatis.

Shell triangular, moderately gibbose, longitudinally costated; costellæ numerous, very irregular, waved, for the most part bifurcated, confluent, knobbed and impressed with transverse striæ, which are very fine and closely arranged, and likewise by the laminæ of growth which are irregular. The hinge is straight, short, oblique, forming an angle of 45 degrees with the anterior border, the umbones are obtuse and usually costellated.

The radiating little ribs are but slightly elevated; they are tolerably distinct upon the anterior part of the shell, but posteriorly, where the folds of growth are larger, they become very irregular, confluent, or vanish altogether, a change exactly similar to that exhibited in the progress of growth of some recent *Pinnas*; in fact, well-preserved specimens of *Pinna ampla* are sometimes obtained, which are quite destitute of the longitudinal costellæ, and retain only the folds of growth. The substance of the test is thicker than is observed in recent shells of this genus.

It occurs rarely in the shelly beds of the Great Oolite, but more frequently in the Stonesfield slate of Gloucestershire.

Localities. Minchinhampton Common, in Great Oolite; Sevenhampton Common, in the Stonesfield slate; Wiltshire, in the Cornbrash.

In the Stonesfield slate of Stonesfield, Oxfordshire, and also in the Oolite of Mitford, Somersetshire.

PINNA CUNEATA, *Phillips*. Tab. VI, fig. 11.

PINNA CUNEATA, *Phillips*. Geol. Yorksh. i, t. 9, f. 17, 1835.

Testá elongatá, subcurvatá, quadriquetrá, latere antico convexo, postico compresso, margine acuto et excavato; superficie lineis undulatis radiantibus subnodosis aliis concentricis decussatis.

Shell elongated, somewhat curved, four sided, anterior portion convex, its margin convex, posterior portion compressed, its margin acute and excavated; the entire surface with undulating knotted radiating lines crossed by others concentrically disposed.

The concentric lines are very irregularly disposed, being much more closely arranged and indistinctly marked as the shell increased in size, at first they are not more numerous than the radiating lines. Length about $3\frac{1}{2}$ inches, basal diameter $2\frac{1}{4}$ inches, diameter through both the valves, 13 lines. In Gloucestershire, it occurs only in the upper division of the Inferior Oolite.

Localities. In the slaty Oolite of Easton and Collyweston, Northamptonshire, and in Lincolnshire; in the Cave Oolite of Yorkshire.

TRICHITES, *Lhwyd*, 1699.

TRICHITES, *Plot*, 1676; *Lhwyd*, 1699; *Guettard*, 1750; *Defrance*, 1828; *Pictet*, 1845; *Lycett*, 1850; *Deshayes*, 1851.

TESTA INCERTI GENERIS, *Woodward*, 1723.

PINNIGENE, *Deluc*, 1799.

CATILLUS, Sp., *Pusch*, 1836.

PINNA, Sp., *Deshayes*, 1835.

PINNIGENA, *D'Orbigny*, 1851.

Gen. Char. Shell of fibrous structure, thick, inequivalve, inequilateral, subquadrate, the valves anteriorly forming a prominent and somewhat pointed apex curved obliquely forwards. The left or larger valve convex and very thick, its apical extremity hollowed internally, and forming with the corresponding portion of the other valve a funnel-like cavity, which is more or less open at its extremity; the right valve is thinner and flattened, or sometimes somewhat concave; the margins of the valves are very irregular and sinuated, but fit closely together all round, and there is always a large flexure upon the posterior side of the shell, forming a wide depression in that portion of the larger valve and a corresponding elevation in the smaller valve. The hinge border is very irregular and sinuated, it is nearly horizontal, lengthened, and internally without teeth, or any testaceous thickening. The interior side of the larger valve is much thicker than the other, its border is excavated beneath the apex, and is somewhat corrugated. The muscular impression is single, large, subcentral, and strongly impressed, its circumference has concentric step-like ridges. Ligament probably linear and subinternal, as in *Pinna*.

The individuals of a species vary much in the convexity of the valves and in the

character of the surface, so that species are not easily discriminated; the costæ, nodules, or other elevations which are occasionally present upon the surface, become indistinct or even vanish altogether; but their broad flexure upon the posterior side and their irregular sinuous hinge border are invariably conspicuous.

The structure of the test consists of closely-packed perpendicular fibres of a columnar aspect, which are traversed transversely by calcareous laminæ of extreme tenuity, parallel to each other, and sometimes of a colour different from the rest of the shell; they occur at very uncertain distances, appearing in the sections as so many fine lines, these thin laminæ give both to the external and internal surfaces of the valves a perfectly smooth appearance, and in some sections a dozen or more of them may be counted, they indicate successive additions of thickness to the test during the growth of the animal. The muscular impression exhibits the mode of growth in a very clear manner, the necessary addition of perpendicular fibres around its circumference producing a sudden elevation, or step like surface at the border of every successive zone of increase. The position of the muscular impression is rather posterior to the centre of the valves, or nearer to the posterior and superior border; there may also usually be observed upon the inner surface of the flat valve, at a little distance from the anterior border and parallel to it an elongated swelling, or rounded prominence, having exactly the contour of the outer border, and exhibiting the appearance of having formed the outer border at a former stage of growth, a feature precisely similar to that which is observed in certain oysters. The irregular swellings upon the surfaces of the valves do not coincide with the surface of the interior, sections of the thicker specimens often exhibit this circumstance in a very striking manner, and likewise a general irregularity and inequality in the thickness of the test; the inner surfaces of the valves, though smooth, are singularly uneven, and it is not uncommon to observe an occasional thickness in the test of seven or eight lines, terminate towards the posterior border in a considerable degree of tenuity and delicacy. It would seem that the transverse laminæ, whatever may have been their original structure, impeded fracture only to a very limited extent, for we find that in most cases the fracture is directly across all the laminæ, occasionally indeed the fracture has been arrested at the surface of one of the laminæ, and has followed the plane of its surface for some distance, an indication that its structure was lamellar. The fibrous structure then was very fragile, in the fossil state, fracture in the direction of the fibres takes place upon any slight concussion, however thick may be the test; and with the living shells the same circumstance seems to have obtained, for in the majority of instances, *Trichites* acquired its fossil state in the condition of fragments only, and these occur in such numbers, both in the Great and Inferior Oolite, as to indicate that this genus occupied a very prominent position amongst the marine fauna of the lower Oolitic epoch. The valves of *Trichites* (more especially the older and thicker specimens), are perforated, and sometimes literally honeycombed with little crypts of *Lithophagidæ*, in which, occasionally, the valves of the shells may be discovered; these perforations are a constant feature pertaining to *Trichites*, from whatever formation or bed

it is obtained, and a little search discloses the crypts in such extraordinary numbers, as to indicate that the *Lithophagidæ* then existed in a force which would not have been expected from the small number of instances in which their tests are preserved. In the shelly beds of the Great Oolite, the convex valve of *Trichites* is usually covered, and even loaded with small adherent oysters; but through these masses the perforations of the *Lithophagidæ* are found to have passed, a sufficient proof that the operations of the latter mollusks commenced posterior to the occupation of the adherent shells, and leading to an inference that the latter may have pertained to the living examples of *Trichites*. Our Great Oolite examples of the genus convey but a very inadequate idea of the magnitude which it sometimes attained; the upper division of the Inferior Oolite has disclosed sections of the valves upwards of two feet in length, and two inches in thickness. A shell imbued with such peculiar fragility, must have been unfitted to exist upon the bed of a littoral deposit exposed to the attritions and accidents to which such a position must have been incident, but in which, nevertheless, we find their remains; it seems more probable that they lived like the *Myadæ*, buried and defended in mud or sand, and that it was only by the denuding action of currents that their shells became exposed, and rolled with other fragmentary bodies.

In seeking for the generic forms allied to *Trichites*, we are reminded of the *Catilli*; the structure of the shell is alike in both genera, and the general figure is not very dissimilar, but the regularity of one contrasts with the irregularity of the other; the character of the surface more especially is distinct, the regular concentric folds of the *Catilli* have no affinity with the nodose and laminated surface of *Trichites*, nor can the recurved solid umbones and thick crenulated hinge plate of the former genus find any similitude with the *Pinna* like termination of *Trichites*. But if the character of the apex be allowed to resemble that portion of *Pinna*, we may search in vain for any other point of affinity with that genus; the structure of the shell in each differs materially; in *Pinna* it consists of two distinct layers, the external one of which is fibrous, but the internal is that of ordinary shell or nacreous, a structure tending to obviate the fragility which pertains to the fibrous structure of the outer layer, and very much resembling a method practised in the mechanical arts, for giving increased strength to thin layers, in substances whose fibres pass in different directions; by this contrivance, a shell very thin is made to possess a considerable degree of elasticity and strength; the other particulars, in which *Pinna* differs from *Trichites*, embrace every remaining generic character, as the equivalve form, its regularity, the gaping truncated posterior extremity, and lastly, the muscular impressions, of which *Pinna* has two. The preceding comparison with *Pinna* has been made in consequence of several authors, who confessedly had acquired only a very imperfect knowledge of *Trichites*, having classed the *Pinnigene* of Deluc, with *Pinna*, under the name of *Pinna Saussurei*.

It is now known that *Trichites* is abundant in the Oolitic rocks of England, and is found over extensive areas, but it is not confined to one of the Oolitic formations merely, as

there are other species which are nearly unknown to science; these circumstances, it is trusted, will sufficiently incite the industry of local collectors, and that ere long our knowledge of this obscure form will be augmented. On referring to the earliest notice of *Trichites*, we find that it dates even to the period when fossil shells were regarded as mere sports of nature, as the product of a supposed plastic power possessed by inorganic matter. Dr. Plot, in his 'Natural History of Oxfordshire, 1676,' applied the term *Trichites* to fragments of these shells, and figured a specimen in pl. 7, fig. 7; these he regarded merely as mineral curiosities. To Lhwyd is due the merit of having discovered their true position in the animal kingdom, and their distinctness from all known shells of Mollusca. He described in his 'Lithophylacii Britannici,' several species from the Coralline Oolite of Oxfordshire, a fact the more remarkable, when it is remembered that more than a century afterwards the majority of systematic writers omitted the genus altogether from their works, or confessed their imperfect acquaintance with it. In Woodward's 'Catalogue of British Fossils, 1723,' it seems to have been confounded with the *Catilli* of the cretaceous rocks, and is placed with the "Testæ incerti generis." Guettard recognised it in the Oolite rocks of Normandy, and mentioned it under the name of *Trichites*.

Deluc, in the great work of Saussure, 'Voyages dans les Alpes,' i, p. 192, made it a new genus, under the name of *Pinnigene*, and figured a species which has not been recognised in this country; he does not seem to have been aware of the identity of *Pinnigene* with the *Trichites* of Lhwyd. The article *Trichites*, in the 'Dictionnaire des Sciences Naturelles,' tom. iv, contributed by DeFrance, contains a digest of all the information which had been acquired respecting this obscure form. Deshayes, in the 2d edition of Lamarck, 'Anim. s. Vert.,' tom. vii, p. 68, refers Deluc's species to *Pinna*, under the name of *Pinna Saussurei*, but states however that he had never seen a perfect specimen. Pusch, in his 'Polens Paleontologie, 1835,' page 45, offers some remarks upon fragments which he had detached from the rocks of the middle Oolite at Brzegi and Koritricz, but having no knowledge of the entire form, he refers the fragments to *Catillus*. Pictet, in his 'Traité Élémentaire de Paléontologie,' allows the generic value of *Trichites*, and reproduces the figures of Deluc reduced in size. Lastly, the reader is referred to a notice of this genus in the 'Annals and Magazine of Natural History for 1850,' p. 347, by one of the authors of this monograph.

TRICHITES NODOSUS, *Lycett*. Tab. III, fig. 11.

TRICHITES NODOSUS, *Lycett*. Ann. and Mag. of Nat. Hist., 1850, p. 347, t. 10.

— — Bronn. Leth. Geog., p. 221, t. 20, f. 1, 1851.

Testá subquadrata, convexá, valvis valdè inæqualibus, valvá sinistrá convexá, valvá dextrá concavá; valvis varicibus subradiantibus irregularibus interdum dichotomis. Valvá minorá nodis nonnullis irregularibus. Apices valvarum attenuatæ et obliquæ.

Shell subquadrate, convex, the valves very unequal, the left valve being very convex or

gryphoid, the right valve somewhat concave; the valves ornamented with irregular varices, sometimes dichotomous, and imperfectly radiating. The smaller valve has a few unequal nodules upon the varices. Apices of the valves oblique and attenuated.

The thickness of the larger valve is moderate, the smaller valve is rather thin; specimens vary much in the convexity of the larger valve and in the varices, the latter being sometimes not distinguishable; the apices are much produced, attenuated, and curved forwards, more especially that of the larger valve. The almost constant manner in which the larger valve is loaded with adherent shells is a considerable obstacle to the determination of species, this, together with some variation in the figure of the valves, suggests doubts which are only to be removed by a comparison of numerous specimens.

Height, $5\frac{1}{2}$ inches; opposite diameter, $4\frac{1}{2}$ inches; diameter through both the valves, $2\frac{3}{4}$ inches.

Localities. Minchinhampton Common, where it is not unfrequent; Scar Hill, near Nailsworth, in the freestone of the Inferior Oolite, where it occurs very rarely.

In the Great Oolite of Comb Down, near Bath. (Museum of Practical Geology, presented by Mr. S. P. Pratt.)

MYTILUS, *Linn.*, 1758.

MYTILUS et MODIOLA, *Auct.*

Gen. Char. Shell longitudinal, oblique; umbones terminal or subterminal. Hinge lateral, linear, and without teeth, ligament marginal and somewhat internal, muscular impression elongated, club shaped, and placed somewhat laterally; anterior impression very small.

MYTILUS SOWERBYANUS, *D'Orb.* Tab. IV, fig. 1.

MYTILUS SOWERBYANUS, *D'Orb.* Prod. Pal. i, p. 282, 1850.

MODIOLA SOWERBYANA, *Bronn.* Leth. Geog., p. 233, t. 15, f. 13, 1851.

— PLICATA, *Sow.* Min. Con., t. 248, f. 1, 1819.

— — *Zeiten.* Petref., t. 59, f. 7, 1835.

MYTILUS PLICATUS, *Goldf.* Petref., p. 175, t. 130, f. 12, 1840.

Testá elongatá, soleniformi, anticè angustá, obtusá, posticè dilatatá, angulo obliquo tenui bipartitá, parte inferiore et anticá lævigatá, superiore et posticá arcuatim plicatá.

Shell elongated, pod-shaped, anterior part narrow and obtuse, posterior dilated, divided into two portions by a thin oblique angle, inferior and anterior part smooth, superior and posterior part with numerous curved folds.

The hinge margin is very much elongated and slightly curved, the inferior border is slightly concave and acute. The short costæ upon the superior border are parallel, oblique, and are impressed with numerous densely-arranged curved lines, which upon the lower portion of the shell are parallel with the inferior border.

Our Great Oolite specimens must be considered as a variety of this well-known shell, they are much attenuated at the anterior extremity, and unusually expanded and compressed at the posterior extremity. It occurs rarely in the Stonesfield Slate, and has not been observed in the shelly beds of the Great Oolite.

Localities. In the slaty beds at Minchinhampton Common; Stonesfield, Oxfordshire. Also in the Upper Marly deposits of the Great Oolite at Felmersham, Bedfordshire, and Blisworth, Northamptonshire.

M. D'Orbigny has changed the generally known name given to this species by Mr. Sowerby, as Gmelin had previously described a recent species under the name of *Mytilus plicatus*.

MYTILUS (MODIOLA) TENUISTRIATUS, *Munst.* Tab. IV, fig. 6.

MYTILUS TENUISTRIATUS, *Goldfuss.* Petref., t. 131, f. 5, 1840.

— — — *Buckman.* Geol. Cheltenham, p. 69, t. 3, f. 3.

Testá ovato-cordatá, fornicato tenuissime concentricè striatá, umbonibus terminalibus arcuatis, margine cardinali recto, brevissimo, dorso alto angusto, latere inferiore cordato, anticè subventricosó. (Goldfuss.)

Shell ovately cordate, short, very convex; umbones terminal acute and curved forwards, hinge border straight and short, dorsal surface very much elevated and narrow, inferior border sinuous, its anterior portion rather ventricose; concentric striations regular, fine, and closely arranged.

This is a short, obtuse shell, and the convexity of the valves is so considerable that the diameter through them, when in apposition, is nearly equal to their length; the striations are very delicate, and the test thin.

Locality. For this pretty species we are indebted to the kindness of Professor James Buckman, who collected it in a bed of yellow Clay at Sevenhampton, together with numerous other testaceous relics, which though numerous in species, are for the most part badly preserved. It is probable that this stratum, which can be traced for two miles and upwards, is a subordinate local deposit of the Great Oolite; at Sevenhampton, it is situated 22 feet above the Stonesfield Slate.

MYTILUS TUMIDUS. Tab. IV, fig. 5.

Testá arcuatá, inflatá, striatá concentricè rugosá, margine cardinali curvato, margine inferiore concavo, umbonibus terminalibus obtusis, crassis.

Shell curved, inflated, with rugose concentric striæ, hinge margin curved, inferior margin arched or concave, umbones terminal, obtuse, and thick.

The dorsal surface is very elevated, narrow anteriorly, and more flattened posteriorly; the convexity of the valves is so considerable that the diameter through both is equal to

half the length of the shell, and is greater than the height; the general form is therefore narrow, very convex, and curved elliptically.

It occurs very rarely in the shelly beds of the Great Oolite.

Locality. Minchinhampton Common.

MYTILUS PULCHERRIMUS, *Roemer, var.* Tab. IV, fig. 12, 12 a.

MODIOLA PULCHERRIMA, *Roemer.* Verst., p. 34, t. 4, f. 14, 1836.

— — *Koch and Dunker.* Beitr. Oolith., t. 6, f. 7, 1837.

MYTILUS PULCHERRIMUS, *Goldfuss.* Petref., p. 177, t. 131, f. 9.

Testá ovato-fornicatá, umbonibus postmedianis retusis, margine cardinali recto, latere inferiore convexo, posticè subretuso, lineis radiantibus crebris supernè crassioribus concentricis decussatis.

Shell ovate, with an elevated dorsal ridge, umbones postmesial, extended backwards, hinge margin straight, inferior side convex, with radiating lines closely arranged upon the superior side, and decussated by very fine concentric lines, which form knots where they cross the longitudinal elevations.

The general figure is subquadrate, the height being equal to half the length, and the diameter through both valves is a little less than the height; the usual length is about four lines; the test is delicate and fragile.

Localities. All our specimens have been obtained in the bed of the soft Shelly Oolite, which at Minchinhampton Common underlies the planking. It is moderately rare. Ancliff, Wiltshire, (Mr. J. D. C. Sowerby's Collection.)

MYTILUS SOLENOIDES. Tab. IV, fig. 4.

Testá prælongá, ellipticá, concentricè rugoso striatá, anticè vix angustatá, obtusá, posticè paulum depressá et dilatatá; margine cardinali subrecto, margine inferiore in medio subsinuato.

Shell elongated, elliptical, gibbose, with rugose concentric striæ, anterior extremity rather narrow and obtuse; posterior extremity more depressed and dilated, hinge margin nearly straight, inferior margin sinuated.

The general aspect has a considerable resemblance to *Mytilus plicatus*, but it is much more gibbose, the diameter through both the valves being upwards of one third of the length, and it is destitute of the posterior plicæ, which distinguish that species; the concentric striæ are very prominent and irregular.

Modiola elongata, Koch and Dunker, which is probably *Modiola scalprum*, Sowerby, is also less gibbose.

Locality. The Slaty Oolite of Minchinhampton Common, rare.

MYTILUS SOLENOIDES, *var. SUBRENIFORMIS*. Tab. IV, fig. 11.

Testá crassá subdepressá aut subreniformi, lævigatá, umbonibus obliquis terminalibus, margine superiore arcuato, margine inferiore excavato aut subsinuato, plicis incrementi paucis irregularibus.

Shell thick, rather depressed, or kidney-shaped, smooth, umbones oblique, depressed, terminal, superior margin curved, inferior margin excavated or somewhat sinuated, folds of growth few and irregular.

The two extremities of the shell are nearly equally rounded and convex, an obscure and obtuse dorsal ridge extends in a curved direction from the umbones to the posterior and inferior extremity; the superior side of the shell has a considerable convexity, and the inferior or ventral side is compressed.

We have only obtained two specimens of this species, which occurred in the soft shelly Oolite which underlies the planking.

Height, 6 lines; length, 14 lines; diameter, through both the valves, 6 lines.

Locality. Minchinhampton Common.

