



A Monograph of the Eocene Mollusca, or Descriptions of Shells from the Older Tertiaries of England. Part II. Pulmonata

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To cite this article: Frederic E. Edwards (1852) A Monograph of the Eocene Mollusca, or Descriptions of Shells from the Older Tertiaries of England. Part II. Pulmonata, Monographs of the Palaeontographical Society, 6:18, 57-120, DOI: [10.1080/02693445.1852.12023332](https://doi.org/10.1080/02693445.1852.12023332)

To link to this article: <https://doi.org/10.1080/02693445.1852.12023332>



Published online: 03 Aug 2018.



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A MONOGRAPH

OF

THE EOCENE MOLLUSCA,

OR

DESCRIPTIONS OF SHELLS FROM THE OLDER TERTIARIES
OF ENGLAND.

BY

FREDERIC E. EDWARDS.

PART II.

PULMONATA.

LONDON :

PRINTED FOR THE PALÆONTOGRAPHICAL SOCIETY.

1852.

C. AND J. ADLARD, PRINTERS, BARTHOLOMEW CLOSE.

To the Subscribers.

SHORTLY after the publication of the first part of the Monograph of the Eocene Mollusca, I received a note from Professor Owen, from which the following is an extract:—

“In reference to the theory of the siphon of the Nautilus, which you attribute to Mr. Wood, I know you will excuse my referring you to a passage (p. 331) of my Lectures on Invertebrata, in which that theory or function of the siphon is plainly though briefly laid down, and I am sure that our excellent Treasurer would be the last person to claim the exclusive credit of the idea, unless his right to it was based on a publication of it prior to 1843. The scrupulous care which characterises your reference to authorities, assures me that if you have overlooked the passage in my Lectures you will be glad to be referred to it.”

Although I had derived much pleasure and instruction from Professor Owen's admirable Lectures, I must confess that the passage referred to had escaped my recollection; and I greatly regret that this should have been the case, for I should have been glad to have availed myself of the powerful support it affords to the theory I advocated. For the convenience of those Subscribers to whom the Lectures are not immediately accessible, I shall extract the passage to which Professor Owen refers. After noticing Dr. Buckland's theory of the hydrostatic action of the siphuncle, and the objections against it, the Professor advances the opinions to which I have referred in the 'Monograph,' as to the function of the air-chambers being that of a balloon, and as to the mode in which the animal alters the specific gravity of its shell; and he concludes with the following paragraph,—the one referred to in his letter to me:

“Whatever additional advantage the existing Nautilus might derive by the continuation of a vascular, organised, membranous siphon through the air-chambers, in relation to the maintenance of vital harmony between the soft and testaceous parts, such, likewise, must have been enjoyed by the numerous extinct species of the tetrabranchiate Cephalopods, which, like the Nautilus, were lodged in chambered and siphoniferous shells.”

It is due to Professor Owen that I should, to the best of my power, repair my omission to refer to this eminently suggestive passage; and now, having brought it distinctly before the Subscribers, I leave it to them to decide as to whom the credit of the siphuncular theory in question is due.

F. E. E.

July, 1852.

CORRIGENDA.

Substitute Sconce for Headon Hill, at p. 65, line 24; at p. 70, line 13; and at p. 78, line 15.

A MONOGRAPH
OF THE
MOLLUSCA FROM THE EOCENE FORMATIONS
OF ENGLAND.

ORDER—*PULMONATA*. CUVIER.

PNEUMOBANCHIATA, Lamarck.

PULMOBRANCHIATA, De Blainville.

PULMONIFERA, Fleming.

THE Molluscs forming this order breathe the free air by means of a chamber termed the pulmonary sac or cavity, placed beneath the dorsal surface of the anterior part of the mantle, and communicating with the atmosphere by a lateral opening, which can be dilated or contracted at the pleasure of the animal. The roof and walls of this chamber are lined with a network of pulmonary vessels, by which the blood is exposed to the air, and the renewal of this vital fluid is effected by movements of the floor of the chamber, analogous with those of the diaphragm.