MYTILUS FURCATUS, *Goldf., var. BATHONICUS, nob.* Tab. IV, fig. 9, 9 a.

MYTILUS FURCATUS, *Goldfuss.* Petref., t. 129, f. 6.

— — *Roemer.* Nordd. Ool., p. 33, t. 18, f. 38.

? MODIOLA ASPERA, *Phillips.* Geol. York., t. 11, f. 9.

Testá ovato-acutá, inflatá, umbonibus acutis, margine cardinali subrecto obliquo, latere inferiore abrupto, costis crebris subpapillois interdum dichotomis, lineis incrementi paucis magnis irregularibus.

Shell ovately acute, very convex, with terminal acute umbones; hinge border straight, or rather oblique, anterior border steep and excavated; costæ numerous, closely arranged and indented with concentric striations, producing a papillary surface, the costæ are waved and occasionally dichotomous. The specimens rarely show the imbricated costæ.

The larger and indented costæ distinguish it from *M. asper*, Sow. It is not uncommon in the shelly beds of the Great Oolite, and varies in length from 3 to 16 lines.

Locality. Minchinhampton Common.

MYTILUS ASPER, *Som.* Tab. IV, fig. 8.

MODIOLA ASPERA, *Sow.* Min. Con., t. 212, f. 3, 1818.

Testá cuneatá gibbosá, arcuatá longitudinaliter striatá, lineis numerosis radiantibus furcatis, imbricatis; umbonibus incurvis subacutis, margine cardinali arcuato, posteriore subrecto.

An elongated arched gibbose and longitudinally striated shell, with rather small and curved beaks; striæ numerous, furcate, and minutely imbricated.

Mr. Sowerby remarks, "the small and nearly flat posterior lobe leaves the beaked end of this *Modiola* so small as to give it much of the contour of a *Mytilus*, the depth of the two valves together is greater than the width, and the length is twice the depth. The roughness of the striæ proceeds from minute elevated scales, that are most conspicuous near the margin of the shell, and are nearly obliterated towards the beaks."

It occurs somewhat rarely in the shelly beds of the Great Oolite, and likewise in the marl bed of the Inferior Oolite in the Cotswolds.

Localities. Forest Marble of Wiltshire; upper marly beds of Great Oolite, at Felmersham, Bedfordshire; Blisworth, Northamptonshire, &c.; Minchinhampton Common, in the Great Oolite; near Nailsworth and Cheltenham in the Inferior Oolite.

MYTILUS LONSDALEI. Tab. IV, fig. 3.

Testá ovato-oblongá, lævigatá; anticè latá, subdepressá, posticè convexiore, angulo obliquo formante; umbonibus gracilibus incurvis, margine cardinali obliquo, curvato, margine inferiore subsinuato; laminis incrementi conformibus tenuibus.

Shell ovately oblong, smooth; anteriorly wide and depressed, posteriorly more convex, divided from the anterior portion by an oblique and obtuse angle, which passes from the umbo to the infero-posterior extremity; umbones slender, incurved; hinge border oblique and curved, inferior border slightly sinuated; the surface has numerous delicate irregular laminæ of growth.

The general figure has some resemblance to *Modiola subæquiplicatá*, Roemer, Verst., tab. v, fig. 7, but the latter shell has greater convexity, the umbones are less attenuated and the oblique angle formed by the anterior depressed surface is less distinct. It has also some resemblance to *M. imbricata*, Sow., but is distinguished by the posterior portion being less expanded and the general form more elongated.

Length, 16 lines; height, 7 lines; diameter, through both the valves, 6 lines.

Localities. Sapperton railway tunnel, in the Great Oolite. In the Cornbrash of Wiltshire it is abundant.

MYTILUS COMPRESSUS, Goldf. Tab. IV, fig. 7.

MYTILUS COMPRESSUS, *Goldfuss*. Petref., t. 131, f. 11.

MODIOLA COMPRESSA, *Portlock*. Geol. Report, p. 122.

Testá ovatá subconvexá, concentricè striatá; umbonibus subanticis, compressis, margine cardinali recto, latere inferiore convexo-plano, posticè subcompresso prorsum rotundato.

Shell ovate, rather convex, concentrically striated; the umbones subterminal and compressed, hinge margin straight; inferior side moderately convex, posterior side rather compressed and rounded.

The anterior extremity is narrow and somewhat compressed, the posterior much

wider and more expanded, the concentric striæ are very numerous and distinct, the folds of growth are few and irregular.

Height, 7 lines; length, 11 lines; diameter, through both the valves, 4 lines.

Localities. It occurs rarely in the shelly beds of the Great Oolite, at Minchinhampton, and more frequently in the slaty or clay beds of the formation, as in the Bradford clay, near Cirencester, and the Stonesfield slate of Oxfordshire.

MYTILUS IMBRICATUS, Sow. Tab. IV, fig. 2.

MODIOLA IMBRICATA, Sow. Min. Con., t. 212, f. 1, 3, 1818.

Testá ovato-reniformi convexá concentricè striatá, umbonibus subterminalibus arcuatis, dorso anticè angusto, posticè planiusculo, margine cardinali recto, parte anticá lateris inferioris brevi ventricosá.

Shell ovately reniform, convex, concentrically striated, umbones subterminal, curved, the dorsal convexity is narrow towards the anterior part, and more expanded posteriorly; the hinge border is straight, its length rather exceeding one third that of the entire shell. The concentric lines are very numerous, irregular, strongly marked and imbricated, those near to the posterior side being the most conspicuous.

Proportions of a medium sized specimen: Length, 21 lines; height, 10 lines; diameter, through both the valves, 9 lines. The largest specimens acquire dimensions one half greater.

This is by very much the most abundant *Mytilus* of the shelly beds of the Great Oolite, but the greater number of examples do not exceed 12 lines in length, and the valves are constantly disunited.

Localities. Great Oolite, at Minchinhampton; Stonesfield slate of the same district; Bradford Clay and Forest Marble, near Cirencester; also in the upper marly beds of the Great Oolite, in Northamptonshire, Bedfordshire, and Lincolnshire.

MYTILUS SUBLÆVIS, Sow. Tab. IV, fig. 19.

MYTILUS SUBLÆVIS, Sow. Min. Con., t. 439, f. 3, 1823.

— — Bronn. Leth. Geog., p. 236, t. 19, f. 14.

— — Goldf. Petref. ii, p. 170, t. 129, f. 3.

? MYTILUS JURENSIS, Roemer. Oolith., p. 89, t. 4, f. 10.

? — EDULIS, Young and Bird. Geol. Yorksh., t. 7, f. 10.

Testá arcuato-cuneiformi, lævigatá, umbonibus terminalibus, acutis, dorso anticè angusto et convexo, posticè expanso, margine superiore arcuato, inferiore concavo.

Shell curved and cuneiform, smooth, umbones terminal, acute, the back of the shell anteriorly narrow and convex, posteriorly expanded, superior margin curved, inferior margin concave with steep sides; lines of growth few, distant, regular, and strongly marked.

The hinge border is curved, and equal to half the entire length of the shell, the terminal umbones are remarkably acute, without any expansion upon the lower side. It is tolerably abundant in the shelly beds of the Great Oolite.

Dimensions of a medium sized specimen : Length, 23 lines ; height, 12 lines ; diameter, through both the valves, 9 lines.

Locality. The whole of the Minchinhampton district ; Felmersham, Blisworth, &c. ; in the marly deposits belonging to the upper portion of the Great Oolite.

MYTILUS BINFIELDI. Tab. IV, fig. 10.

Testá ovatá subarcuatá concentricè striatá, umbonibus obtusis, dorso fornicato, margine cardinali recto, latere inferiore abrupto antice convexo.

Shell ovate, superior side compressed, inferior side elevated, with terminal obtuse umbones, hinge margin rather oblique, the greatest convexity is about the middle of the valves, the lower margin is straight, and the general aspect of the shell is smooth.

It occurs rarely in the shelly beds of the Great Oolite.

Locality. Minchinhampton Common.

Named in compliment to Mr. W. R. Binfield, who has assiduously collected the fossils of the Oolite.

LITHODOMUS, Cuvier, 1817.

Gen. Char. Shell elongated, subcylindrical, anterior extremity rounded and convex, posterior extremity more attenuated, margins of the valves close all round ; umbones anterior, terminal, pointed ; hinge without teeth, ligament internal linear, and placed in a lengthened groove.

Lithodomus perforations are extremely common in the shelly beds of the Great Oolite ; they are not, however, confined to the surface of any particular bed, but occur indifferently throughout a considerable thickness of shelly rock, and the more massive bivalves often exhibit their perforations, more especially *Trichites* and *Astarte subquadrata* ; the number of these perforations proves that the *Lithodomi* existed in great profusion, and contrasts singularly with the paucity of the specimens preserved ; we may infer from this fact, that a very qualified degree of dependence should be placed in the number preserved of certain thin and fragile bivalves, as representing the actual number of individuals which existed in the seas of the Oolitic period. The valves which occur in the shelly detritus are well preserved, others which remained in the hollow oval crypts are uniformly very tender and imperfect, they can scarcely be said to be fossilized ; the crypts themselves are for the most part empty, or contain only a little hardened mud ; when, however, the crypts are filled with calcareous spar, it is probable that the living animals themselves were entombed in the deposit.

LITHODOMUS INCLUSUS, *Phil.* Tab. IV, fig. 13, 13 a.

MODIOLA INCLUSA. *Phil. Geol. York.*, i, t. 3, fig. 20, 1835.

— — *Deslongchamps. Mém. Soc. Linn. de Normand*, 1838, pl. 9, f. 39, 40.

Testá parvá, subellipticá, convexá, umbonibus subanticis, margine postico compresso, producto et curvato, striis concentricis tenuissimis irregularibus, lineis incrementi paucis, distantibus.

Shell small, delicate, subelliptical, tumid, umbones anterior, nearly terminal, posterior margin compressed, produced, and curved; concentric striæ fine and irregular; lines of growth few, and distant.

This delicate little shell occurs in all the shelly beds of the Great Oolite, more especially in the beds of soft Oolite which underlies the planking, where the numerous cylindrical crypts sometimes contain it; the cavities themselves filled with calcareous spar, elongated and pyriform, are not uncommon; the general figure is much more tumid than is observed in the *Lithodomi* generally. The diameter through both the valves somewhat exceeds the height, and is equal to two thirds of the entire length, which latter rarely exceeds six lines.

Localities. Minchinhampton Common; Bisley Common; Ancliff, Wiltshire. It occurs also in the Coralline Oolite of Yorkshire (Phillips).

LITHODOMUS PARASITICUS, *Deslongchamps*, Sp. Tab. IV, fig. 15, 15 a.

MODIOLA PARASITICA, *Desl.* *Mém. Soc. Linn. de Normand.*, 1838, t. 9, f. 44—46.

LITHODOMUS PARASITICUS, *D'Orbigny.* *Prod. Paléont.*, p. 312, 1850.

Testá parvá, tenui, obliquá, costis radiantibus magnis paucisque ornatá, interstiis angustis, umbonibus terminalibus acutis.

Shell small, thin, oblique, lengthened, with terminal acute smooth umbones, the middle and posterior portions of the shell are ornamented with a few large radiating costæ, the interstitial spaces narrow and deeply depressed; the absence of decussating plications, and the acute apex readily distinguishes it from *Mytilus pulcherrimus*, the only contemporaneous allied species. It has occurred very rarely both in the shelly Great Oolite and Stonesfield Slate.

Localities. Minchinhampton; Langrune, Normandy.

Professor E. Deslongchamps records a curious fact connected with the occurrence of this species in Normandy: in a block of stone containing about twenty individuals, each of them occur within the valves of another species, the *Modiola (Lithodomus) inclusa*, which had previously effected their perforations in the limestone. The Rev. H. Jelly has described a somewhat analogous case, as occurring in the Bath Oolite, in which two or three individuals of a species of *Modiola* lie encased in the valves of a *Lithodomus*, that had perforated a coral.

ARCA, *Linn.*, 1758.ARCA RUDIS, *Sow.* Tab. V, fig. 12.GUCULLÆA RUDIS, *Sow.* Min. Con., t. 447, f. 4, 1824.

Testá oblongá, subcylindricá, umbonibus magnis antemedianis approximatis, margine cardinali elongato, marginibus aliis arcuatis, costis radiantibus numerosis anticis et medianis acutis, posticis magnis irregularibus subdistantibus, nodosis, lineis concentricis decussatis.

Shell oblong, subcylindrical, umbones large, contiguous, and placed anterior to the middle of the valves, hinge border elongated, the other margins rounded; radiating costæ acute, elevated upon the anterior and middle portions of the valves, much larger, irregular, more distant and nodose upon the posterior side, decussated by numerous concentric lines.

The posterior side of the shell is rather compressed, and has four or five very prominent irregular knotted costæ; the concentric lines are very fine, and for the most part indistinct. It occurs rarely in the shelly beds of the formation.

Height, 6 lines; length, 12 lines; diameter through both the valves, 6 lines.

Localities. Minchinhampton and Bisley Commons; Ancliff, Wiltshire.

ARCA PULCHRA, *Sow.* Tab. VI, fig. 6.ARCA PULCHRA, *Sow.* Min. Con., t. 473, f. 3, 1824.

Testá ovato-oblongá, convexá, umbonibus antemedianis subdistantibus, margine cardinali elongato, margine infero parallelo, areá angustá, lateribus costalis radiantibus crebris subequalibus, striis concentricis tenuissimis indentatis.

Shell ovately oblong, convex, umbones anterior, separated, hinge margin elongated, with the inferior margin of the valves parallel to it, area narrow; the sides of the valves are ornamented with densely arranged radiating little ribs, these are rather unequal in size, but radiate in every direction, and are indented by fine closely arranged concentric striations.

The example of this species figured in the 'Mineral Conchology,' represents the immature stage of growth in which the concentric striations are scarcely distinguishable, and the general form has not acquired the full degree of convexity. In the description of *Arca pulchra*, Mr. Sowerby states that it is "nearly twice as wide as long; the striæ are very uniform and close together; the valves are rather flat in the middle;" and further remarks—"Although there is hardly any appearance of a sinus in the margin, this is placed as an *Arca* because it has no transverse elongated teeth in the hinge, those nearest the extremities being longitudinal; it is, however, one of the links that unite the two genera."

Localities. The shelly beds of the Great Oolite throughout the Minchinhampton district; Ancliff, Wilts; Ponton, Lincolnshire.

ARCA KILVERTI. Tab. V, fig. 10.

Testá oblongá aut subrhomboidali, umbonibus medianis contiguis; lateribus compressis; basi arcuatá; superficie bipartitá sulco lato; costulis radiantibus (circa 50) subnodosis, lineis concentricis crebris decussatis.

Shell oblong or subrhomboidal, umbones moderately large, mesial, and contiguous; the sides of the shell compressed, the lower margin curved; the surface divided into two parts by a wide superficial sulcation; radiating lines or costæ (about 50) slightly nodose, and decussated by fine, closely arranged concentric lines.

Upon the sides of the shell the costæ are more widely separated, and the interstitial spaces sometimes disclose a smaller rib. It ranks as one of the more rare Great Oolite forms, the figure nearly agrees with *Arca bipartita*, Roemer, 'Nordd. Ool.,' tab. 14, fig. 12; but that species is destitute of the concentric lines.

Height, 3 lines; length, 6 lines.

Locality. Minchinhampton Common.

Named in compliment to Mr. Kilvert, of Bath.

ARCA TENUITEXTA. Tab. V, fig. 9.

Testá parvá, ovato-oblongá, umbonibus obliquis antemedianis subdistantibus; marginibus rotundatis; dorso convexo, superficie mediano sulco lato impressá; lineis radiantibus crebris minutis aliis concentricis decussatis.

Shell small, ovately oblong, umbones oblique, anterior to the middle of the valves, and separate; hinge margin of moderate length, its extremities rounded, base slightly sinuated by a wide but superficial sulcation which descends from the umbo; the entire surface is covered with radiating, closely arranged, depressed, very fine lines, crossed by others concentric and closely arranged.

The general figure has a considerable degree of convexity, and the hinge margin is very short; the radiating and concentric interstitial spaces are so minute that they resemble fine punctuations. It ranks as one of the smallest and most rare of the Great Oolite *Arcacea*; it is found in the planking and contemporaneous white stone of Bussage.

Localities. Minchinhampton and Bisley Commons.

ARCA PRATTII. Tab. V, fig. 3.

Testá subrhomboideá, umbonibus antemedianis contiguis, areá angustatá; latere antico margine rotundo, latere postico producto, angulo obliquo declivi; costulis radiantibus

tenacissimis crebris, costulis posticis majoribus subnodosis; lineis incrementi paucis distantibus.

Shell subrhomboidal, umbones compressed, placed anterior to the middle of the valves, and contiguous; area narrow; anterior portion with the margin rounded, posterior side more lengthened, with an angle passing obliquely from the umbones to the inferior posterior extremity; radiating costæ very fine and closely arranged, the costæ posterior to the angle are larger and nodose; lines of growth few and distant.

The usual figure is compressed, and the posterior angle is acute, but there is much variation in the convexity of the valves. The *Arca funiculosa*, Goldfuss, tab. 121, fig. 13, has a general resemblance to it, but differs in having regular distinct concentric lines.

It is the most common *Arca* in the Great Oolite, and occurs throughout all the shelly beds.

Height, 8 lines; length, 15 lines; diameter through both the valves, 6 lines.

Localities. Minchinhampton, in the Great Oolite; Ancliff, Wiltshire. Leckhampton Hill near Cheltenham, in the shelly free stone of the Inferior Oolite; also in the Oolite of Ponton, Lincolnshire.

This species is dedicated to S. P. Pratt, Esq., F.R.S.

ARCA EUDESII. Tab. V, fig. 6, 6 a.

Testâ oblongâ, subcompressâ; umbonibus obliquis, acutis, antemedianis distantibus, areâ latâ; latere antico margine rotundo; latere postico producto carinato longitudinaliter plicato, plicis 3 latis profundis; dorso costulis radiantibus crebris inæqualibus nodosis; striis concentricis frequenter obsoletis; basi rectâ.

Shell oblong, rather compressed, umbones oblique, acute, anterior to the middle of the valves, and distant; area large; anterior side with the margin rounded, posterior side with an obtuse carina more produced, and having upon the surface posterior to the carina three large strongly-marked longitudinal plications; the dorsal surface has very fine radiating costæ densely arranged, knotted, and unequal; concentric striæ very faintly traced; inferior margin straight.

The less convex form will distinguish it from *Arca trisulcata*, Goldfuss, the figure is nearly that of his *Arca fracta*, but that shell is destitute of the posterior longitudinal plications, it is scarcely so wide as *Arca lata*, Dunker, and more compressed upon the dorsal surface; that species would likewise seem to want the large posterior folds. It occurs very rarely in the shelly beds of the Great Oolite.

Height, 7 lines; length 14 lines; diameter through both the valves, 7 lines.

Localities. Minchinhampton Common; Langrune, Normandy.

This species is dedicated to Professor Eudes Deslongchamps, of Caen, who has obligingly forwarded to us, for comparison, many interesting shells from the Great Oolite of Normandy.

ARCA ÆMULA, *Phil.* Tab. V, fig. 17.

ARCA ÆMULA, *Phil.* Geol. Yorksh., i, t. 3, f. 29, 1835.

Testá subrhomboideá, vel oblongá, inæquilaterali, convexá, umbonibus obliquis antemedianis distantibus; latere antico convexo, latere postico elongato, obtusi carinato et compresso; superficie sulco lato mediano; basi subrectá; lineis radiantibus crebris minutis nodosis, plicis concentricis paucis interruptis: superficie posticá excavatá, plico unico obliquo mediano et sulcis duobus conformibus parallelis.

Shell subrhomboidal or oblong, inequilateral, convex, umbones oblique, placed anterior to the middle of the valves and separated by a moderately wide area; anterior side convex, posterior side elongated, obtusely carinated and compressed; the dorsal surface with a wide and slightly oblique depression which is not always distinct; basal margin straight; radiating lines closely arranged, fine, minute, and knotted, interrupted by a few concentric plications; the surface posterior to the obtuse carina is concave, has a mesial oblique plication which is bounded upon each side by a sulcation.

The greater number of examples have not preserved the lines which ornament the surface, but the posterior plications are always distinctly shown. In the Great Oolite of Minchinhampton, the species occurs in a dwarfed or rather in an immature form, which would scarcely be identified, but for the aid of specimens from other localities; it occurs well preserved in the shelly roe stone of Leckhampton Hill, and likewise in the Ponton Oolite, at both of which places it attains its full dimensions.

Localities. Minchinhampton and Bisley Commons. Ponton, Lincolnshire.

ARCA ÆMULA, *Phil.* var. TRANSVERSA. Tab. V, fig. 8.

A shell which we consider to be only a variety of *A. æmula* requires a separate notice, it is more elongated and subcylindrical, the mesial or oblique depression upon the dorsal surface is usually distinctly marked, and the shell never acquires the dimensions of the typical form, the length of the largest specimens not exceeding 10 lines.

The more mesial position of the umbones will serve to distinguish this shell from young examples of *Macrodon Hirsonensis*, to which in other respects it has a considerable resemblance; it is more elongated and cylindrical than any other of the contemporaneous *Arcacea*.

It occurs not uncommonly throughout the shelly beds of the Great Oolite, but the delicate features of its surface are seldom well preserved.

Localities. Minchinhampton and Bisley Commons.

ARCA RUGOSA? var. of ARCA PRATTII. Tab. V, fig. 2.

Testá subrhomboideá, convexá, anticè rotundá, posticè compressá, angulo obliquo acuto; umbonibus depressis approximatis, antemedianis lineis radiantibus crebris undulatis subnodosis et imbricatis; plicis concentricis rugis, irregularibus subundulatis; basi subsinuatá.

Shell subrhomboidal, convex, anterior side rounded, posterior side much compressed,

with an oblique sloping acute angle; umbones depressed, approximate, placed anterior to the middle of the valves, radiating costæ closely arranged undulated, slightly nodulated and imbricated; concentric folds numerous, rugose irregular and somewhat undulated; base sinuated.

This species is exceedingly irregular both in its general figure and convexity, the portion of the shell posterior to the carina is excavated and compressed, the lines upon its surface are much knotted; *Arca Prattii* approximates to it but is less convex, and in that species the lines are not nodose, neither has it the concentric undulating plications and sinuous base which distinguishes the *Arca rugosa*. It occurs somewhat rarely in the shelly beds of the Great Oolite.

Localities. Minchinhampton and Bisley Commons.

ARCA MINUTA, Sow. Tab. V, fig. 11 a; Tab. VI, fig. 19.

CUCULLÆA MINUTA, Sow. Min. Con., t. 447, f. 3, 1824.

Testá parvâ trapeziformi, convexâ, umbonibus acutis submedianis, subdistantibus, areâ magnâ lævigatâ obliquâ; lateribus striis crebris radiantibus plicis incrementi interruptis.

Shell small trapeziform, convex, with acute and rather distant umbones, area large, smooth, sloping obliquely, the sides of the valves with densely arranged radiating striations, broken by the concentric plications of growth.

The figure of this little shell varies considerably in the size of the area, and in the general convexity, the posterior angle is strongly marked, rather acute and slightly concave; the striations are only visible under a magnifier; from two to ten lines appear to be the amount of variation in length. It is not common, and is usually badly preserved, its range is throughout the Great Oolite and Bradford clay of Gloucestershire.

Localities. Minchinhampton; Ancliff, Wiltshire; Langrune, Normandy.

Sub-Genus—MACRODON, *Lycett*.

MACRODON, H. E. Strickland and J. Buckman. Geol. of Chelt., 1845, p. 98.

Testâ subrhomboidâ, umbonibus anticis subremotis, areâ cardinali modicè latâ lævigatâ, margine cardinali recto valde elongato; latere antico convexo crasso, latere postico compressiusculo, tenui et subtruncato; margine inferiori corrugato, sinuato et hiante. Cardo linearis, dentibus (5—7), anticis, angustis parallelis et obliquis; dentibus posticis plerumque duobus, angustis, longitudinaliter elongatis ad extremitatem posticam testæ productis. Impressio muscularis, anticus elevatus (ut in Cucullæa instructa,) posticus obsoletus.

Shell subrhomboidal, umbones anterior, rather distant, cardinal area moderately wide, smooth, hinge line straight, and much elongated; anterior side rounded and thick, posterior side rather compressed, somewhat truncated and thinner, inferior margin corrugated in its middle part, sinuated and gaping. Hinge linear, teeth (5—7), situated anteriorly, narrow, parallel, and oblique; posterior teeth usually two, narrow, elongated longitudinally

extending nearly to the posterior extremity of the hinge line. Of the muscular impressions the anterior one is elevated upon a raised internal projecting ledge, as in *Cucullæa*, the posterior impression is indistinct. The general figure is that of *Byssoarca*, the umbones which are rather small, are placed near to the anterior extremity of a very lengthened hinge line, the corrugation in the ventral border and hiatus are strong points of resemblance to that genus. The dental characters present an approach to those of *Cucullæa*, but in lieu of diverging from the central or subumbonal portion of the hinge line, as in that genus, they are all turned in one direction inclining posteriorly. Another external feature should be noticed, which it possesses in common with some other of the *Arcacea*, viz.: there is a depression upon the back of the shell, extending obliquely from the umbo to the middle of the lower border. In generic value, this form will take rank with *Cucullæa* and *Byssoarca*, but whether the two latter should be regarded, of generic or only of subgeneric value, as considered by some authors, is a subject which we will not discuss; Palæontologists, however, will perceive the convenience of separating the present form from others of the *Arcacea*.

MACRODON HIRSONENSIS, *D'Archiac*, Sp. Tab. V, fig. 1, 1a, b, c.

CUCULLÆA ELONGATA. Phil. Geol. York., i, t. 11, f. 43, 1835.

— — Goldfuss. Pet., t. 123, f. 9, 1840.

— HIRSONENSIS, *D'Archiac*. Mém. Soc. Géol. Fr., t. v, t. 27, f. 5, 1843.

Testâ in ætate juniore costatâ, costis radiantibus, regularibus, et imbricatis, ætate progrediente costis plerumque obsoletis, cum laminis incrementi magnis, paucis et rugis.

Shell in the young state costated; costæ radiating, elevated, regular and imbricated; with increase of growth the costæ gradually disappeared, and the surface was rendered rugose by large folds or laminæ of growth, which are usually few and distant; they become corrugated near to the hiatus in the lower border, as in *Byssoarca*.

The aspect of this shell changed so much during the progress of growth, that without a regular series for comparison, the larger and smaller specimens would probably be separated into distinct species; the figure given in the 'Geology of Yorkshire,' Pt. 1, t. 11, fig. 43, accurately represents the shell in its young state; the costæ are then sharply defined, perfectly regular, and it has not acquired the laminæ of growth which subsequently disarranged the regularity and continuity of the costæ; the figure of Goldfuss, t. 12, fig. 9, is rather more elongated than is usual, it is of middle size, and the costæ are still visible; the figure of *D'Archiac*, t. 27, fig. 5, though beneath the middle size, represents the stage of more advanced growth, in which the costæ are obliterated, and the lower border becomes corrugated. Sometimes, however, traces of the costæ are visible even upon shells of the largest size, and on the other hand, small shells may be found smooth. The cast figured under the name of *Macrodon rugosus*, by Professor Buckman, in the 'Geology of Cheltenham,' plate 5, fig. 5, appears to represent another species which has a few distant and strongly-marked radiating costæ.

Localities. It occurs abundantly in the Minchinhampton district, but is chiefly found in the planking of Minchinhampton Common; it occurs likewise more rarely in the Inferior Oolite of the same district. Ponton, Lincolnshire.

Height of the largest example, $2\frac{1}{2}$ inches; length of the hinge line, 5 inches.

Sub-Genus—CUCULLÆA, Lam., 1801.

Gen. Char. Shell inequilateral ventricose; umbones large, distant, separated by a ligamental area. The posterior surface with an oblique angle more or less prominent; the margins of the valves close all round. Hinge linear straight, teeth radiating obliquely from beneath the umbones. Muscular impressions two, of which the anterior one is supported by an elevated plate or ledge, projecting from the side of the shell; the posterior impression is rounded and faintly marked.

CUCULLÆA CONCINNA, *Phil.* Tab. V, fig. 7.

CUCULLÆA CONCINNA, *Goldfuss.* Petref., t. 123, f. 6? 1840.

— — *Phil.* Geol. York., i, t. 5, f. 9, 1835.

? CUCULLÆA SUBLÆVIGATA, *Zieten.* Wurt., p. 75, t. 56, f. 3, 1834.

Testá ovato-rhomboidéá, convexá, umbonibus antemedianis magnis depressis approximatis; latere antico brevi margine rotundo; latere postico acute-carinato obliquo declivi; superficie striis concentricis regularibus crebris; lateribus costis radiantibus paucis et prominentibus.

Shell ovately rhomboidal, convex, umbones anterior to the middle of the valves, large, depressed, and nearly touching each other; anterior side short, its margin rounded; posterior side with an acute carina sloping obliquely; the surface has closely arranged, regular and very fine concentric striations; the sides of the shell have a few radiating prominent costæ, those upon the anterior side are four, elevated and distant.

Our specimens agree with the figure of Phillips, but differ somewhat from that of Goldfuss, which has fine radiating lines; it is probable, therefore, that the latter is a distinct species.

It occurs not uncommonly in the shelly beds of the Great Oolite.

Localities. Minchinhampton and Bisley Commons.

CUCULLÆA GOLDFUSSI, *Roemer.* Tab. V, fig. 4, 4a.

CUCULLÆA GOLDFUSSII, *Roemer,* 1836. Nordd. Ool., p. 104, t. 6, f. 18.

Testá trapeziformi convexá, concentricè subrugosá, anticè rotundatá, angustatá, posterius angulo rotundo cordato-compressá margine postico oblique truncato; umbonibus crassis prominulis incurvis, areá lanceolatá 5—6 striatá. (Roemer).

Shell trapeziform convex, the surface with irregular concentric rugose plications, anterior side short, convex, its margin rounded, posterior side with an oblique obtuse angle, the side posterior to the angle compressed and truncated ; umbones large, incurved, and almost touching each other ; area lanceolate, of moderate size, with 5 or 6 striæ.

This species has some resemblance to *Cucullæa oblonga*, Phillips, but it is less elongated, the umbones are more compressed, and it is destitute of all radiating lines ; the more oblique form, compressed umbones, and longer posterior side, will distinguish it from *Cucullæa cucullata*, when the surface markings of that species are not distinguishable.

Height, 16 lines ; length, 21 lines ; diameter through both the valves, 14 lines.

Localities. Minchinhampton and Bisley Commons, where it occurs in all the shelly beds.

CUCULLÆA CUCULLATA, *Goldfuss*. Tab. V, fig. 5.

CUCULLÆA CUCULLATA, *Goldfuss*. Petref., p. 148, t. 123, f. 7, 1840.

Testâ ovato-rhomboidedâ, ventricosâ, umbonibus antemedianis approximatis, latere postico compresso-declivi, concavo, carinato levi ; lineis concentricis confertis et radiantibus subtilissimis. (*Goldfuss*.)

Shell ovately rhomboidal, ventricose, umbones placed anterior to the middle of the shell, oblique, and somewhat separated ; posterior side with an oblique obtuse carina, posterior to which is a flattened or slightly concave surface ; the inferior margin is curved ; the lines both radiating and concentric are closely arranged, very fine, but irregular and unequal, the part posterior to the carina or angle being destitute of lines ; the plications of growth are faintly marked, few, and distant.

The finely reticulated surface is usually most distinct in young specimens, those of more advanced growth being nearly smooth. It occurs throughout the shelly beds of the Great Oolite, but is not abundant. It likewise occurs in the middle division of the Inferior Oolite at Leckhampton, and near to Nailsworth in Gloucestershire.

Locality. Minchinhampton Common.

NUCULA, *Lam.*, 1801.

Gen. Char. Shell transverse, inequilateral, ovately oblong ; hinge linear, separated in the middle by a fossa or oblique channel ; teeth numerous, elevated, narrow, or frequently comb-like ; umbones contiguous, curved posteriorly ; ligament partly internal, inserted in the central fossa or canal.

NUCULA VARIABILIS, *Sow.* Tab. V, fig. 13, 13a.

NUCULA VARIABILIS, *Sow.* Min. Con., t. 475, f. 2, 1824.

— — Phil. Geol. York., vol. i, t. 9, f. 11, 1835.

NUCULA SUBGLOBOSA, *Roemer*. Verst. Oolith., t. 6, f. 7, 1836.

Testá parvá, læviusculá, ovatá, convexá, obliquá, umbonibus anticis, latere antico brevissimo, latere postico, oblique declivi, basi ellipticá curvatá, lineis concentricis irregularibus tenuissimis.

Shell small, smooth, ovate, convex, oblique, umbones anterior, anterior side very short, posterior side lengthened, its border obliquely sloping, base curved elliptically, lines concentric, irregular, and very fine.

This small shell is common throughout the shelly beds of the Minchinhampton district, where its figure is much less variable than in the specimens from Ancliff, which are figured in the 'Mineral Conchology,' so that it is not easily mistaken for any other contemporaneous species.

Localities. Ancliff and Minchinhampton.

NUCULA WALTONI, Tab. V, fig. 14.

Testá parvá ovatá subcompressá, umbonibus acuminatis, anticis, latere antico rotundo, postico elongato et subrostrato.

Shell small, ovate, rather compressed, umbones acute and anterior; anterior side short and rounded, posterior side elongated and somewhat rostrated.

The figure has some resemblance to *N. acuminata*, but the anterior side is much more produced, the posterior extremity more pointed; there is a kind of obtuse ridge, extending posteriorly from the umbo to the inferior and posterior extremity, and the junctions of the valves posteriorly are compressed, and the surface is very smooth. It is very common in the Clays of the Fullers-earth and likewise in the Bradford Clay, having the valves in apposition; in the shelly beds of the Great Oolite it occurs very rarely, and the valves are disunited.

Localities. The Cotswold Hills, at various localities in the Fullers-earth; the Tetbury Road Railway Station, in the Bradford Clay; Minchinhampton Common, in the Great Oolite.

This species is dedicated to that indefatigable collector, Mr. Walton of Bath.

LEDA, *Schumacher*, 1817.

NUCULA (pars), *Lam.*

LEMBULUS, *Risso*, 1826.

DACROMYA, *Agass.*, 1840.

Gen. Char. Shell inequilateral, umbones small, contiguous, anterior side convex, its margin rounded; posterior side attenuated, posterior slope lengthened, and excavated; teeth numerous parallel, separated in the middle by a fossa, structure of the test fibro-lamellar.

LEDA MUCRONATA, *Sow.*, Sp. Tab. VI, fig. 7.

NUCULA MUCRONATA, *Sow.* Min. Con., t. 476, f. 4, 1824.

Testá parvâ subrhomboidali, rotundatâ, convexâ concentricè sulcatâ, posticè mucronatâ.

Shell subrhomboidal, rounded, convex, concentrically sulcated, posteriorly mucronated.

Two thirds as long as wide, very minute; the posterior side is drawn out in the form of a flattened spine, and is distinguished from the other portion of the shell by being flatter. (Sowerby.)

The figure of this shell is copied from the one given in the 'Mineral Conchology.'

Locality. Ancliff, Wiltshire.

LEDA LACHRYMA, *Sow.*, Sp. Tab. V, fig. 15, 15a.

NUCULA LACHRYMA, *Sow.* Min. Con., t. 476, f. 3, 1824.

— — Phil. Geol. York., i, t. 11, f. 14, 1835.

— — Goldfuss. Petref., t. 125, f. 10, 1840.

NUCULA CAUDATA, *Köch and Dunker.* Beit. Nord. Ool., p. 31, t. 2, f. 7, 1837.

? LEDA ACATA, *D'Orb.* Prodrom. Paléont., i, p. 275, 1850.

Testá ovato-subtriquetrâ ventricosâ, anticè inflatâ, posticè elongatâ attenuatâ, umbonibus antemedianis, lunulâ declivi ellipticâ, marginatâ, angulo cardinali obtuso; lateribus striis concentricis remotiusculis interdum obsoletis.

Shell ovately subtriquetral, ventricose, anterior side inflated, posterior side lengthened and attenuated, umbones anterior to the middle of the shell, lunule elliptical, sloping obliquely and marginated, the cardinal angle obtuse; the sides of the shell with regular concentric striations, rather remote, and faintly impressed, sometimes undistinguishable.

The few specimens which have been obtained agree with the figure in the 'Mineral Conchology,' rather than with that of Goldfuss, which is more produced posteriorly; the apparent absence of striations in the specimen figured by Sowerby has induced D'Orbigny to regard the striated figure of Goldfuss as distinct, but whoever has examined the half-obiterated striations of the Great Oolite specimens will be convinced of the fallacy of such a distinction. The figure 15a represents the smooth variety from Ancliff, which has been kindly lent to us for comparison by Mr. J. D. C. Sowerby.

Localities. Minchinhampton and Bisley Commons; Ancliff; it is rare.

LIMOPSIS, *Schacchi*, 1827.

TRIGONOCÆLIA, *Nyst*, 1834.

PECTUNCULINA, *D'Orbigny*, 1850.

Gen. Char. Shell smooth, transverse, ovately oblong or subquadrate, umbones mesial depressed, contiguous; hinge curved, teeth raised, numerous, minute, placed in a parallel series, which is separated in its middle portion by a triangular depression. Ligament

nearly internal, placed in the trigonal fossa beneath the umbones, margins of the valves entire.

The smooth valves, mesial cardinal fossa, subquadrate form, and entire margins distinguish it from *Pectunculus*. The general character of the hinge presents an approximation to *Limea*, Goldfuss, both in the curvature of the series and form of the teeth; the latter genus may in fact be regarded as a representative of *Limopsis* amongst the *Limæ*. In *Nucula* the series of teeth form an angle, they are narrow and raised like a comb.

LIMOPSIS OOLITICUS, *D'Archiac*, Sp. Tab. V, fig. 16, 16a.

PECTUNCULUS OOLITICUS, *D'Archiac*. Mém. Soc. Geol. Fr., t. v, t. 27, f. 6, 1843.

? — OBLONGUS, *Sow.* Min. Con., t. 472, f. 6, 1824.

? — MINIMUS, *Sow.* Ibid., t. 472, f. 5.

Testá lævigatá oblongá, convexo-planá, subcompressá inæquilateratá, umbonibus prominulis, obliquis, lateribus oblique truncatis.

Shell smooth, oblong, more or less transverse, convex but somewhat flattened, inæquilateral, umbones prominent, oblique, the sides obliquely truncated, the lower margin lengthened and curved.

This species, which is very abundant, occurs under several varieties of aspect; the hinge line may be nearly straight and angular, or rounded; the figure may differ much in the degree of convexity, and in the length transversely; all the specimens are larger than the Ancliff shells which were figured in the 'Mineral Conchology' under the specific names *P. minimus* and *oblongus*, but which, nevertheless, we are disposed to regard as only varieties of the present species, and to these we might add another variety, which together with a short superior or hinge border, has several irregular folds upon the surface, giving it a rugose aspect. Owing to the great abundance of the species, we are at any time enabled to compare these varying forms, the test being thick, always well preserved, and never compressed. It occurs indifferently in all the shelly beds, and is one of the most common shells of the formation.

The *Limopsis Dammariensis* of Buvignier, 'Geol. de la Meuse,' p. 20, pl. 16, f. 26—29, has some resemblance to our species, but has greater convexity and less angularity of figure.

Localities. The entire formation in the Minchinhampton district; Ancliff, Wiltshire. Eparcy, Langrune, France.

TRIGONIA, *Bruguière*, 1791.

TRIGONIA, *Lam.*, 1804. *Park*, 1811. *Sow.*, 1815. *D'Orbigny*, 1850.

HIPPOCEPHALOIDES (NUCLEUS), *Plot.*, 1676.

LYRIODON, *Bronn*, 1836. LYRODON, *Goldfuss*, 1838.

Gen. Char. Subtrigonal, rounded anteriorly, truncated posteriorly with an oblique

flattened, or excavated area, which extends posteriorly from the umbo to the infero-posterior extremity, and is separated from the dorsal surface by a ridge or angle, and by a similar division from a small lanceolate space upon the other side, the anterior part of which supports the ligament; umbones recurved, contiguous, usually angulated; the dorsal surface is ornamented with longitudinal or concentric rows of costæ or tubercles. The hinge has four oblong compressed diverging teeth in one valve, the sides of which are grooved transversely, and two similar teeth in the other valve; ligament external, muscular impressions two in each valve, elliptical, and deeply impressed.

In the descriptions of species, we use the term *marginal carina* to indicate the ridge which bounds the area from the other surface of the shell; *inner carina*, the ridge which separates the area from the lanceolate space; the *median carina* is a ridge or line of tubercles which passes longitudinally along the middle of the area.

TRIGONIA SUBGLOBOSA. Tab. V, fig. 21.

Testá suborbiculari, convexá, umbonibus prominulis recurvatis; margine anteriore et inferiore rotundato, margine posteriore brevi et concavo; areá brevi, latá transversè striatá, carinis tribus ornatis, carinis tuberculosi, carina marginali tuberculis majoribus; costis numerosis per series angulatis dispositis, posticè magnis et tuberculatis, anticè lævigatis crebris interdum obsoletis.