The Pulmonated Molluscs are furnished with eyes, which are either placed at the anterior extremities of two elongated cylindrical peduncles, or seated in the head of the animal. Most of the genera in which the eyes are pedunculated, are also furnished with shorter cylindrical tentacula, placed beneath the peduncles, but in some few instances these appendages are wanting. In the genera in which the eyes are sessile, the animal is furnished with two sub-cylindrical or compressed tentacles only. The sessile eyes are variously placed; in some genera they are seated at the inner sides of the bases of the tentacles; in others at the outer sides; and in others on the frontal disc. The peduncles and tentacles are both contractile, and in by far the greater number of genera they are also retractile, that is, capable of being withdrawn under the skin. They are eminently sensitive organs of touch.

The head is well developed, and the mouth is provided with an apparatus

consisting of a horny dentated plate, placed transversely across the upper part, and the sharp outer edge of which forms, as it were, the upper jaw. The cavity of the mouth is furnished with a thin cartilaginous tongue, the anterior extremity of which is of a flattened spoon-like form, and which plays against the edge of the horny plate, answering the purpose of an under jaw. The remainder of the tongue is rolled up into a tube closed at the end, and thickly covered with teeth, distributed in transverse rows of various forms. The number of these teeth is almost incredible, amounting, in one of the English slugs (*Limax maximus*) to nearly 27,000, and ranging in several of the snails from 10,000 to upwards of 20,000.* A dentition of a similar character prevails among the Branchiated Gasteropods; and Professor Lovén has proposed the employment, for the purposes of classification, of characters taken from the form and arrangement of the teeth.

The free air-breathing Molluscs are, in some few instances, viviparous,† but, for the most part, they are oviparous. The eggs are either enveloped in a skin, or are covered by a hard calcareous shell, which, among the larger Bulimi and Achatinæ, is sometimes of considerable size. The larvæ are in all cases shaped like the parent. The generative organs present various modifications; in some genera the animals are unisexual; but more generally they are hermaphrodite.

These Molluscs are, with few exceptions, provided with hard calcareous shells, which are sometimes either internal or partly concealed beneath the mantle, but more generally are external, and large enough to contain the whole, or nearly the whole, of the animal. In some genera the foot of the animal is provided with a calcareous or horny operculum; in others the animal is without this appendage, and in the genus *Clausilia*, the purpose of the operculum is answered by a peculiar apparatus termed the clausium. The external shells present many modifications in the proportions and conditions, as well of the spire and volutions, as of the aperture and columella. Certain of these forms are accompanied by corresponding peculiarities of organisation, and the genera which have been established for their reception may be considered types in this order; such are the genera *Helix*, *Bulimus*, *Pupa*, *Succinea*, *Limnæa*, *Physa*, *Planorbis*, *Cyclostoma*, *Helicina*, *Auricula*, &c., and the Palæontologist will have little difficulty in distinguishing them. Other genera, however, have been proposed from time to time on characters taken from modifications of these typical forms; but a more intimate acquaintance with the anatomy of the animals has latterly induced great caution in the admission of these genera; since, in many cases, the Malacologist, after the most careful investigation, has failed to detect any peculiarity of organisation corresponding

* For a more detailed account of the oral apparatus, the reader is referred to Mr. W. Thompson's highly interesting "Remarks on the Dentition of British Pulmonifera," in the 'Annals and Mag. of Nat. Hist.,' 2d series, vol. vii, p. 86.

† This is the case with some species of *Helix*, and with several species of *Bulimus*, for which Férussac, on this ground, proposed the genus *Partula*.

with the modifications of the shell. In the extensive family of the Helicidæ, most especially, has this occurred, and many of the genera thus formed are consequently either wholly rejected, or received provisionally until it is ascertained by further examination whether or not there is anything except merely artificial characters to support them.

The Gasteropods forming this order are all phytophagous. They are very widely spread, being found in almost all parts of the earth, but they principally abound in warm or tropical climates, where the largest species occur. They are, for the most part, inhabitants of land, but many live in water, coming to the surface for respiration; of those which live in water, the greater number inhabit ponds, running streams, or stagnant waters, but some few are marine animals, frequenting the shallow sea near the shores, or salt-water marshes.