Shell subglobose, umbones prominent and recurved, the anterior and inferior margins rounded, the posterior margin short and somewhat concave; area short and wide, striated transversely, and ornamented with three tuberculated carinæ, of which the marginal carina has the larger tubercles; the space between the inner carinæ is smooth and short; the other portion of the shell has numerous closely-arranged oblique tuberculated costæ which form a series of angles upon the middle of the shell, the angles being usually greater than right angles. The anterior portions of the costæ pass obliquely downwards to meet the posterior portions, they are smooth, usually undivided, and towards the lower part of the shell become nearly obsolete; their posterior portions are large, forming irregular varices, which are very prominent. It is nearly allied to *Trigonia Goldfussii* in the character of its surface, the chief distinction consisting in the fewer costæ and less acute angle of the latter species; but the figure of the two species is very different. *T. Goldfussii* is much more flattened and less elongated posteriorly, the umbones are not recurved, the figure of the area altogether is more lengthened and straight, and it likewise attains to a larger size than *T. subglobosa*.

Our species occurs rarely both in the shelly beds of the Great Oolite and in the upper part of the middle division in the Inferior Oolite.

Localities. Minchinhampton Common, in the Great Oolite; Nailsworth, or Scar Hill, in the Inferior Oolite.

TRIGONIA GOLDFUSSII, *Agass.* Tab. V, fig. 18, 18a.

LYRODON LITTERATUM, *Goldfuss.* Petref., t. 136, f. 5, 1840.

TRIGONIA GOLDFUSII, *Agaz.* Mém. sur les Trigonees, p. 35.

? — CUSPIDATA, *Sow.* Min. Con., t. 507, f. 4, 5, (junior.)

Testá plano-convexá, ovato-trigoná, anticè et infernè rotundatá, posticè truncatá; tuberculis per series undulatas dispositis, ad carinam marginalem crassissimis; cariná marginali tuberculis ornatá; areá cardinali transversim striatá; tuberculis nonnullis in cariná interná. (Agassiz, pro parte.)

Shell with a moderate convexity, ovately trigonal, the anterior and inferior borders rounded, the posterior border truncated; umbones not prominent, nearly straight, costæ few, tuberculated, disposed in a series of rows which anteriorly are slightly curved, passing obliquely downwards, posteriorly the costæ are larger, and are curved upwards at a considerable angle; the area is flattened, transversely striated in the young state, but nearly smooth in the adult; the inner carina is slightly tuberculated, and the tubercles upon the marginal carina are more distinct.

The series of costæ posteriorly, which at first are tuberculated and moderately curved, afterwards gradually become large, irregular compressed varices, which are directed nearly perpendicularly downwards, and form a considerable angle at their junction with the posterior portions of the costæ. The inner carina is small and indistinctly tuberculated; the marginal carina is much larger, but has likewise indistinct tubercles, which disappear altogether in the adult state of growth; the area is divided into two parts by a slight longitudinal furrow.

The examples of this species are moderately numerous and of every stage of growth, so that ample materials are afforded for comparison. The surface markings underwent a continuous change throughout the life of the *Mollusk*; in the earliest condition, when the length is only 6 or 7 lines, the surface has a few regular curved and smooth costæ, which form an angle or prominence as they pass over the marginal border (or position of the carina), to the area which they cross, forming so many large plications; when about seven costæ have been perfected, those which succeed begin to have their posterior extremities more curved and indented to form tubercles, the plications upon the area have then degenerated into striations; ultimately these latter become indistinct, and the portion of the area last formed is nearly smooth; the posterior extremities of the costæ gradually become large varices, which are directed nearly perpendicularly downwards, and are imperfectly united to the anterior portions. The minute shell from Ancliff, figured in the 'Mineral Conchology' under the name of *Trigonia cuspidata*, Sow., is probably the present species in its earliest stage of growth.

It will also be perceived, that the young shell very nearly resembles the same stage of *Trigonia Moretoni* the only distinction residing in the more prominent costæ of *T. Goldfussii*. The Great Oolite shells never attain to the magnitude of those figured by

Goldfuss, and the small example figured by him, tab. 136, fig. 5*a*, appears to be another species altogether unlike the young examples of our shell. *Trigonia litterata* of Phillips, 'Geol. Yorksh.,' i, tab. xiv, fig. 11, from the *Lias* of Robin Hood's Bay, is likewise a distinct species, and having the priority, that specific name must be retained for it. *Trigonia Goldfussii*, and more especially young specimens, occur not unfrequently in the coarse bed of planking forming part of the shelly beds of the formation. *Trigonia undulata* from Fromberg, of which M. Agassiz has given two very different figures, would appear to be nearly allied to our species, more especially the shell figured by him, (Etudes Mol. Trigonées, tab. vi, fig. 1,) which exhibits small tubercles upon the carinæ.

Locality. Minchinhampton Common.

TRIGONIA MORETONI. Tab. V, fig. 19, 19*a*.

? TRIGONIA CONJUNGENS, Phillips. Geol. Yorkshire, i, p. 122.

Testá ovato-trigóná, plano-convexá, umbonibus obtusis recurvis, areá angustá, transversim plicatá; plicis magnis irregularibus; cariná marginali et interná depressis irregulariter subnodulosis; costis per series numerosis (ætate juniori arcuatis, adulto subangulatis,) et tuberculatis, tuberculis posticis magnis crebris confusè dispositis.

Shell ovately trigonal, rather depressed, umbones obtuse, recurved, anterior border rounded, posterior border lengthened and slightly excavated; area narrow, transversely plicated, plications large and irregular; marginal and inner carinæ depressed, rather obscure, (more especially in adult specimens,) irregularly undulated; costæ disposed in a numerous series (about 16), which in the young state are regularly curved, but subsequently become somewhat angulated; they are tuberculated, the posterior tubercles being the larger, closely arranged and much confused or irregular.

In the earliest stage of growth the aspect is so dissimilar that it requires a separate notice, the shell is rather compressed, the costæ are prominent, regular, and smooth, the plications upon the area appearing like continuations of the costæ, which they nearly equal in size, and the oblique divisional line upon the area which replaces the median carina is perceptible.

It is only when five or six costæ have been perfected, that they become indented, the indentations becoming more strongly marked with succeeding costæ, and at length forming distinctly rounded tubercles; during a series of five or upwards, the tuberculated costæ continue to have a regular graceful curvature, but subsequently they become irregular and confluent; posteriorly the tubercles are large, and the costæ are at that part usually bent upwards at a considerable angle. Thus in the adult stage of growth, the surface is always irregular and varies in every individual, even more than is usual in the tuberculated *Trigoniæ*. It would seem to be more nearly allied to *T. impressa* than to any other British species, but it is twice or thrice as large, has greater convexity, the apex is more obtuse, the area has much larger and more distantly arranged plications, neither has

it the distinct and regularly tuberculated marginal carina of that species; the arrangement of the rows of costæ is similar, but the tubercles are larger, and the adult condition more confusedly disposed in our shell.

It occurs in the shelly beds of the Great Oolite, in which small specimens are abundant, but adult forms are comparatively rare. The species is respectfully dedicated to Lord Moreton, who has assiduously cultivated geological science.

Localities. The Minchinhampton district in general. Stonesfield slate, Oxfordshire.

TRIGONIA COSTATA, Sow., *Var.* PULLUS. Tab. V, fig. 22, 22a.

CURVIROSTRA NON RUGOSA, *Luid.* Lithoph. Brit., t. 9, No. 714, 1760.

DONACITES COSTATUS, *Schoth.* Petref., i, p. 193, 1820.

LYRIODON COSTATUM, *Bronn.* Leth. Geog., t. 20, f. 4, 1836, 1851.

LYRODON COSTATUM, *Goldf.* Petref., ii, t. 137, f. 3, 1840.

TRIGONIA PULLUS, Sow. Min. Conch., t. 508, 1826.

— COSTATA, *Lamarck.* An. s. Vert., vi, p. 64, 1819.

— — *Parkinson.* Org. Rem., iii, t. 12, f. 4, 1811.

— — *Zeiten.* Wurt., p. 78, t. 58, f. 5, 1834.

— — *Roemer.* Oolith., p. 97, 1835.

— — *Agassiz.* Mém. sur les Trigonées, p. 35, t. 3, f. 12—14, 1840.

Testá subtrigóná, umbonibus prominentibus recurvis, acutis, areá magná, plicata et carinatá.

In ætate juniore, cariná marginali acutá et lævigatá, cariná mediá et interná denticulatá.

Ætate adulto areá in valvá sinistrá cariná marginali magná rotundatá et indentatá; cariná mediá et interná distinctá et denticulatá sed parvâ; superficie inter carinis plicis longitudinalibus densis interdum spinis acutis instructis; areá in valvá alterâ sine carinâ mediâ plicisque longitudinalibus magnis, paucis intertiusque latis et profundis. Costis dorsalibus magnis, lævigatis, elevatis et curvatis, cariná marginali separatis.

Shell subtrigonal, umbones prominent, acute, recurved; area large, longitudinally plicated and carinated, dorsal surface costated. In the young state, the marginal carina is acute and smooth, the inner and mesial carinæ are denticulated. In a more advanced stage of growth, the area in the left valve has a marginal carina large, rounded, and deeply indented, the median and inner carinæ are distinct and denticulated, the spaces between the carinæ have numerous longitudinal plications, which are not unfrequently covered with asperities, or acute spinous elevations. In the right valve, the surface of the area is different; it is divided into two portions, the posterior portion being more depressed than the other, there is no distinct median carina, but the anterior portion of the area has two large indented plications, separated by wide interstitial spaces, ultimately two other plications are added. The longitudinal costæ are large, smooth, and gracefully curved, separated from the marginal carina by a smooth sulcus; the lanceolate space between the inner carinæ has a surface very similar to that of the area. Notwithstanding the frequency

with which this species has been figured and described, the foregoing definition will be found to differ from all which have previously been given; it is founded, however, upon observation of the form in its varieties and stages of growth without stint of examples. It is distinguished from other allied costated species, by characters which are chiefly supplied by the posterior slope, and which are constant and of importance. When from six to eight costæ have been perfected, the marginal carina acquires large denticulations, and subsequently continues to be indented transversely. The distinctly elevated median carina and finely reticulated surface of the left valve are very different from the corresponding parts of the right valve, the area of which has in its middle a longitudinal divisional line which separates the surface into two portions, the posterior portion being more depressed than the other; at first, there appears a kind of median carina, which subsequently is not to be distinguished from the other plications; these large plications do not occupy the entire surface of the area, but have between them, and more especially separating them from the marginal carina, wide and depressed interstitial spaces. Goldfuss states, that the apex of the right valve is more recurved, or advances before the other; this feature has occasionally been observed in specimens from the Cotswolds, it may therefore be regarded not as an accidental but as an occasional feature, which certainly is absent in the majority of specimens. Neither is this character altogether peculiar to the present species of *Trigonia*. A rigid comparison of specimens proves that the minute *Trigonia pullus* of the 'Mineral Conchology' from Ancliff, is only the germ of *Trigonia costata*, not of the typical large Inferior Oolite shell, but of a much smaller variety, which is abundant in the Great Oolite; adult specimens of this variety, which may be called *pullus*, have an equal number of costæ with the typical form, but the figure is less convex; the anterior border is not truncated, both that and the inferior border being regularly rounded. The linear dimensions never attain to half of the large Inferior Oolite form, an inconsiderable number only exceed an inch in length, but specimens of half an inch, or even less, are much more abundant. The peculiar features of the cardinal area above described are persistent in all the varieties of the species, and furnish a ready means of distinguishing it from allied costated forms, such as *Trigonia similis* of Bronn, *T. Meriani*, *monilifera*, *denticulata*, *papillata*, and *suprajurensis* of Agassiz; *T. costata* of Pusch, 'Polens Palæont.,' taf. vii, figs. 1, 2, is regarded by Agassiz as a distinct species, for which he proposes the specific name of *zonata*. *Trigonia costata* would appear to have very frequently been confounded with an abundant Kimmeridge clay species, but in the latter shell the area is alike in both valves, the marginal carina has not large denticulations, the general form is more elongated, the umbones much less recurved, the marginal carina is nearly straight, and the costæ are much more oblique. In the Minchinhampton district the *pullus* variety of *T. costata* is exceedingly abundant, surpassing in numbers those of the other *Trigonias* combined; the valves are usually disunited, and internal casts are never obtained; a length of 20 lines upon the marginal carina appears to be its utmost limit in size.

Localities. Everywhere in the shelly beds of the Minchinhampton district; in the Forest Marble of Wiltshire and Dorsetshire.

TRIGONIA COSTATA, Sow., var. ELONGATA. Tab. V, fig. 23.

Somewhat rarely an elongated variety of this well-known form occurs in the shelly beds of the Great Oolite; it is somewhat more convex than *T. pullus*, the marginal carina is remarkable for its general straightness and prominence, the costæ are less curved and are disposed with greater obliquity than in the other varieties, and the character of the area has nothing peculiar. It is not distinguishable from a shell from Cutch, figured and described by Mr. Sowerby in the 'Geological Transactions,' 2d ser., vol. v, pl. 21.

TRIGONIA FLECTA. Tab. V, fig. 20.

Testá ovato-trigoná, subcompressá, areá elongatá, planatá, transversè striatá; carinis ejusdem subnullis, superficie costis angustis, horizontalibus rectis, posticè angulo flectis, angulo costarum subrecto.

Shell ovately trigonal, or oblong, rather compressed, area elongated and flattened, transversely striated; carinæ scarcely distinguishable, the middle portion of the area with a longitudinal furrow; the other portion of the shell with narrow straight nearly horizontal costæ, which at their posterior portions are suddenly bent upwards at a right angle, and become nodose, forming short perpendicular varices.

It differs from *T. angulata*, Sow., in the absence of tuberculated carinæ upon the area, in its flatness and in the costæ, which are more closely arranged, and have not the elegant curvature of the Inferior Oolite shell. The general figure is more oblong than *T. Goldfussii* and *T. undulata*, Agassiz, to both of which it has a certain resemblance in the character of its surface. It would seem to be rare; we have only met with a single example, which occurred in a rock too hard to permit the perfect exposure of the shell; its position is a bed somewhat shelly and situated a little beneath the Bradford clay.

Locality. The Tetbury Road station of the Great Western Railway.

TRIGONIA DUPLICATA, Sow. Tab. VI, fig. 2.

TRIGONIA DUPLICATA, Sow. Min. Con., t. 237, f. 4, 1819.

Testá ovato-trigoná anticè rotundatá, postice productá et rostratá, umbonibus obtusis sub-recurvis; areá angustatá transversá striatá, medio sulco longitudinali, carinis parvis tuberculis minimis instructis; costis serratis ornatis; costulis prioribus concentricis et regularibus, aliis obliquis nonnunquam dichotomis.

Shell ovately trigonal, moderately convex, anterior extremity rounded, posterior extremity produced and rostrated, superior border rather concave; umbones mesial,

obtuse, slightly recurved; area narrow, transversely striated with a mesial longitudinal furrow; carinæ small, with densely arranged minute tubercles; costæ serrated; the first few costæ are regular and concentric, the others are directed obliquely downwards from the marginal carina to the lower border, they are nearly straight, some few are dichotomous and slightly waved, the serrations are irregular or unequal, which gives to the costæ a knotted aspect.

This species is not uncommon (more especially the external moulds), in the bed called *Trigonia grit*, a member of the upper division of the Inferior Oolite; in the Great Oolite it is very rare.

Localities. Minchinhampton Common, in the Great Oolite. The Cotswold hills generally, in the Inferior Oolite.

TRIGONIA IMPRESSA, Sow. Tab. V. fig. 24.

TRIGONIA IMPRESSA, Sow. Zool. Journal, iii, t. 11.

— — Prevost. Ann. Scien. Nat., iv, t. 18, f. 22, 23.

— — Morris. Catal. Brit. Foss., p. 103, 1843.

Testá ovato—trigoná subcompressá, anticè productá rotundatá, posticè rectá, obliquá; umbonibus submedianis acutis; costis per series numerosis læviter arcuatis, subundulatis et tuberculatis, costis, anticis, obliquis, angustis, subrectis densè serratis, posticis curvatis, tuberculis parvis crebris; areá angustá, transversim striatá, striis tenuibus crebris; cariná marginali nodulis parvis regularibus ornatis, cariná interná transversim plicatá; cariná mediá sulco longitudinali.

Shell ovately trigonal, rather compressed, anterior side produced and rounded, posterior side straight, oblique, and compressed, umbones nearly mesial acute and very slightly recurved; costæ disposed in a numerous series which are moderately curved, little elevated, somewhat angulated and tuberculated. The anterior portions of the costæ are narrow and but little prominent; they are nearly straight, but are directed obliquely downward, and are more or less distinctly serrated or indented, but do not form distinct tubercles; posteriorly the costæ are more curved or rather angulated; they rise upwards to meet the marginal carina at a right angle and are distinctly tuberculated, the tubercles being small and closely arranged. The area is rather narrow and distinctly bounded by two carinæ; the marginal carina is small, it has regular elevated tubercles which are rather distantly arranged, the inner carina is plicated, an oblique furrow or line replaces the median carina, the surface of the area has at first a few prominent transverse plications, but these soon degenerate into striations which are fine and densely arranged; the lanceolate space between the inner carinæ is elongated and smooth.

The aspect of this little shell is peculiar, and its features are very persistent—few exceed an inch in length, and from this size to half an inch is its most frequent dimensions; they were eminently gregarious, and are numerous scattered over the thin laminæ of

Stonesfield slate, at very many localities, but have not hitherto been discovered in the shelly beds of the Great Oolite.

Localities. Stonesfield, Eyeford, and generally throughout Oxfordshire and Gloucestershire, where the Stonesfield slate is present.

TRIGONIA PHILLIPSI. Tab. VI, fig. 1.

Testá ovato-trigoná, convexá, umbonibus submedianis obtusis, subrectis, arcá parvâ planatâ; carinâ marginali angustâ, tuberculis parvis, crebris ornatâ, carinâ internâ varicibus subdistantibus; superficie inter carinis plicis crebris transversis et sulco obliquo mediano instructo; valvis lateribus costis concentricis regularibus crebris elevatis, tuberculis parvis densè dispositis.

Shell ovately trigonal, convex, anterior border produced and rounded; posterior border truncated, umbones nearly mesial, obtuse, nearly straight and scarcely recurved, marginal carina nearly straight, narrow, and little elevated, ornamented with minute closely arranged tubercles, inner carina with a few prominent rather distantly placed varices; lanceolate space between the inner carinæ wide and smooth; the surface of the area between the carinæ is flattened, traversed transversely by prominent closely arranged plications, and divided in its middle part by an oblique furrow; the sides of the valves have very numerous elevated narrow concentric regular costæ, which are ornamented with small, equal, densely arranged tubercles.

This elegant shell possesses a considerable general resemblance to *Trigonia striata*, Sow.; like that shell the costæ are regular, concentric, elevated, and are furnished upon their upper surfaces with small tubercles; but the figure is essentially different; *T. striata* has the umbones recurved and pointed, the hinge margin posteriorly much excavated, the marginal and inner carinæ have a graceful curvature, and the posterior side of the shell is considerably produced; none of these features are observable in our species, the hinge margin of which is scarcely concave, the umbones obtuse, not prominent and recurved; the posterior side is likewise so short that the umbones appear to be nearly mesial; the costæ in our species are nearly twice as numerous, equally elevated, and the minute tubercles upon them are rounded and much more densely arranged, so that a little distance from the eye the tubercles are scarcely distinguishable. This comparison can only be made between the specimens themselves, for it happens that nearly all the figures hitherto published of *Trigonia striata* are very unsatisfactory, with the exception only of that in the *Petrefacten* of Goldfuss, which is excellent, and represents the adult condition of that species.

Trigonia Phillipsi occurs in soft Oolite, in the vicinity of Stamford and Denton, Lincolnshire, and has not been recognised in the Great Oolite of Gloucestershire.

Dedicated to Prof. John Phillips, whose philosophic researches have greatly contributed to the advancement of geological science.

TRIGONIA IMBRICATA, *Sow.* Tab. VI, fig. 8, 8a.

TRIGONIA IMBRICATA, *Sow.* Min. Con., t. 507, f. 2, 3.

Under this name, Mr. Sowerby has figured apparently an immature or young state of a species of *Trigonia* from Ancliff, of which the adult specimens have scarcely been recognised; this small form is shewn in the figure 8a; we believe, however, that the shell represented by fig. 8 belongs to a more advanced stage of growth; the peculiar imbrication of this species noticed by Mr. Sowerby appears to arise from the erosion of the concentric spinose tubercles which ornament the shell.

The young stage of this shell is described in the 'Mineral Conchology,' as being "Transversely oblong, depressed; with five or six concentric, dentated, subimbricated keels upon the rounded anterior side; posterior side obliquely truncated, ribbed. The carinæ upon the surface of this little shell resemble terraces one above the other; each is divided into four or five angular lobes."

Localities. Minchinhampton, (fig. 8, in the British Museum Collection;) Ancliff, Wiltshire.

CARDIUM, *Linn.* 1758.

Gen. Char. Shell equivalve subcordiform, umbones prominent, contiguous. Hinge with two cardinal and two lateral teeth in each valve; the cardinal teeth are approximate, oblique, crucially inserted, one with the other, lateral teeth remote.

CARDIUM SEMICOSTATUM, *Lycett.* Tab VII, fig. 6, 6a, b.

CARDIUM SEMICOSTATUM, *Lycett.* Annals Nat. Hist., 1850.

Testâ parvâ, ovato-orbiculari, convexâ, umbonibus magnis, medianis, concentricè et tenuissimè striatis; latere postico compresso, costulis crebris radiantibus decussatis.

Shell small, ovately orbicular, convex, umbones large, mesial; concentric striæ regular and faintly impressed; the posterior side is compressed, its concentric striæ are crossed by radiating closely arranged ribs.

The figure of this little species is wide towards the ventral border and narrow towards the umbones, the lunule is small or nearly obsolete; the convexity of the valves is moderate, and the flatness of the posterior side produces at its junction with the dorsal surface a well-defined oblique angle. It would seem to be rare in the shelly beds of the Great Oolite, but the Bradford clay of Wiltshire produces numerous casts of a *Cardium*, which we believe to belong to this species, and which attained a much greater development of growth; casts of this shell are also abundant adjacent to the Tetbury Road Railway station, a locality which is very prolific of the fossils of the Bradford clay.

The height and lateral diameter are about equal, varying from $2\frac{1}{2}$ to 5 lines.

Locality. Minchinhampton Common in the Great Oolite. It occurs likewise in the middle division of the Inferior Oolite of the same district.

CARDIUM STRICKLANDI. Tab. VII, fig. 5, 5a.

CARDIUM STRIATUM. Geol. Chelt., *J. Buckmann* and *H. E. Strickland*, 1845, p. 97.

Testá suborbiculari æquilaterali, ventricosá, umbonibus medianis, contiguís, marginibus, arcuatis; latere postico lineis radiantibus crebris; dorso lineis concentricis crebris regularibus.

Shell suborbicular, equilateral, ventricose; umbones, mesial and contiguous, margins of the valves regularly rounded; surface ornamented with concentric regular small ridges, posterior portion with radiating closely arranged lines.

This small species is very abundant in the shelly beds of the Great Oolite, the concentric lines are most elevated and conspicuous in the smallest specimens, in those of the largest size which have a diameter of 10 lines, the lines are nearly or quite obsolete.

Height and lateral diameter equal, diameter through both the valves one third less.

Localities. Every Great Oolite quarry in the Minchinhampton district.

CARDIUM BUCKMANI. Tab. VII, fig. 2.

CARDIUM LÆVIGATUM, *Lycett*. Annals Nat. Hist., p. 422, 1850.

Testá sublevi ovato-suborbiculari convexá, umbonibus medianis prominulis incurvis, latere antico rotundo, postico obliquo, sed rotundo, basi arcuatá; striis concentricis tenuissimis irregularibus.

Shell smooth, ovately orbicular, convex, umbones mesial, prominent, and incurved, anterior side rounded, posterior side oblique and rounded, base curved symmetrically; dorsal surface, with a few very fine and irregular concentric striæ.

The substance of the test is very thin, and its bad state of preservation together with the variety of the species render it difficult to exemplify it from any one specimen; much finer and more perfect specimens have been procured in the shelly freestone of Leckhampton hill, by the Rev. P. B. Brodie.

Height 22 lines; lateral diameter 24 lines; diameter through both the valves 15 lines. It has occurred in more than one of the shelly beds.

Locality. " Minchinhampton Common.

CARDIUM SUBTRIGONUM. Tab. VII, fig. 3.

Testá subtrigoná, convexá, umbonibus acuminatis contiguís anticis, latere postico elongato oblique declivi, lineis radiantibus undulatis; dorso striis tenuissimis concentricis irregularibus.

Shell subtrigonal, convex; umbones pointed, prominent, contiguous and anterior; posterior side elongated, sloping obliquely with radiating and waved lines; dorsal surface with very fine, concentric, irregular striæ. An ill-defined obtuse angle passes obliquely

from the umbones to the posterior and inferior angle, and forms a boundary to the radiating posterior lines. The posterior side is not excavated or flattened, as in some other trigonal species, but is rather convex.

It occurs very rarely near to the base of the Great Oolite, in a band of hard whitish argillaceous rock, but has not been found in the shelly beds.

Locality. The southern boundary of Minchinhampton Common.

CARDIUM-PES-BOVIS, D'ARCHIAC. Tab. VII, fig. 4, 4a.

CARDIUM PES-BOVIS, *D'Archiac.* Mem. Soc. Geol. Fr., tom. v, t. 27, f. 2, 1843.

Testá nucleo subtrigóná, convexá; umbonibus magnis incurvis, dorso fornicato, angulo obliquo, acuto carinato; lunulá magná cordatá; latere postico angusto, excavato; dorso lineis longitudinalibus tenuissimis perpendicularibus ornatis.

Shell with the nucleus subtrigonal and convex; umbones large, incurved, dorsal surface with a ridge forming an oblique and acute angle; lunule large, cordate; posterior side narrow and excavated; dorsal surface with longitudinal, fine, perpendicular lines.

The large excavated lunule, fine perpendicular lines, and more erect mesial umbones, distinguish this from our *C. concinnum*, which latter is a much smaller species. It occurs very rarely in a whitish argillaceous rock near to the base of the Great Oolite.

Height, 30 lines; lateral diameter, 28 lines; diameter through both the valves, 22 lines.

Locality. The southern side of Minchinhampton Common.

CARDIUM CONCINNUM. Tab. VII, fig. 7a, b, c.

? CARDIUM MINUTUM, *D'Archiac.* Mem. Soc. Geol. Fr., v, t. 27, f. 4.

? — PES-BOVIS, *junior.*

Testá ovato-orbiculari, obliquá, umbonibus angulatis incurvis, latere antico rotundo brevi, lunulá parvâ, latere postico compresso aut excavato, angulo obliquo obtuso carinato; dorso costulis radiantibus rotundis crebris, striis concentricis decussatis.

Shell ovately orbicular, oblique; umbones large, angulated, and curved forwards, anterior side rounded, short; lunule small, moderately excavated; posterior side flattened and excavated, bounded by an oblique and obtuse angled carina; dorsal surface with little ribs radiating, closely arranged, rounded, and decussated by regular, numerous, concentric striæ.

The posterior surface is ornamented in a manner similar to the other part of the shell, but so much more faintly marked that, in ordinary or not well preserved specimens, it appears smooth. The general figure has a considerable resemblance to the large *Cardium pes-bovis*, but the latter species is much higher, and more nearly equilateral.

Height, 9 lines; lateral diameter, 10 lines; diameter through both valves, 7 lines.

Localities. Minchinhampton Common, Bisley Common.

ISOCARDIA. *Lam.* 1799.

Gen. Char. Cordiform, regular, ventricose; umbones prominent, distant, diverging, involute; hinge with two compressed cardinal, and one compressed lateral tooth in each valve; ligament external, bifid, diverging in the direction of the umbones.

ISOCARDIA TENERA, *Sow.* Tab. VII, fig. 1, 1a.

ISOCARDIA TENERA, *Sow.* Min. Con., p. 494, t. 295, f. 2, 1821.

— — *Deshayes.* Traité Élémentaire de Conch., ii, p. 27, t. 24, f. 6, 7.

CEROMYA TENERA, *Agassiz.* Etud. Cat., t. 8—e, f. 1—12, p. 34.

? Var. ISOCARDIA TUMIDA, *Phil.* Geol. Yorksh., i, t. 4, f. 25, 1835.

Testá nucleo subtrigono, inflato; umbonibus medianis, altis antrorsum incurvis; latere antico lato, striis concentricis subtilissimis.

Shell with the nucleus subtrigonal, inflated; umbones mesial, elevated, and curved forwards and inwards; anterior side very wide, rather flattened, giving somewhat a three-sided figure to the nucleus; surface of the test with fine concentric striæ.

The convexity of the valves is so considerable that the diameter through both is almost equal to that of the height and length, but the length varies with the stages of growth, the younger forms being more produced laterally and less convex; the posterior side is always rather compressed, and usually exhibits an angle, which passes obliquely from the umbones backwards, but in the more inflated specimens it is obsolete; the valves appear to fit closely at their circumference, and the ventral border is regularly and elliptically curved. The anterior side is very wide, and somewhat flattened, giving a three-sided aspect to the general figure. The nuclei do not display any concentric striæ, and we have never found the test preserved.

Locality. It occurs somewhat rarely in the upper beds of the Great Oolite, two miles east of Minchinhampton, but has not been found in the shelly beds of the same formation.

LUCINA, *Brug.* 1791.

Gen. Char. Inequilateral, orbicular, posterior side short or truncated, anterior side more produced. Hinge usually with two small cardinal, and two lateral teeth in one valve, one lateral tooth in the other; ligament external, but deeply excavated. Muscular impressions two in each valve, the anterior one narrow and lengthened, the posterior somewhat rounded; impression of the mantle not sinuated.

LUCINA BELLONA, *D'Orb.* Tab. VI, figs. 18, 18 a.

LUCINA LIRATA, var. TRANSVERSA, *D'Archiac.* Mem. Soc. Geol. France, v, t. 26, f. 3.

— BELLONA, *d'Orb.* Prod. Paléont., 1, p. 309.

Testá transversá, ovato-orbiculari, plano-conveaxá, anticè rotundatá, posticè subsinuatá, umbonibus medianis acutis, margine cardinali subrecto, oblique declivi, lunulá parvâ excavatá; superficie plicis concentricis magnis irregularibus, striis densissimis impressis.

Shell transverse, ovate, rather flattened, anterior margin rounded, posterior margin sinuated; umbones mesial and pointed; hinge margin lengthened, straight, and oblique; concentric folds rather irregular, elevated, and impressed with longitudinal, densely arranged, and very fine striations. An obscure elevation passes obliquely from the umbones to the inferior and posterior border. This shell presents considerable variety in its form and markings; young specimens are much more compressed, and their borders are very acute, the general outline is nearly orbicular, and the concentric plications are very distinct and regular: the adult shell becomes either of a suborbicular and convex, or of a transverse and more depressed form, and in both varieties the concentric elevations are placed at unequal distances; the suborbicular variety has a more excavated lunule, and the umbones are more directed forwards or oblique. The shell figured by M. D'Archiac, belongs to the transverse variety to which our Great Oolite specimens belong, but we are not without examples of the other form. It is absent in the shelly beds of the Great Oolite, being found only in mudstones, or a fine calcareous muddy sediment which has become limestone. It occurs very abundantly in the middle division of the Inferior Oolite in Gloucestershire, associated with *Nerinaea*, and a numerous suite of other Mollusks, but is almost absent when the organic *facies* consists of *Terebratulæ*. It reappears in the upper beds of the Great Oolite, forming a numerous colony in a compact marly rock, about one hundred feet above the Fuller's earth, where it is seldom that specimens much better than nuclei can be disengaged.

Dimensions. Transverse variety:—lateral diameter, 31 lines; height, 25 lines; diameter through both valves, 13 lines. Suborbicular variety:—lateral diameter, 26 lines; height, 24 lines; diameter through both valves, 13 lines.

Localities. In Great Oolite, two miles east of Minchinhampton. In Inferior Oolite, along the outer escarpment of the northern and middle Cotswold hills. Also near Stamford, and in other localities in Lincolnshire.

LUCINA BELLONA, var. *Depressa.* Tab. VI, fig. 15.

Testá transversá, subæquilatérá, orbiculatá, compressá et lævigatá; margine superiori anticè subhorizontali posticè recto declivi, striis concentris irregularibus.

Shell transverse, subequilateral, orbicular, compressed and smooth, superior margin anteriorly produced, and nearly horizontal, posterior margin straight and sloping; base regularly elliptical.

The lateral diameter, in regard to the height, is as eleven to nine; the umbones are nearly mesial, and pointed, but depressed; the concentric striæ are very slightly impressed, which gives to the shell a smooth and depressed aspect. It is not very common, but occurs in more than one of the shelly beds of the Great Oolite.

Localities. Minchinhampton and Bisley Commons.

LUCINA CRASSA, *Sow. var.* Tab. VI, fig. 13.

LUCINA CRASSA, *Sow.* Min. Con., t. 557, f. 3, 1827.

Testá crassá, suborbiculari, plano-convexá, lateribus subæqualibus; umbonibus acutis medianis, cardine marginali recto, obliquo declivi; lunulá parvá obliquá; basi arcuatá, lineis concentricis crebris irregularibus.

Shell convex, suborbicular, the sides nearly equal; umbones acute, mesial; hinge margin straight, oblique, and sloping; lunule small, oblique; base regularly rounded, concentric lines closely arranged and irregular.

The umbones are mesial and curved forwards, so that the anterior side of the shell is less produced than is usual with the genus; the degree of convexity near the umbones is moderate, and less than in *L. obliqua*. It occurs very rarely well preserved in the planking beds of the Great Oolite.

The specimen figured is contained in the collection of the British Museum.

Worn specimens of this species, of which the shell has become thin, and the exterior markings obliterated, are difficult to distinguish from what we consider a distinct species, *L. rotundata*, and which may prove to be only a variety.

Locality. Minchinhampton Common.

LUCINA ROTUNDATA, *Roemer, sp.* Tab. VI, figs. 14, 14 a.

? ASTARTE ROTUNDATA, *Roemer.* Vers. Oolith., t. 6, f. 12, 1836.

Testá subtransversá, inæquilaterá, oblique orbiculari, concentricè lineatá, convexá, anticè subproductá, complanatá; umbonibus parvis incurvis.

Shell somewhat transverse, inequilateral, obliquely orbicular, concentrically lineated convex, anterior side rather produced; umbones small, incurved.

Specimens vary both in the degree of convexity, and in the proportions between the lateral diameter and the height, but the former measurement always exceeds the latter. The concentric lines or plications are very irregular and faintly marked, so as to give a general smoothness to the surface.

It occurs somewhat rarely in the shelly beds of the Great Oolite, and has also been recognised in the upper ragstones of the Inferior Oolite.

Localities. Minchinhampton Common in the Great Oolite; Rodborough Hill in the Inferior Oolite.

The figure showing the hinge has been copied from a specimen in the British Museum collection.

LUCINA DESPECTA, *Phil.* Tab. VI, figs. 16, 17.

LUCINA DESPECTA, *Phil. Geol. Yorksh.*, i, t. 9, f. 8, 1835.

— CARDIOIDES, *D'Archiac.* Mem. Soc. Geol. France, tom. v, t. 25, f. 6.

— DESPECTA, *junior*, tab. nost. vi, f. 16.

Testá suborbiculari, obliquá, convexá; umbonibus parvis acutis, postmedianis, latere antico producto, postico brevi; superficie lineis concentricis crebris irregularibus.

Shell suborbicular, oblique, convex, anterior side produced, posterior side short; umbones small, acute, situated posterior to the middle of the valves, and curved forwards; the surface with closely arranged, irregular concentric lines.

Having had the advantage (through the kindness of Mr. Bean) of comparing the original specimen (fig. 17) figured in the 'Geology of Yorkshire,' we are enabled to affirm that *Lucina cardioides*, *D'Archiac* (Mem. Soc. Geol. Fran., vol. v, tab. xxv, fig. 6), represents the young of this species (Tab. VI, fig. 16); in that condition the shell is somewhat more convex, the concentric lines are prominent and less irregular than in the adult condition. *Lucina obliqua*, Goldfuss, (Petref., tab. 146, fig. 14,) is probably another synonym of the same species; these synonyms having been occasioned by the figure in the 'Geology of Yorkshire,' unaccompanied by any description not having been fully recognized.

The numerous specimens which we have examined present a considerable diversity in figure, depending chiefly upon the varying amount of obliquity; the substance of the test is thick, and in the ultimate stage of growth the concentric plications become both prominent and closely arranged. In the shelly beds of the great Oolite the greater number of specimens are diminutive; in the upper portion of the Inferior Oolite they are much larger.

Localities. Minchinhampton Common in the Great Oolite; Ponton, Lincolnshire; near Nailsworth, in the Inferior Oolite.

CORBIS, *Cuvier*, 1817.

IDOTEA, *Schumacher*, 1817.

Gen. Char. Shell transverse equivalve, umbones submesial, incurved, contiguous; surface imbricated or cancellated. Hinge, with two narrow triangular teeth, in each valve of which one is bifid, and two lateral teeth, the anterior of which are approximate, the posterior teeth remote. Muscular impressions lunulate, pallial impression simple.

CORBIS LAJOYEI, *D'Archiac.* Tab. VII, fig. 12, 12a, b.

CORBIS LAJOYEI, *D'Archiac.* Mem. Soc. Geol. Fr., tom. v, t. 27, f. 1, 1843.

Testá crassá, convexá, transversè elongatá, umbonibus magnis medianis; anticè sub-

horizontali producto, posticè subrostrato, attenuato; margine cardinali subrecto, oblique declivi; costis concentricis crebris imbricatis; margine interno integro.

Shell thick, convex, transversely elongated, umbones large mesial; anterior side produced subhorizontal; posterior side more attenuated, slightly rostrated; hinge border nearly straight, elongated, and sloping obliquely; concentric costæ densely arranged, regular imbricated; inner margins of the valves smooth.

A very rare shell readily distinguished from other contemporaneous species by the finer and more densely arranged costæ.

Height 16 lines; length 25 lines; diameter through both the valves 13 lines.

Locality. Minchinhampton Common, where it occurs in the bed of coarse planking.

CORBIS LAJOYEI, *Var. cingenda*. Tab. VII, fig. 11.

Testá ovato-rotundatá concentricè costatá; costis magnis subdistantibus prominulis lamelliformibus; latere antico brevi, marginibus rotundis.

Shell ovately rounded, convex, concentrically costated; costæ rather distant, regular, prominent, lamellar, anterior side short, margins rounded.

The figure is less elongated than in the preceding species, more especially the anterior side; the costæ are much more distantly arranged.

Height, one inch; length, an inch and a quarter; rare.

Locality. Minchinhampton Common, in the bed of coarse planking.

CORBIS ASPERA. Tab. VII, fig. 13, 13a.

CORBIS ASPERA, *Lycett*. Ann. Nat. Hist., Dec. 1850, pl. 11, f. 7.

Testá ovato-elongatá, convexá, umbonibus subacutis prominulis, costis concentricis subacutis regularibus distantibus.

Shell ovately elongated, convex, umbones prominent, mesial, rather acute; concentric costæ regular, distinctly arranged, and rather acute.

Compared with *C. cingenda*, the figure is more elongated, the umbones more pointed, and the costæ are more elevated and distantly arranged.

Height, 8 lines, length, 11 lines; but larger specimens occur in the Inferior Oolite.

Localities. Minchinhampton Common, in the Great Oolite; the vicinity of Nailsworth, in the Inferior Oolite.

Sub-Genus, SPHÆRA, Sow.

Shell thick, subæquilateral, equivalve, globose, umbones large, contiguous, directed forwards, lunule small, but slightly excavated, ligament external, surface smooth, or impressed only with the folds of growth. Hinge, massive, with two cardinal teeth in the right valve, these are thick and united beneath the umbo; the posterior one is prominent, and placed transversely to the hinge plate, the anterior one is oblique and elongated

forwards, having a pit above it to receive the anterior lateral tooth of the other valve. Left valve with two cardinal teeth, of which the anterior one is prominent, somewhat conical, and disunited from the other, there is also a small approximate anterior lateral tooth. Each valve has likewise a distant posterior lateral tooth, which is not very prominent.

As *Sphæra* has a considerable general resemblance to *Corbis*: we will concisely indicate the features whereby they are distinguished. In *Corbis*, the anterior side is the most prominent; *Sphæra*, is equilateral and oblique. The surface of *Corbis* is always cancellated having a denticulated inner border; *Sphæra*, has its surface smooth, or is marked only with the lines of growth, and the inner margin is acute and smooth. The hinge in the right valve of *Corbis* consists of two narrow triangular teeth placed like the sides of the letter V, the angle being at the umbo, the anterior lateral tooth being separate and distinct; in *Sphæra*, the cardinal teeth are thick, not angular or pointed, and the anterior one forms a thickened oblique, lengthened process, before which there is no lateral tooth. In the left valve the arrangement of the teeth is likewise different; in *Sphæra*, the anterior and larger cardinal tooth is obtusely conical and projecting; in the other genus it is trigonal and depressed, and the anterior lateral tooth is differently situated with respect to the teeth of the other valve. Allowing, then, that *Sphæra* is nearly allied to *Corbis*, there would appear to exist sufficiently distinctive characters to demand their separation subgenerically.