Two distinct forms of the opening by which the communication between the pulmonary sac and the external air is kept up, are presented; and as each appears to be accompanied by corresponding peculiarities of organisation, Mr. Gray has availed himself of them for dividing the order into the two sub-orders, *Adelopneumona* and *Phaneropneumona*.* In the first division the communication is through a lateral orifice formed by the edge of the mantle, which, except at that part, is united along the left side of the animal; in the second division the edge of the mantle is free or detached along the nape, leaving the pulmonary cavity open. The animals comprised in the first division are all hermaphrodite, and without an operculum; while, on the contrary, those which form the second division are unisexual and operculated. The genera constituting this order had previously been divided, according to their habitats, into terrestrial and aquatic (*terricola* and *aquatica* of Dr. Fleming); a mode of distribution which brought together animals presenting important zoological differences. This principle of subdivision may, however, be used with convenience in the *Adelopneumona*, and Mr. Gray has, in fact, divided that sub-order into the three sections, *Geophila*, *Limnophila*, and *Thalassophila*, the last two representing the *aquatica* of Fleming.†

Mr. Webster many years ago, ('Geol. Trans.,' vol. ii,) noticed the occurrence in the Purbeck beds of fossils resembling fresh-water shells, and in the Museum of Practical Geology is a series of fossils from that formation, comprising *Limnæa* and *Planorbis*. Fossil remains, referred to the genus *Auricula*, have also been found, according to M. Nyst, in the chalk formation in the department of the Aube in France. In the

* Etym., *Αδηλος*, (hidden, concealed,) and *φανeros*, (open, exposed,) prefixed to *πνευμων*, (the lungs.) These sub-orders correspond with the divisions *inoperculata* and *operculata*, proposed by Férussac, and adopted by Dr. Turton, M. Rang, and others, but as the names used by Mr. Gray express modifications of the respiratory apparatus, which forms the character of the present order, I have adopted them, although the words *operculata* and *inoperculata* are preferable from their simplicity.

† Etym., *γεια* (land), *λιμνη* (a pool or marsh), and *θαλασση* (the sea), respectively prefixed to *φιλος* (loving).

fresh-water deposits of the Eocene epoch, remains of numerous species belonging to various of the land and fresh-water genera, constituting this order, occur in abundance. These species are, for the most part, without any living analogue, but some few occur which appear to be identical with species still in existence.

I believe that, as yet, remains of land inhabiting genera have not been found below the Eocene formations. It must not, however, be assumed from that circumstance that these latter forms of animal life date their existence with the Eocene Epoch. The older formations with which Geologists are at present acquainted, are, with the exception of the Wealden group and the Coal-measures, of marine origin; and the preservation in them of the remains of land-shells would be due only to accidental circumstances. Individuals might occasionally be transported by rivers or currents of water into estuaries, or be swept away by an irruption of the sea. To such a cause is to be attributed the presence of a specimen of *Bulinus ellipticus*, found by Mr. Wetherell in the London Clay at Primrose Hill; but the number deposited in the bed of the deep sea by the agency of such casualties, must necessarily be small, and it need not excite surprise that their remains have not occurred in the older formations.

SUB-ORDER—*ADELOPNEUMONA* (Gray), *INOPERCULATA* (Férussac).

Sect. α. *TERRICOLA*, Fleming.
GEOPHILA, Férussac.

Family—*HELICIDÆ*.

Genus 6th. *HELIX*. Linn., 1758; Brug., 1792; Lam., 1801.

Shell turbinated, orbicular, sub-globose, or depressed; spire more or less elevated, with several convex whorls, generally smooth; the last often large and ventricose; aperture entire, transverse, oblique, lunate, or semi-ovate, impressed by the prominent part of the body whorl, and sometimes furnished with one or more lamelliform teeth; peristome confluent with the columella, generally thickened internally, or having the edge reflected, especially on the side covering the umbilicus; without an operculum.

Notwithstanding that in Lamarck's time but little was known of the comparative anatomy of the animals belonging to this family, we must concur in the regret expressed by M. Deshayes (2d edit., 'Hist. Nat.' &c.) that that illustrious naturalist did not attempt a systematic arrangement of the numerous species forming this genus.

A much more intimate knowledge of the anatomy of the animals has since been acquired; and it appears that, although the shells present a great variety of forms, differences of organisation of importance sufficient to justify the separation of genera to receive them, do not exist, or, at all events, have not been observed in the animals. This strong general resemblance extends, in fact, to the whole of the

Helicidæ, and induced M. de Férussac to arrange the different genera as sub-genera merely of the typical genus *Helix*.