SPHÆRA MADRID. Tab. VII, fig. 14, 14a, b, c, d.

CARDIUM MADRID, *D'Archiac.* Mem. Soc. Geol. Fr., tom. v, pl. 25, f. 7, 1843.

CORBIS MADRID, *D'Orb.* Prodrome Paléont., i, p. 309.

? CARDIUM INCERTUM, *Phil.* Geol. York., i, t. 11, f. 5, 1835.

Testâ crassâ subglobosâ, umbonibus magnis obliquis et contiguis. Valvis in ætate juniore lævigatis subdepressis; in ætate adulto globoso plicis incrementi rugis, concentricis et irregularibus.

Shell thick, subglobose; umbones large, directed obliquely forwards, and contiguous. In the young state the valves are rather depressed and smooth; in the adult state they become much more globose, and acquire concentric, irregular, and prominent folds of growth.

Considerable variation occurs in the figure of this species, the more globose specimens have the height and length of the valves almost equal, those which are more depressed have a greater length laterally and are nearly smooth; the latter characters are exhibited in specimens from the Inferior Oolite of Leckhampton Hill, where it occurs somewhat rarely. Our species ranks as one of the most abundant shells of the shelly beds of Great Oolite in the Minchinhampton district, and we have also detected it at several positions higher in the series, even to 120 feet above the Fuller's earth.

Localities. Minchinhampton and Bisley Commons, in the Great Oolite; in the shelly roe stone of the Inferior Oolite of Leckhampton Hill; and in the Forest Marble, near Frome.

Genus UNICARDIUM. D'Orbigny, 1847.

Shell thin, convex, ovately oblong; umbones contiguous, depressed; hinge margin elongated, nearly horizontal; margins of the valves rounded, not close fitting, but without any regular aperture. Hinge ligamentary, the ligament being external, supported by a thin shelly lamina, which is partly internal, and extends posteriorly the length of the hinge margin; beneath the umbo is a small depressed tooth in each valve, but these are nearly obsolete, and in the greater number of specimens cannot be distinguished. Muscular impressions elliptical; pallial impression simple. The external surface is destitute of ornament, but has large, concentric, irregular plications; the substance of the test is very thin.

The three species which we give as examples of *Unicardium*, belong to an extensive series of shells, several of which M. Agassiz has figured and described as *Mactromyæ*, but which are in fact perfectly distinct from another portion of the same genus, for which the name *Mactromya* may perhaps be retained; these latter are *Mactromya mactroides striolata*, *tenuis*, and *brevis*; these shells are distinguished by well-marked features, externally they have an oblique posterior angle, internally they have an anterior, oblique, elongated rib, and a large sinus in the pallear impression.

Three other species of the same author, viz., *M. globosa*, *æqualis*, and *rugosa*, have a figure much more convex, without any posterior angle; internally they are destitute of the anterior rib, and their pallear impression is simple; the latter group should therefore be removed from the *Myadæ*. M. D'Orbigny, ('Prodrome de Paléontologie,') has referred this group, together with other shells, to his new proposed genus *Unicardium*, the type of which is *Corbula cardioides*, of Phillips. *Unicardium* is described as resembling *Cardium*, but having only a single cardinal tooth in each valve.

Unicardium comprises a numerous group of species, several of which are so nearly allied in form as to be with difficulty distinguished. They occur throughout the Lias, the lower, the middle, and the upper Oolitic rocks of Europe, and it is probable that many species remain undescribed; they occur indifferently in beds of clay, in lias limestone, and in shelly oolite, in the latter case the valves are always disunited, but in the lias and other clays, and argillaceous limestones, the valves are invariably in apposition. Their habits were not gregarious, but, on the contrary, they always occur sparingly, and from the thinness of the test, have often sustained fracture or compression. From the borders of the valves not being close fitting, and perhaps from a considerable amount of lateral motion which the kind of union in the valves would permit, one valve frequently overwraps the other, producing a mistaken appearance of inequality in the valves, which may have led to the species first figured in the 'Geology of Yorkshire,' having been assigned to *Corbula*.

We regard *Unicardium* as presenting a considerable resemblance to certain species of *Lucina*, and would arrange it in the Malacological series near to that genus.

UNICARDIUM VARICOSUM, *Sow.*, Sp. Tab. VIII, figs. 7, 7a, b; 8a, b.

VENUS VARICOSA, *Sow.* Min. Con., t. 296, 1819.

? UNICARDIUM CORBISOIDEUM, *D'Orbigny.* Prod. de Paléont., i, p. 309, 1850.

— VARICOSUM, *D'Orbigny.* Ibid., p. 310.

Testá subglobosá, umbonibus magnis, medianis antrorsum incurvis, lateribus brevibus, posticè subtruncato, marginibus rotundis, plicis concentricis tenuibus irregularibus.

Shell very thin, subglobose; umbones large, mesial directed forwards; sides of the shell short, more especially the posterior side, which, differing from the usual form of the genus, is somewhat shorter than the other side; the margins of the valves are rounded and slightly irregular; the concentric plications are not prominent.

The nuclei of this species are impressed with one or more strongly-marked grooves, which pass downwards from the umbones towards the inferior border in each valve. Mr. Sowerby remarks that this species is "not remarkable for anything but the furrows that occur along the middle of the specimens, all of which are casts in a light-coloured limestone; the furrows are two upon each valve, one of them much larger than the other, and terminated before reaching the edge by a deep hollow; corresponding ridges must have existed inside the shell, but whether they were visible externally cannot now be discovered; the concentric furrows that are strongly marked upon some specimens would seem to indicate a thin shell. It is nearly globose, but not so deep as long; the line of the hinge is two thirds as long as the shell, and nearly straight; other characters of the hinge are not discoverable; the beaks are much incurved." (Min. Con., vol. iii, p. 173.)

Localities. Casts occur in the upper marly deposits of the Oolite at Felmersham, Blisworth, Kingsthorpe, Oundle, &c. The shells occur rarely in the Great Oolite of Minchinhampton Common.

UNICARDIUM IMPRESSUM. Tab. VIII, fig. 9a, b, c.

Testá ovato-obliqua aut subquadrátá, convexá; umbonibus contiguís submedianis, depressis, latere antico brevi, margine ejusdem rotundato, latere postico magis producto margine oblique declivi, margine superiori subhorizontali recto, basi curvatá, plicis concentricis magnis irregularibus.

Shell obliquely ovate, or subquadrate, convex; umbones submedian, contiguous, and depressed; anterior side short, its margin rounded; posterior side more lengthened, its margin sloping obliquely; superior border nearly horizontal and straight, gaping slightly; lower border curved; concentric plications large and irregular.

In its young state this species is very delicate, more transverse or oblong, and depressed, its surface is nearly smooth. It is only in a very advanced stage of growth that the surface acquired large concentric folds, and the figure becomes subglobose, but the degree of obliquity and convexity varies very much even with individuals of the same size. The

ligamental area is elongated, smooth, and lanceolate, its margins are not in contact, but have between them a distinct elongated aperture, which is beneath the cushion of the ligament. It occurs very frequently in a crushed or imperfect condition, a circumstance which seems to indicate that it was not habitually a mud living species.

It is met with somewhat rarely throughout the shelly beds of the Great Oolite, and likewise in the middle division of the Inferior Oolite in Gloucestershire.

Compared with *U. globosum*, Ag., it is more elongated, depressed, and oblique; as the test is always preserved, and the valves disunited, we are precluded from examining the characters of the internal casts.

Localities. Minchinhampton and Bisley Commons in the Great Oolite; Leckampton and Selsley Hills in the Inferior Oolite.

UNICARDIUM PARVULUM. Tab. VIII, fig. 6, 6a.

Testá parvá subdepressá, ovato-oblongá; umbonibus subanticis acuminatis, latere antico breví, postico elongato; basi curvatá, lineá cardinis horizontali, subrectá; superficie subcompresso plicis concentricis irregularibus.

Shell small, rather depressed, ovately oblong; umbones anterior and acute, anterior side short, posterior side elongated, base curved elliptically; hinge border lengthened, horizontal, and straight; surface somewhat compressed with irregular concentric plications.

This little species has less convexity, and is more oblong than is usual with this genus; the hinge border is nearly horizontal, but rounded at its extremity, and the valves do not gape perceptibly at the ligamental area; in many specimens there is an obscurely defined angle directed from the umbo to the antero-ventral border, and in common with other species there is much variation in the degree of obliquity and convexity. One of our specimens, a portion of which exposes the internal cast, has a very fine radiating striæ, of which there is no trace upon the external surface of the shell. It occurs not uncommonly in the shelly beds of the Great Oolite, and has also been recognised in the upper portion of the formation.

Height, 7 lines; length, 9 lines.

Locality. Minchinhampton Common.

CYPRICARDIA. Lam. 1801.

Gen. Char. Shell equivalve, inequilateral, oblique, transverse, anterior side short; hinge with two or three cardinal teeth in each valve, and one lateral tooth. Muscular impressions two in each valve; ligament external.

CYPRICARDIA BATHONICA, *D'Orb.* Tab. VII, fig. 8, 8a, b, c.

CYPRICARDIA BATHONICA, *D'Orbigny.* Prodrôme de Paléont., p. 308, 1850.

Testá ovato, transversá, inæquilaterá, turgidá, cordiformi, postico angulatá et elongato lævigatá; umbonibus magnis obliquis recurvis, cardine bidentato dentibus lateribus distantibus elongatis; margine integro postice subsinuato.

Shell ovate, transverse, inequilateral, ventricose, heart-shaped, posterior side angulated, elongated and smooth; umbones large, oblique, slightly recurved; hinge with two large cardinal teeth and one distant elongated posterior lateral tooth; margin of the valve entire, slightly sinuated posteriorly.

This species approaches near to *C. cordiformis*, Deshayes, but it is more oblique or lengthened posteriorly; it occurs rather abundantly in the bed of coarse planking.

Height, 21 lines; length, 27 lines; diameter through the valves, 17 lines.

Localities. Minchinhampton Common; Ponton, Lincolnshire; in the Fuller's earth of Box Tunnel, near Bath.

CYPRICARDIA ROSTRATA, *Sow.* sp. Tab. VII, fig. 9, 9a, b.

ISOCARDIA ROSTRATA, *Sow.* Min. Con., t. 295, f. 3, 1819.

— — *Goldf.* Petref., p. 210, t. 140, f. 12, 1840.

— — *Morris.* Cat., p. 88, 1843.

? CARDIUM BEAUMONTI, *D'Archiac.* Mém. Soc. Géol. Fr., tom. v, t. 26, f. 4, (nucleus,) 1843.

Testá subtrigondá, convexá; umbonibus angulatis, antemedianis, prominulis; lunulá parvâ excavatá; latere antico rotundo, postico truncato angulo obliquo carinato; dorso lævigato; lineis incrementi paucis, irregularibus.

Shell subtrigonal, convex; umbones angulated, prominent, anterior, and incurved; lunule small, excavated; anterior side rounded, posterior side truncated and somewhat concave, its inner border forming a prominent and obtuse angle; the surface of the shell is smooth, and marked only with a few faintly impressed lines of growth.

The hinge line posteriorly is nearly horizontal, forming an angle with the posterior sloping margin, the margin itself forming an acute angle with the inferior borders.

Height, 10 lines; lateral diameter, 11 lines; diameter through both the valves usually about 8 lines, but the latter measurement varies in individuals.

It occurs abundantly in the form of nuclei in the upper portion of the Great Oolite, and very rarely with the test preserved, in the shelly beds of the formation. The figure of *D'Archiac* has a greater height than is exhibited by our specimens, and the umbones are less inclined forwards, but looking at the great varieties of figure which the nuclei assume, we do not see any sufficient reason to regard it as a distinct species.

Localities. Minchinhampton Common; Oxfordshire; Northamptonshire.

CYPRICARDIA NUCULIFORMIS, *Roemer*, sp. Tab. VII, fig. 10, 10a, b..

CYRENA NUCULIFORMIS, *Roemer*. Verst. Oolith., t. 9, f. 13, 1836.

Testá subtrigóná aut cuneiformi, inæquilatérá; umbonibus anticis contiguís, margine antico rotundo, postico elongato et recto, basi curvatá, subsinuatá, cardine bidentato dentibus lateribus magnis.

Shell subtrigonal or cuneiform, very inequilateral; umbones anterior, contiguous; anterior margin rounded, posterior margin elongated and straight; base curved, slightly sinuated; hinge with two cardinal teeth in each valve and a large lateral tooth placed at some distance from the others. The general form is rather compressed; the concentric plications are distinct, but not very prominent.

It occurs somewhat rarely in the shelly beds of the formation, also occasionally in the upper beds in the form of casts.

Height 8 lines; length, 12 lines; diameter through both the valves, 5 lines.

Locality. Minchinhampton Common.

HIPPOPODIUM, *Sow.* 1819.

A solitary specimen of this genus has been found by us in the Stonesfield slate of Oxfordshire; unfortunately it is in too imperfect a condition for description or comparison, but it bears a general resemblance to some specimens of *H. ponderosum*, *Sow.*, and we have recorded the fact of its occurrence with the view of drawing further attention to the subject.

MYOCONCHA, *Sow.*, 1824.

Gen. Char. Shell equivalve, transverse, very inequilateral, umbones small, depressed, subterminal; hinge border lengthened, straight, having an external elongated groove parallel with it, and extending from the umbo posteriorly to the extremity of the shell, ventral margin entire, not sinuated, and parallel with the hinge border. Hinge, with an elongated cardinal tooth in the right valve, situated beneath the umbo, and which is received into an elevated cavity in the other valve; there is also in each valve a lengthened posterior thickened plate or rib, serving to support the ligament, which is external. Muscular impressions, two in each valve, of which the anterior are rounded, and bounded internally by an elevated and thickened plate which projects from beneath the cardinal tooth; posterior impression expanded; pallial impression not sinuated.

MYOCONCHA CRASSA, *Sow.* Tab. III, fig. 16, 16a.

MYOCONCHA CRASSA, *Sow.* Min. Con., t. 467, 1824.

— — *Bronn.* Leth. Geog., p. 237, t. 20, f. 15, 1851.

MYTILUS SULCATUS, *Goldfuss.* Petref., t. 129, f. 4, 1840.

Testá subellipticá, fornicatá, concentricè striatá, lineis radiantibus irregularibus, tenuissimis undulatis, sæpissime obsoletis; umbonibus parvis; sulco elongato postico semper notato.

Shell subelliptical, ridged, concentrically and irregularly striated, with very fine longitudinal waved lines, frequently obsolete; umbones small; posterior elongated, external groove always visible.

The few Great Oolite examples of this well-known shell are of much smaller dimensions than those which are so abundant in the lower or Ammonitiferous beds of the Inferior Oolite at Dundry, they are likewise more compressed; they have only a moderate degree of thickness, and the fine lines radiating from the umbones can rarely be discovered; these variations are such as might be expected to occur in a species which possesses so considerable a geological range, and they are moreover precisely similar to those which the species presents when it is found in the middle or freestone division of the Inferior Oolite, in Gloucestershire.

Dimensions of the larger Great Oolite specimens:—

Height, 14 lines; longitudinal diameter, 27 lines; diameter through both the valves, 8 lines.

Localities. Minchinhampton Common; Barnack, Northamptonshire; Ponton, Lincolnshire.

MYOCONCHA ACTÆON, *D'Orbigny*. Tab. III, fig. 17, 17a.

MYOCONCHA ACTÆON, *D'Orbigny*. Prodrôme de Palæont., p. 312, 1850.

Testá ovato-oblongá subdepressá, marginibus superioribus et inferioribus parallelis, margine postico subrecto, umbonibus parvis, depressis, plicis concentricis paucis irregularibus.

Shell ovately oblong, the superior and inferior borders straight and nearly parallel, the posterior border nearly square; the umbones very small and depressed, posterior sulcus distinct; concentric plications few and irregular.

On comparison with *Myoconcha crassa*, this shell is more depressed, less pointed at the extremities, the posterior border more especially being quadrate; the superior and inferior borders are more nearly straight or parallel, and no radiating lines are visible upon the surface.

Length, one inch and three quarters; height, one inch.

Locality. Minchinhampton Common, where it occurs in the bed of coarse planking.

MYOCONCHA ELONGATA. Tab. III, fig. 18.

Testá soleniformi, elongatá, subdepressá, umbonibus parvis contiguis depressis, latere antico angusto, postico latiore et compresso, marginibus superioribus et inferioribus rectis, parallelis, plicis incrementi paucis tenuibus.

Shell pod-shaped, elongated, rather depressed; umbones small, contiguous, depressed;

anterior side, narrow, posterior side wider and more compressed, upper and lower margins straight and nearly parallel, concentric plications few and delicate.

A species unusually elongated and compressed posteriorly; it appears to be destitute of radiating lines, judging from three examples which are the whole that have passed under our notice.

Height, 8 lines; length, 21 lines; diameter through both the valves, 6 lines.

Localities. Minchinhampton Common, in the Great Oolite; it occurs also in the Inferior Oolite of the same district.

PACHYRISMA, *Morris* and *Lycett*, 1850.

PACHYRISMA, *Deshayes*, 1851.

Testá oblongá, cordiformi, æquivalvi, valdè inæquilaterali, crassissimá, læviusculá aut concentricè striatá; umbonibus magnis angulatis contiguís et involutis, anticè recurvis; cariná obtusá, dorsali, posticá; ligamento externo, crasso, subelliptico, umbones versus bifurcato. Dente et foveá cardinali unicá in utrâque valvâ; dente magno, obtuso, irregulariter conico lateribus compressis, et dente parvo accessorio in valvâ dextrâ; impressionibus muscularibus duabus; posticâ obliquâ in laminâ internâ sitâ; anticâ oblongâ excavatâ processu dentiformi supernè instructâ.

Shell oblong, cordiform, equivalve, very inequilateral, thick, with large, angulated, contiguous, and involute umbones diverging anteriorly; an obtuse-angled posterior dorsal keel divides the surface into two portions; ligament large, external, somewhat elliptical and bifurcated towards the umbones, to the apices of which a groove passes for its reception, as in *Isocardia*. Hinge massive, consisting of a single large, obtuse, conical tooth in each valve, compressed laterally; and a pit by the side of it to receive the corresponding cardinal tooth of the other valve; the right valve has, in addition, a small accessory tooth placed upon the anterior margin of the cardinal pit. Muscular impressions two, the posterior one is supported upon a raised projecting plate, which descends from beneath the hinge obliquely backwards, the position of which is marked upon the external surface by a slight furrow; anterior impression deeply excavated, of an oblong form, and with a small tooth upon its upper margin.

This genus has some affinities with *Isocardia*, *Opis*, and *Megalodon*, the latter of which it appears to represent in the Jurassic period, and with it may constitute a family "*Megalonidæ*." It is distinguished from *Megalodon* by the cardinal tooth in the right valve not having been divided as in the latter genus. *Megalodon* has the anterior muscular impression upon a somewhat raised or lamelliform plate; but the posterior raised plate of *Megalodon* presents a near approximation to that of *Pachyrisma*. From *Opis* it is sufficiently distinguished by the characters of the dentition. The dichotomous ligament resembles that of *Isocardia*, and when viewed anteriorly, it reminds us of the recent *Isocardia cor.*, with its large and graceful diverging umbones. *Pachyrisma*, then, may be

described as a *Megalodon-like* shell, the dental characters of which, however, are peculiar, combined with the external figure of *Opis* and *Isocardia*.

A detailed description of this genus and its affinities will be also found in the valuable and useful work of Mons. G. P. Deshayes, the 'Traité Élémentaire de Conchologie.'

PACHYRISMA GRANDE, *Lycett*. Tab. VIII, figs. 1—5.

PACHYRISMA GRANDE, *Morris and Lycett*. Journal of the Geol. Society, 1850, p. 401.

— — — *Deshayes*. Traité Élémentaire de Conch., ii, p. 187, pl. 32bis, f. 1—3.

Testá cordatá, elongatá; cariná obtusá, dorsali, posticá, latere antico breví; latere postico profundé depresso; striis numerosis, concentricis, irregularibus.

Shell cordate, with an obtuse, prominent, posterior, dorsal keel; posterior side deeply excavated, with a mesial oblique furrow, forming with that of the other valve a cordiform surface; striæ numerous, concentric, and irregular.