The present genus, as defined by Lamarck, embraces considerably more than a thousand living species; and may well be considered to be "deserving of subdivision, were it only to assist the student in the difficult task of investigation." Very many genera and sub-genera (amounting, including the synonyms, to nearly two hundred,) have, in fact, been proposed from time to time by different authors; but being nearly all founded, more or less, on conchological differences, they are, with few exceptions, rejected by the advocates of a strictly natural arrangement. M. Deshayes, one of the most able advocates for a system of arrangement dependent on anatomical structure, admits the convenience of having recourse to artificial divisions in this genus in which it is impossible to form natural groups; and suggests that the *Helices* may be classed, by the form of the shell, in four sections, consisting of the planorbular species, (*Zonites*, Montfort; *Helicella*, Lamarck,) the globose species, (*Acavus*, Montfort,) the carinated species, (*Iberus*, Montfort; *Carocolla*, Lamarck,) and the trochiform or turbiniform species (*Petasia*, Beck; *Geotrochus*, Swain.): and that these sections may be again subdivided into groups, according as the species are or are not umbilicated, have the aperture simple or reflected, or are or are not furnished with teeth.

The fossil *Helices* are more numerous than might be expected with respect to land-shells. Many extinct species, from the Freshwater deposits of the Paris basin, have been described by MM. Brogniart, ('Ann. du Mus.' vol. xv, p. 378,) Deshayes, ('Descr. des Coq. Foss.,' &c., vol. ii,) Matheron, ('Ann. des Sci. et de l'Indust. du Midi,' vol. iii,) Michaud, ('Guerin's Mag. de Zool.,' 1837,) De Roissy, ('Guerin's Mag. de Zool.,' 1839,) and Melleville, ('Mém. sur les Sables Tert. Inferieurs du Bassin de Paris,' p. 45;) and from the contemporaneous Freshwater formations in Germany by MM. Zeiten, ('Petr. Wurt.,' tab. xxix and xxxi,) Steininger, ('Bull. Soc. Géol. de France,' vol. vi,) Deshayes, ('Ency. Méthod. Vers.,) and Pusch, ('Polens. Pal.,' p. 94.) One species only, *H. globosa*, has as yet been described from the synchronous deposits in England; to this I am enabled to add eight species, one of which is identical with an existing species, *H. labyrinthica*, Say., found in North America.

Many species also occur, mixed with marine remains in the Miocene formations of Touraine, Dax, and Bordeaux, and in the Pleiocene formations of Piedmont, the Crag of England, and its equivalent in Belgium; of these but few are extinct, by far the greater number being referred to existing species.

Among the French species described by M. Deshayes is one (*H. dubia*), which, on the authority of Mr. Underwood, is mentioned as occurring in the Isle of Wight. I have not met with any specimen from that place; and M. Deshayes, as I learn from that gentleman himself, entertaining doubts as to the English locality, I have not considered *H. dubia* as an English species.

No. 14. *HELIX VECTIENSIS*. *F. E. Edwards*. Tab. X, fig. 8 *a—e*.

H. testá orbiculato-depressá, umbilicatá; superficie punctulis minutissimis confertis aspersá; spirá parum elevatá; anfractibus quinque sub-rotundatis, suturis depressis; aperturá semi-ovali, peristomate reflexo: umbilico profundo, semi-obtecto.

A somewhat convex shell, having the surface thickly covered with minute punctules. The slightly elevated spire is composed of about five bluntly convex whorls, depressed at the sutures. The aperture is semi-ovate, having the margins strongly reflected; that of the inner lip partly covering the umbilicus, which is deep and moderately wide. The shells, when in the young state, are, like many others in this genus, slightly carinated. In the general contour, this species much resembles the recent *H. rufescens*, but it is distinguished as well by the punctulated surface, as by the less rounded whorls, the more strongly reflected peristome, and the larger umbilicus.

Casts in the Limnæan limestone at Sconce are not uncommon; but specimens with the shell preserved are rare. The casts may be separated from those of *H. D'Urbani*, with which, at first sight, they are liable to be confounded, by the narrower umbilicus, and frequently by the impression of the reflected lip of this species. Where the shell is preserved, the punctulated surface presents a character by which it may be at once distinguished.

Diameter, 4-10ths of an inch; elevation, 2-10ths in.

Localities.—Sconce near Little Yarmouth, and Headon-Hill, Isle of Wight.

No. 15. *HELIX D'URBANI*. *F. E. Edwards*. Tab. X, fig. 5 *a—d*.

H. testá orbiculato-depressá, lævi, umbilicatá: spirá subprominulá; anfractibus quinque aut sex sub-rotundatis; suturis perspicuis: aperturá semi-ovali, peristomate simplici; umbilico magno.

A smooth, depressed, umbilicated shell, with a slightly elevated spire; the five or six volutions of which it is composed are bluntly convex, and the upper edges are so much depressed as almost to present a channel at the suture; the aperture is semi-ovate, with a perfectly simple unreflected lip; the umbilicus is wide, disclosing the volutions within.

This species somewhat resembles *H. Lemani* of Brogniart, but the spire is less elevated, and the umbilicus is more open.

The smooth and polished surface, which barely shows the lines of growth, and the sharp lip prevent its being confounded with *H. Vectiensis*. When young, the whorls are slightly carinated. A variety occurs in which the spire is much depressed, and the whorls consequently assume a less bluntly convex form.

The species is not uncommon ; but most generally casts only are found. In that condition the wide umbilicus is the only character by which it can be separated from *H. Vectiensis*.

Diameter, 4-10ths of an inch nearly; elevation rather more than 2-10ths in.

Localities.—Sconce and Headon-Hill.

I have much pleasure in dedicating this species to my friend John D'Urban, Esq., whose Palæontological pursuits have enabled him to add several interesting species to our Eocene Fauna.

No. 16. *HELIX GLOBOSA*. *Sowerby*. Tab. X, fig. 2 *a—d*.

H. GLOBOSUS. *Sow.* 1818. *Min. Con.*, vol. ii, p. 157, t. 170.

— *Morris*. 1843. *Cat. of Brit. Fos.*, p. 147.

H. testá globoso-conoideá, apice obtuso: anfractibus sex aut septem, transversim substriatis, ultimo anfractu ad basin convexo; striis numerosis, irregularibus, tenuissimis; suturis perspicuis; aperturá depressá, semi-lunari, marginibus reflexis; columellá sub-rectá; umbilico obtecto.

This well known shell is globosely conical, with an obtuse apex; the spire is formed of six or seven whorls, which exhibit obscure, transverse, irregular striæ, or lines of growth, so faint that, as Mr. Sowerby remarks, they are only to be seen in the best preserved specimens. The base of the shell is very tumid, rising from the periphery of the whorl with a bluntly convex swell until it nearly reaches the umbilicus, into which it sinks abruptly, imparting an almost vertical slope to the columella. The aperture in the adult shell is semilunate and depressed, with the margins reflected, that of the inner lip entirely concealing the umbilicus. The young shell, like that of all the globosely conical shells of this genus, presents a form very different from that of the mature one. When in the young state, the whorls are subcarinated, increase rapidly in size, and consequently are very convex, giving a sub-quadrate form to the aperture; and the shell presents a small umbilicus: but, as the shell approaches maturity, they lose their sub-carinated form, increase in size more and more slowly, and become less and less convex in their contour, so that, in the mature state, the aperture assumes a semilunate form, and at this period of growth the umbilicus is concealed by the reflected margin.

Specimens with the shell preserved are extremely rare, but casts in all stages of growth are comparatively common at Sconce Point. In the young state the casts resemble those of *Helix occlusa*; but the flattened base, the shorter and more oblique columella, and the semi-ovate aperture, serve to distinguish the latter species.

I am indebted to Mr. Sowerby for the use of the original specimen described

in the 'Mineral Conchology,' from which the larger figures are taken; fig. 2 *a* is from a specimen in the cabinet of Mr. D'Urban.

Diameter, 2 inches; elevation, 2·3 in.

Localities.—Shalcome (near Ryde) and Sconce, Isle of Wight.

No. 17. *HELIX OCCLUSA*. *F. E. Edwards*. Tab. X, fig. 10 *a—e*,

H. testá sub-globosá, fulvo uni-fasciatá; spirá prominulá, quinquies vel sexies circumvolutá; anfractibus convexiusculis, ad suturam depressis, obscure ad basin striatis, subplanulatis; aperturá semi-ovatá, marginibus parum reflexis: margine columellari umbilicum occludenti.