In young specimens the form is less gibbous, the small dental processes are very distinct, but the large tooth has little of the prominence which it afterwards attains, it not having acquired the conical projecting form as in the adult state.

The massive character of the hinge, umbones, and anterior side of the shell, presents a striking contrast with the attenuation of the posterior side; this latter portion is consequently very rarely well preserved, although the internal projecting oblique plate must have contributed to strengthen this part; the small dentiform processes bordering the anterior muscular impression are just in contact when the valves are closed, that of the left valve being received into a small depression above the corresponding process of the right valve, the tooth of the right valve resting within the muscular impression of the opposite one. The thickness of this portion of the test is such that in an individual which measured six inches across, it was upwards of three quarters of an inch.

Our shell nearly resembles a figure published by Catullo¹ of a cast of a shell named *Cardium triquetum*, by Wolfen,² from the Jurassic strata of Antello, near Cardonino. The shells figured by Pusch, (Polens. Palæont., t. vii, figs. 8, 9,) under the names *Isocardia exaltata*, and *I. ventricosa*, have some affinity with our shell, and may belong to the same genus.

Geological position. This species occurs near to the base of a series of hard cream-coloured limestone beds which extend from Minchinhampton to Cirencester, the base line of which has at one locality been ascertained to be forty-five feet above the Fuller's earth; the position is therefore higher than the shelly weatherstones of Minchinhampton Common, and near to the middle of the formation. The limestones have, in the aggregate, a very considerable thickness, but become browner and more sandy upwards. It is impossible to disengage the crystalline tests from the hard limestone, but an accidental seam of softer

¹ 'Saggio di Zoologia Fossile,' de T. A. Catullo, t. 1, f. D, E, F, f. 2 A; Padua, 1827.

² 'Abhandl. von Kärnthenschen pfauenschen. Helmintholith.,' p. 48.

and less homogeneous rock has enabled us to disclose the interior of the valves in many instances. The valves occur of all sizes, both in conjunction and disunited; the habits of the species were gregarious to the almost entire exclusion of other Mollusks, a few casts of *Purpuroidea* and *Natica*, however, accompany it. *Pachyrisma* occupies a vertical thickness of only half a yard, and its horizontal extension would likewise appear to have been very limited; hitherto it has been found only at two localities of the same neighbourhood.

Locality. The vicinity of Minchinhampton and Chalford.

OPIS. *Defrance*, 1825.

CARDITA, Sp., *Sow.*, 1819.

Gen. Char. Shell subtrigonal or cordate, thick, the valves convex, arched, the posterior side being separated from the anterior by an angle or carina; umbones prominent, large, curved spirally outwards and forwards; lunule large, cordiform, sometimes deeply excavated. Hinge massive, the right valve with a large obliquely pyramidal tooth compressed laterally, posterior to which is a narrow and deep cavity, with parallel sides; the left valve with a large subquadrate cavity to receive the tooth of the other valve, and a small accessory tooth extending along the posterior margin. Ligament external. Muscular impressions strongly marked and rounded; pallial impression simple.

OPIS LUNULATUS, *Sow.* var. Tab. VI, figs. 3, 3 *a*, *b*, *c*.

CARDITA LUNULATA, *Sow.* Min. Con., p. 55, t. 232, f. 1, 2, 1819.

OPIS LUNULATUS, *Morris.* Catalogue, p. 96, 1843.

— — *Blainville.* Malacol., t. 70 bis, f. 1,

Testá trigoná, ventricosá, concentricè lineatá; umbonibus magnis involutis, carinâ dorsali subacutâ, elevatâ, latere postico abrupte-plano; lunulâ cordatâ profundâ, marginibus acutis.

Shell trigonal; umbones large, angular, terminal, and curved outwards, the posterior side bounded by a prominent and acute angled carina; anterior side with closely arranged regular concentric lines; posterior side flattened or slightly excavated, smooth, or with faintly-marked oblique lines; lunule smooth, cordate, large, deep, its margins acute.

This thick shell, with the valves disunited, is one of the most abundant bivalves of the Great Oolite shelly beds; the size of the lunule varies very much, as likewise does the number and prominence of the concentric lines; occasionally, indeed, the surface appears to have become quite smooth in the more advanced stage of growth.

The height and lateral diameter are of equal dimensions; the diameter through both the valves is one third less.

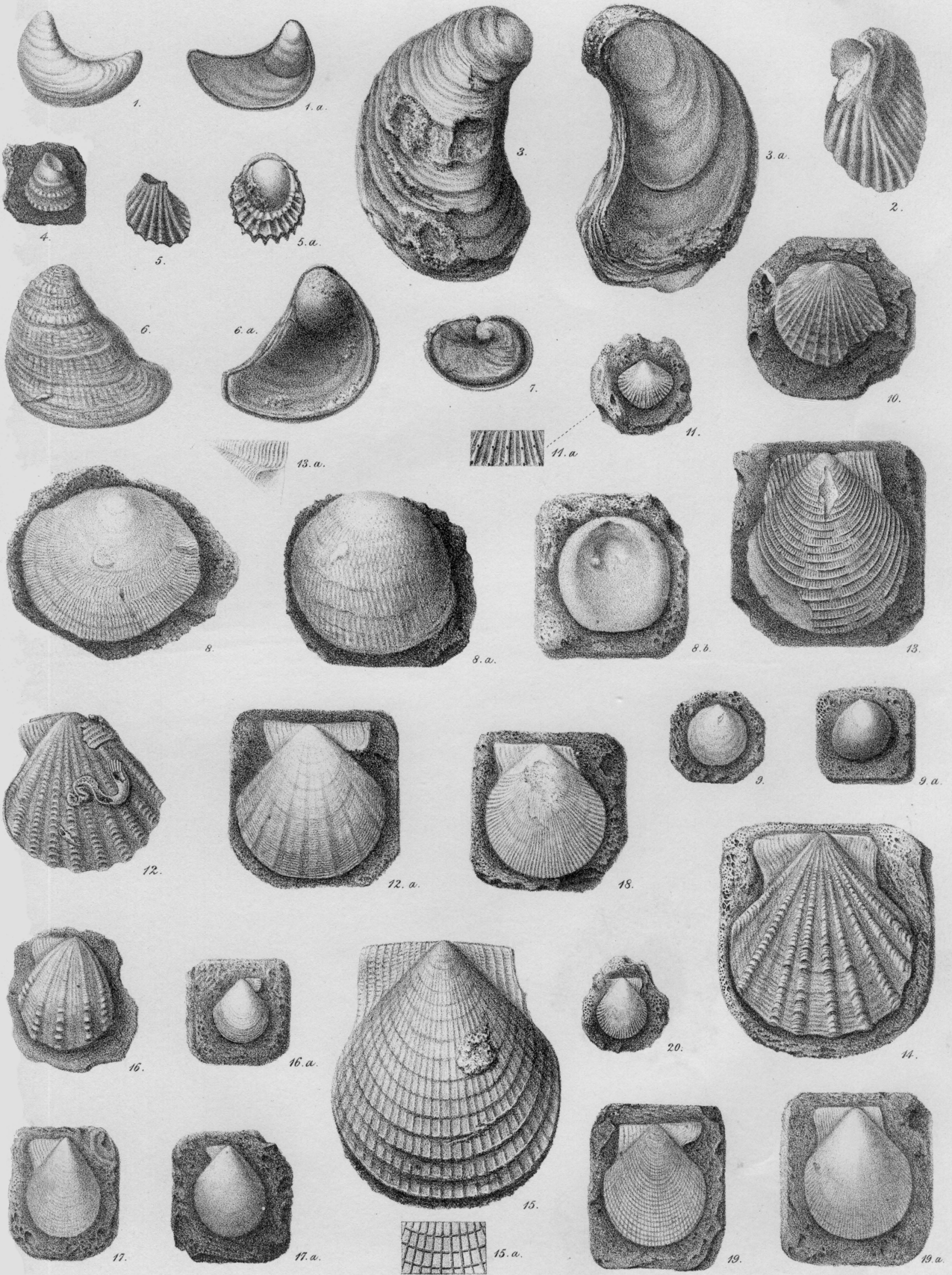
Upon comparison with the typical form from Dundry, this variety is observed to be smaller, less elongated, the lunule usually larger, and its margins more acute, but we do not regard these differences of more importance than might be expected to occur in shells procured from a different stratum and locality.

Localities. The whole of the Minchinhampton district in the Great Oolite; Ponton, Lincolnshire.

TAB. I.

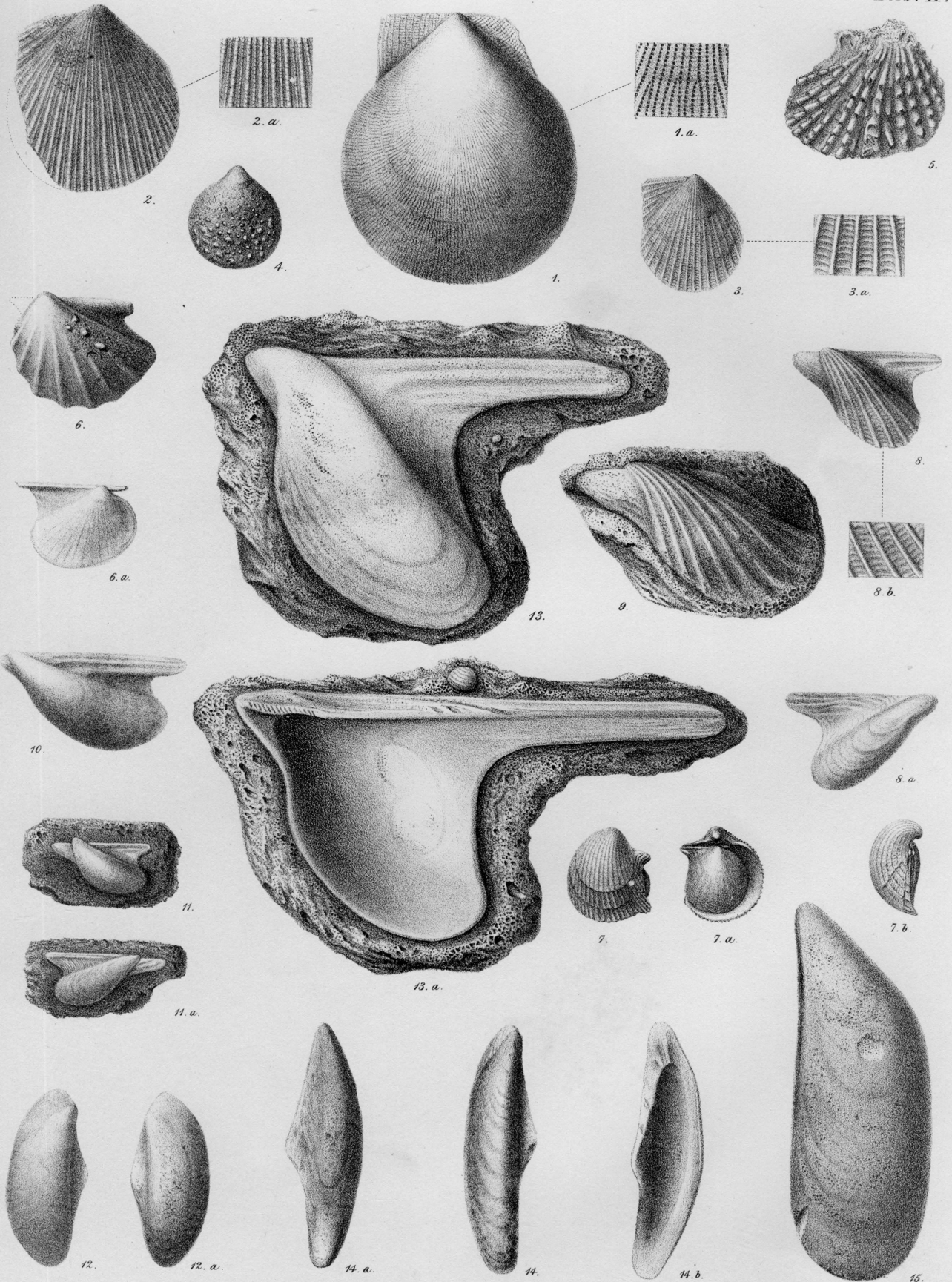
Fig.

- 1, 1 *a.* *Ostrea acuminata*, *page* 3.
2. „ *gregarea*, *var.*, *p.* 4.
- 3, 3 *a.* „ *Sowerbii*, *p.* 4.
4. „ *rugosa*, *p.* 2.
- 5, 5 *a.* „ *costata*, *p.* 3.
- 6, 6 *a.* „ *sub rugulosa*, *p.* 4.
7. *Exogyra auriformis*, *p.* 5.
- 8, 8 *a.* *Placunopsis Jurensis*, *p.* 6.
- 8 *b.* Interior of Ditto, showing muscular impression.
- 9, 9 *a.* *Placunopsis socialis*, *p.* 7.
10. „ *radians*, *p.* 7.
- 11, 11 *a.* „ *ornatus*, *p.* 7.
- 12, 12 *a.* *Pecten vagans*, *p.* 8.
13. „ *annulatus*, *p.* 12.
14. „ *peregrinus*, *p.* 9.
- 15, 15 *a.* „ *retiferus*, *p.* 9.
16. „ *hemicostatus*, *p.* 10.
- 17, 17 *a.* „ *personatus*, *p.* 11.
18. „ *arcuatus*, *p.* 11.
- 19, 19 *a.* „ *clathratus*, *p.* 13.
20. „ *Woodwardii*, *p.* 8.



TAB. II.

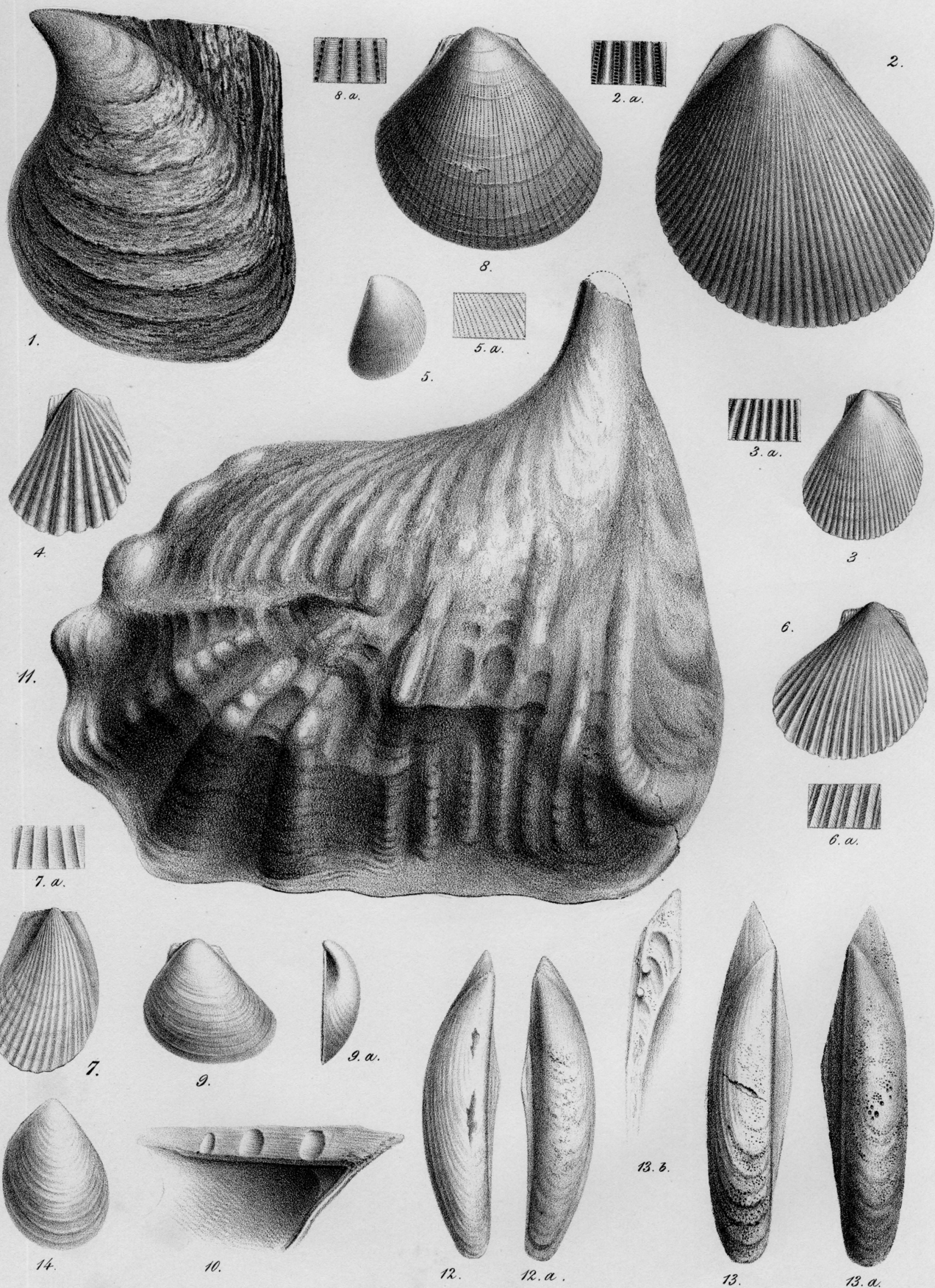
Fig.	
1, 1 <i>a</i> .	<i>Pecten lens</i> , <i>p.</i> 11.
2, 2 <i>a</i> .	<i>Hinnites velatus</i> , <i>p.</i> 14.
3, 3 <i>a</i> .	„ <i>tegulatus</i> , <i>p.</i> 14.
4.	<i>Plicatula tuberculosa</i> , <i>p.</i> 15.
5.	„ <i>fistulosa</i> , <i>p.</i> 15.
6, 6 <i>a</i> .	<i>Avicula costata</i> , <i>p.</i> 15.
7, 7 <i>a, b</i> .	„ <i>echinata</i> , <i>p.</i> 16.
8.	<i>Pteroperna costatula</i> , young of, showing the costated surface, <i>p.</i> 18.
9.	<i>Gervillia crassicosta</i> , <i>p.</i> 23.
10.	<i>Pteroperna emarginata</i> , <i>p.</i> 19.
11, 11 <i>a</i> .	„ <i>pygmæa</i> , <i>p.</i> 19.
12, 12 <i>a</i> .	<i>Gervillia ovata</i> , <i>p.</i> 22.
13.	<i>Pteroperna costatula</i> , <i>p.</i> 18.
13 <i>a</i> .	Interior of ditto, showing muscular impression and hinge area, <i>p.</i> 18.
14, 14 <i>a, b</i> .	<i>Gervillia monotis</i> , <i>p.</i> 22.
15.	„ <i>Bathonica</i> , <i>p.</i> 21.



TAB. III.

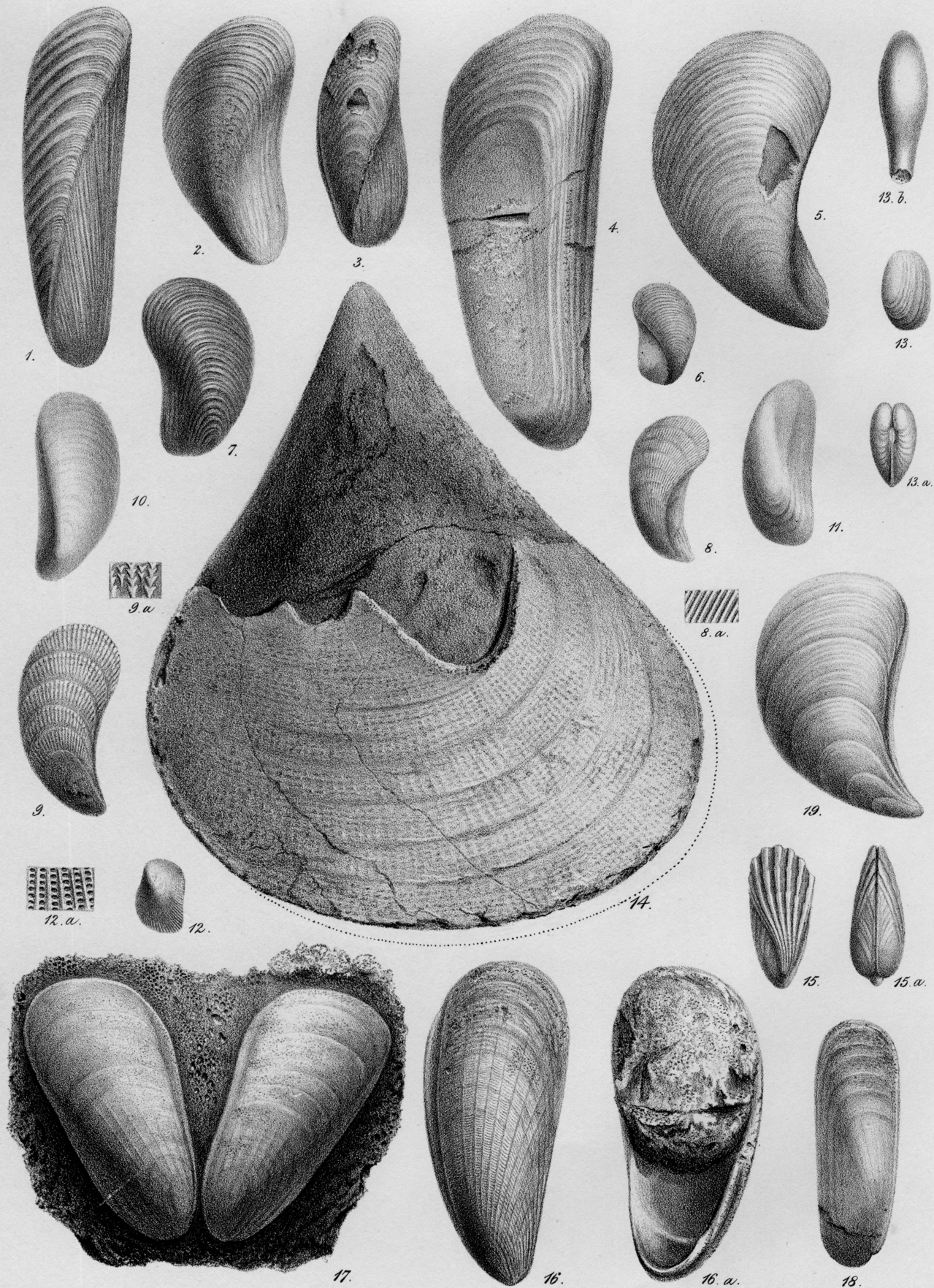
Fig.

- | | |
|---------------------|--|
| 1. | Perna rugosa, <i>p.</i> 25. |
| 2, 2 <i>a.</i> | Lima cardiiformis, <i>p.</i> 27. |
| 3, 3 <i>a.</i> | ,, semicircularis, <i>p.</i> 29. |
| 4. | ,, Luciensis, <i>p.</i> 28. |
| 5, 5 <i>a.</i> | ,, ovalis, <i>p.</i> 29. |
| 6, 6 <i>a.</i> | ,, duplicata, <i>p.</i> 26. |
| 7, 7 <i>a.</i> | ,, gibbosa, <i>p.</i> 28. |
| 8, 8 <i>a.</i> | ,, impressa, <i>p.</i> 29. |
| 9, 9 <i>a.</i> | ,, bellula, <i>p.</i> 30. |
| 10. | Hinge area of Gervillia crassicosta, <i>p.</i> 23. |
| 11. | Trichites nodosus, <i>p.</i> 35. |
| 12, 12 <i>a.</i> | Gervillia acuta, <i>p.</i> 20. |
| 13, 13 <i>a, b.</i> | ,, subcylindrica, <i>p.</i> 21. |
| 14. | Inoceramus Fittoni, <i>p.</i> 24. |



TAB. IV.

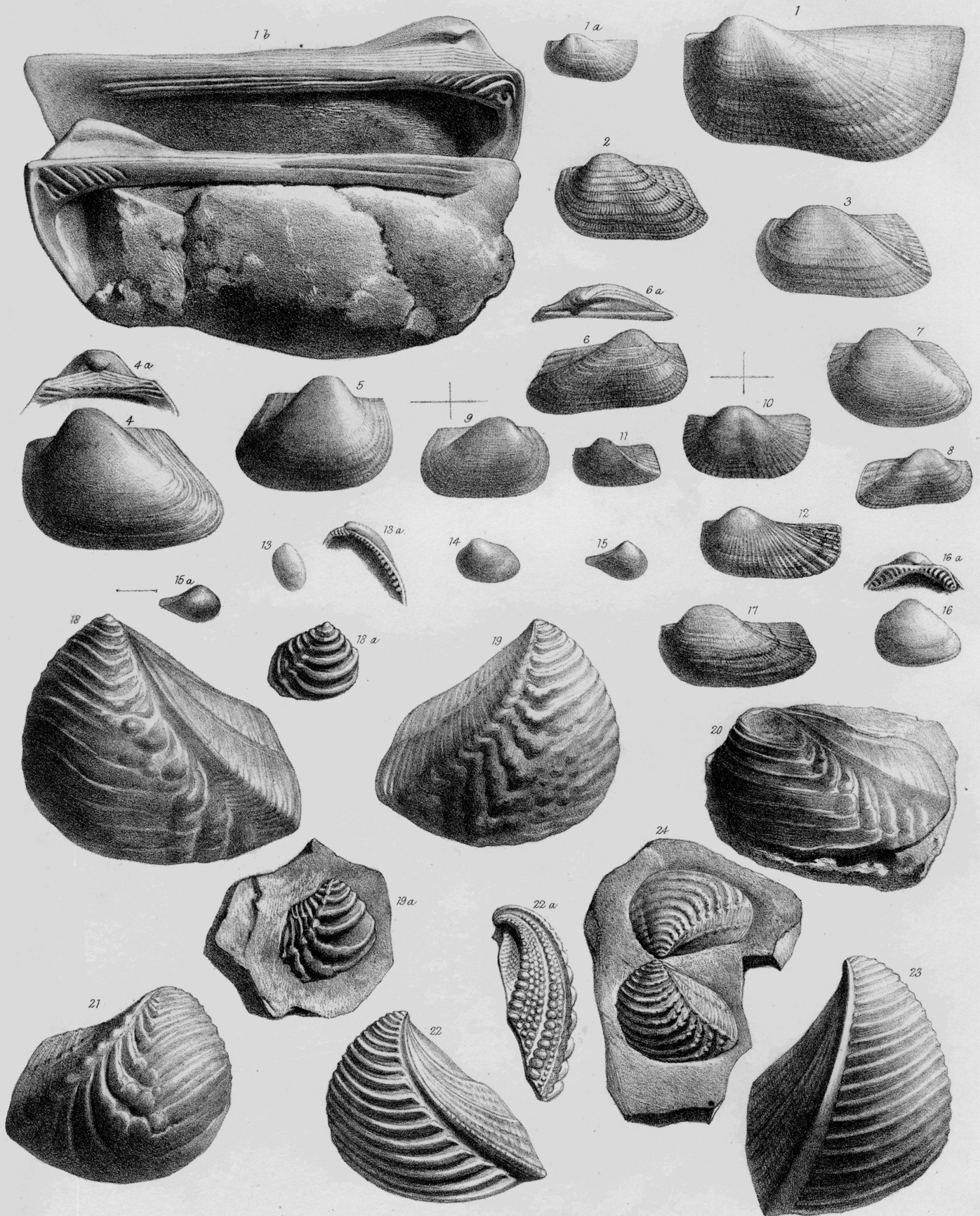
Fig.	
1.	<i>Mytilus Sowerbyanus</i> , <i>p.</i> 36.
2.	„ <i>imbricatus</i> , <i>p.</i> 41.
3.	„ <i>Lonsdalei</i> , <i>p.</i> 40.
4.	„ <i>solenoides</i> , <i>p.</i> 38.
5.	„ <i>tumidus</i> , <i>p.</i> 37.
6.	„ <i>tenuistriatus</i> , <i>p.</i> 37.
7.	„ <i>compressus</i> , <i>p.</i> 40.
8.	„ <i>asper</i> , <i>p.</i> 39.
9, 9 <i>a.</i>	„ <i>furcatus</i> , <i>p.</i> 39.
10.	„ <i>Binfieldi</i> , <i>p.</i> 42.
11.	„ <i>subreniformis</i> , <i>p.</i> 39.
12, 12 <i>a.</i>	„ <i>pulcherrimus</i> , <i>p.</i> 38.
13, 13 <i>a.</i>	<i>Lithodomus inclusus</i> , <i>p.</i> 43.
14.	<i>Pinna ampla</i> , <i>p.</i> 31.
15, 15 <i>a.</i>	<i>Lithodomus parasiticus</i> , <i>p.</i> 43.
16, 16 <i>a.</i>	<i>Myoconcha crassa</i> , <i>p.</i> 76.
17.	„ <i>actæon</i> , <i>p.</i> 77.
18.	„ <i>elongata</i> , <i>p.</i> 77.
19.	<i>Mytilus sublævis</i> , <i>p.</i> 41.



TAB. V.

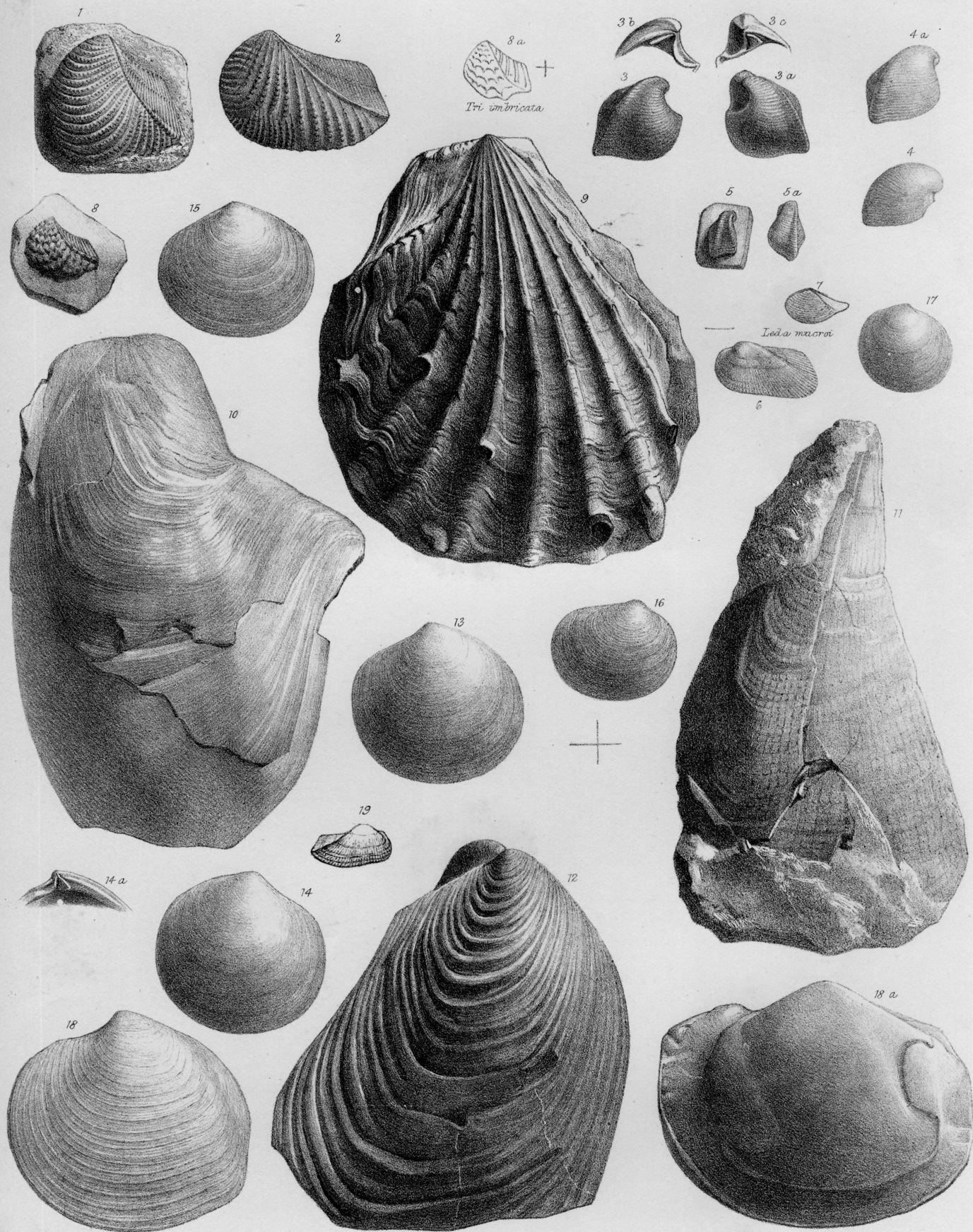
Fig.

- 1, 1 *b*. *Macrodon* (*Arca*) *Hirsonensis*, *p.* 49.
- 1 *a*. „ young state of ditto, *p.* 49.
2. *Arca rugosa*, *p.* 47.
3. „ *Prattii*, *p.* 45.
- 4, 4 *a*. *Cucullæa Goldfussi*, *p.* 50.
5. „ *cucullata*, *p.* 51.
6. *Arca Eudesii*, *p.* 46.
7. *Cucullæa concinna*, *p.* 50.
8. *Arca æmula*, *var. transversa*, *p.* 47.
9. „ *tenuitexta*, *p.* 45.
10. „ *Kilverti*, *p.* 45.
11. „ *minuta*, *p.* 48.
12. „ *rudis*, *p.* 44.
- 13, 13 *a*. *Nucula variabilis*, *p.* 51.
14. „ *Waltoni*, *p.* 52.
- 15, 15 *a*. *Leda lachryma*, *p.* 53.
- 15 *a*. „ „ the smooth variety of ditto, *p.* 53.
- 16, 16 *a*. *Limopsis ooliticus*, *p.* 54.
17. *Arca æmula*, *p.* 47.
- 18, 18 *a*. *Trigonia Goldfussi*, *p.* 56.
- 19, 19 *a*. „ *Moretoni*, *p.* 57.
20. „ *flecta*, *p.* 60.
21. „ *subglobosa*, *p.* 55.
- 22, 22 *a*. „ *costata*, *var. pullus*, *p.* 58.
23. „ „ *var. elongata*, *p.* 60.
24. „ *impressa*, *p.* 61.



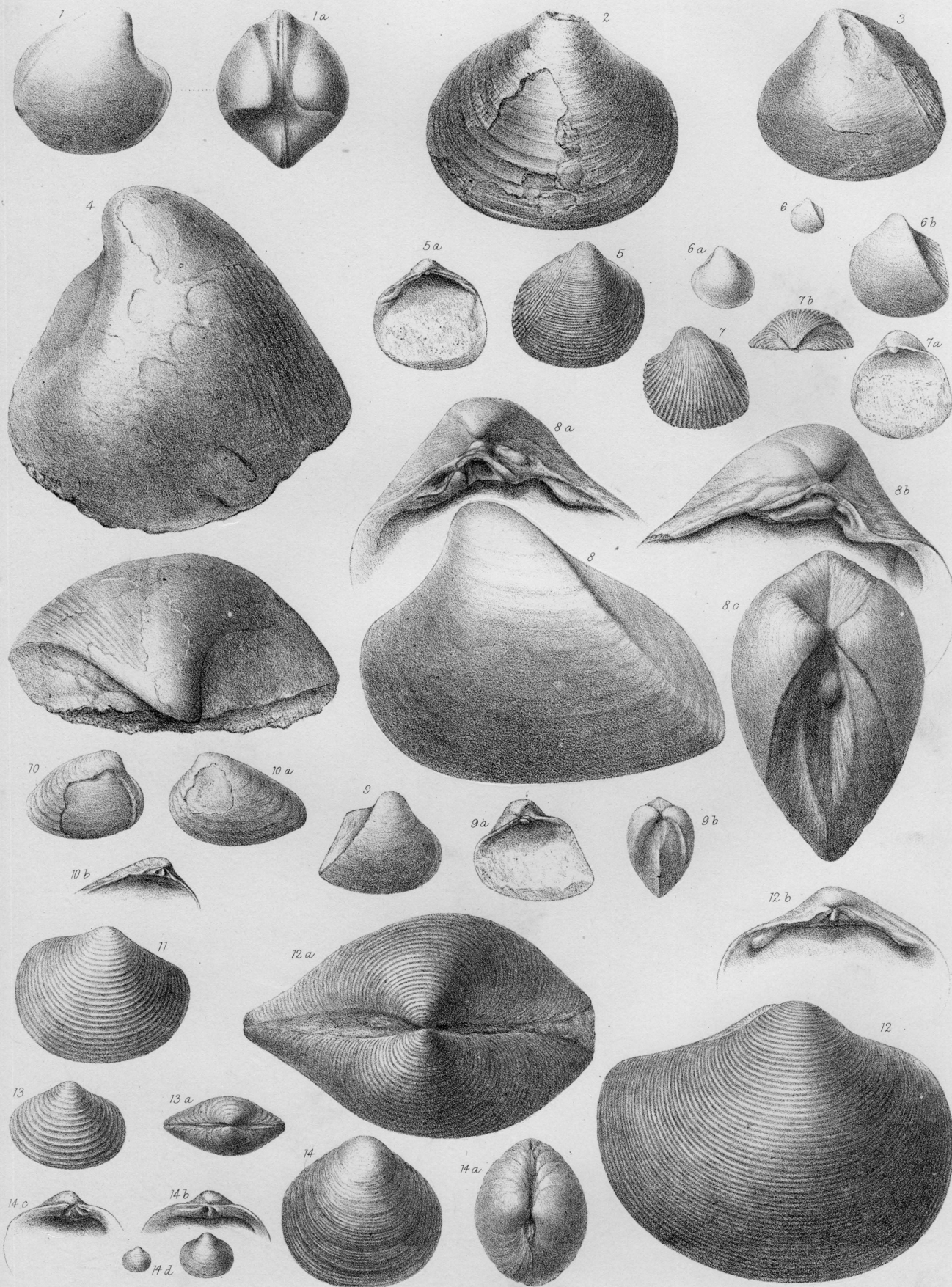
TAB. VI.

- Fig.
1. *Trigonia Phillipsii*, *p.* 62.
 2. ,, *duplicata*, *p.* 60.
 - 3, 3 *a*, *b*, *c.* *Opis lunulatus*, *p.* 80.
 - 4, 4 *a*, *b.* ,, *similis*, *p.* 81.
 - 5, 5 *a.* ,, *Deshayesii*, *p.* 81.
 6. *Arca pulchra*, *p.* 44.
 7. *Leda mucronata*, *p.* 53.
 - 8, 8 *a.* *Trigonia imbricata*, *p.* 63.
 9. *Lima pectiniformis*, *p.* 26.
 10. *Gervillia radians*, *p.* 23.
 11. *Pinna cuneata*, *p.* 32.
 12. *Inoceramus obliquus*, *p.* 24.
 13. *Lucina crassa*, *p.* 68.
 - 14, 14 *a.* ,, *rotundata*, *p.* 68.
 15. ,, *Bellona*, *var. depressa*, *p.* 67.
 16. ,, *despecta*, *p.* 69.
 17. ,, ,, *var. cardioides*, *p.* 69.
 - 18, 18 *a.* ,, *Bellona*, *p.* 67.
 19. *Arca minuta*, *p.* 48.



TAB. VII.

Fig.		
1, 1 <i>a</i> .	Isocardia tenera,	<i>p.</i> 66.
2.	Cardium Buckmani,	<i>p.</i> 64.
3.	„ subtrigonum,	<i>p.</i> 64.
4, 4 <i>a</i> .	„ pes-bovis,	<i>p.</i> 65.
5, 5 <i>a</i> .	„ Stricklandi,	<i>p.</i> 64.
6, 6 <i>a, b</i> .	„ semicostatum,	<i>p.</i> 63.
7, 7 <i>a, b, c</i> .	„ concinnum,	<i>p.</i> 65.
8, 8 <i>a, b, c</i> .	Cypricardia Bathonica,	<i>p.</i> 75.
9, 9 <i>a, b</i> .	„ rostrata,	<i>p.</i> 75.
10, 10 <i>a, b</i> .	„ nuculiformis,	<i>p.</i> 76.
11.	Corbis Lajoyei, <i>var.</i> cingenda,	<i>p.</i> 70.
12, 12 <i>a, b</i> .	„ „	<i>p.</i> 69.
13, 13 <i>a</i> .	„ aspera,	<i>p.</i> 70.
14, 14 <i>a, b, c, d</i> .	Sphæra (Corbis) Madridi,	<i>p.</i> 71.



TAB. VIII.

Fig.

1. Pachyrisma grande, anterior view, *p.* 79.
2. ,, posterior view, showing ligamental area, *p.* 79.
3. ,, hinge area of right valve, *p.* 79.
4. ,, hinge area of left valve, *p.* 79.
5. ,, side view, *p.* 79.
- 6, 6 *a.* Unicardium parvulum, *p.* 74.
- 7, 7 *a, b.* ,, varicosum, *p.* 73.
- 8, 8 *a, b.* ,, ,, nucleus of ditto, *p.* 73.
- 9, 9 *a, b, c.* ,, impressum, *p.* 73.