A sub-globose shell, with a somewhat elevated spire, composed of five or six rapidly enlarging convex whorls, depressed round the suture, and flattened on the base. The surface presents numerous, very faint, oblique, irregular striæ, produced by the lines of growth. The aperture is of a regular semi-ovate form, having the margins slightly reflected; the inner lip spreads over, and entirely closes the umbilicus. The shell is ornamented by a narrow, brownish-yellow band running round the whorls, just above the line of the suture, the colouring matter of which is retained, more or less, in all the specimens I have seen, in which the shell is preserved.

This is a well-marked species, easily distinguishable when the shell is preserved. The casts, which are more commonly found, resemble those of the young shell of *H. globosa*, but can be separated from them without difficulty by the flattened base and oblique columella which present a strong contrast with the tumid base, and nearly vertical columella of that species. The smaller number of the whorls and the narrower umbilicus separate it as distinctly from *H. Vectiensis* and *H. D'Urbani*.

Diameter, 1·2 in.; elevation, $\frac{3}{4}$ in., nearly.

Localities.—Sconce and Headon Hill, where it occurs more rarely than any of the preceding species.

No. 18. *HELIX TROPIFERA*. *F. E. Edwards*. Tab. X, fig. 3 *a—c*.

H. testá orbiculari, supra plano-convexá, subtús convexo-turgidá, umbilicatá: spirá plus, minusve elevatá; anfractibus quinque aut sex, ad peripheriam subcompressis, et carinatis; aperturá transversá, subtrigoná; marginibus reflexis umbilico magno.

I have seen two specimens only, both casts, of this *Helix*; from the character of the whorls and the aperture it would belong to Lamarck's genus *Carocolla*,—the *Chilotrema* of Dr. Leach. It is an orbicular shell, with a slightly elevated spire, apparently variable in height; the upper sides of the five or six whorls, of which it is formed, are nearly flat, and somewhat compressed near the periphery, which presents a

sharp keel; the under side is tumidly convex, rising with a regular swell until it approaches the umbilicus, into which it sinks rather suddenly, presenting a blunt angle which defines the umbilicus. In the smaller of the two specimens, the spire is more elevated, and the underside of the body-whorl more convex than in the other. The umbilicus is deep and moderately wide; the aperture transverse, and wider than long. The specimen figured exhibits the impression of a slightly reflected peristome.

The present species is much less than the recent *H. lapicida*, the umbilicus is smaller in proportion, the keel round the whorls more prominent, and, judging from the cast figured, which appears to be that of a fully-grown shell, the aperture at maturity does not present the downward inflection which characterises *H. lapicida*. The condition of the keel is apparently a character of little value, inasmuch as it varies considerably in specimens of *H. lapicida*, some of which, particularly in the young state, have it as acute and prominent as that of the present shell.

The smaller size of the umbilicus, and the absence of the downward inflection of the aperture, are the most important differences; but these characters, even if constant, would scarcely justify my considering the shell as more than a variety. With only two specimens, however, and those casts, I do not venture to pronounce as to their identity with the recent species. If, on more perfect specimens being obtained, it should appear that the shell presents the granulated surface which characterises *H. lapicida*, I should feel little hesitation in referring it to that species.

The specimen figured belongs to Mr. D'Urban's collection.

Size.—Diameter, $\frac{1}{2}$ an inch; elevation rather more than 2-10ths in.

Locality.—Headon Hill, where, however, it is extremely rare.

No. 19. HELIX OMPHALUS. *F. E. Edwards*. Tab. X, fig. 5 a—e.

HELIX STRIATELLA. *S. Wood*. Lond. Geol. Journ., vol. i, p. 118.

H. testá planorbulari, depressá, undato-costulato-lineatá, umbilicatá: anfractibus quaternis, convexiusculis; suturis conspicuis, depressis: aperturá rotundato-semi-lunari; marginibus simplicibus; umbilico magno.

This shell, which belongs to the section represented by *Zonites*, Montfort,*

* The genus *Zonites*, as defined by Mr. Gray, embraces those Helices which have a depressed spire and a lunate mouth, with thin simple lips. It is divided into two sections—*Verticillatæ* (Fér.), in which the shell is brown, or varied, and striated; and *Hyalinæ* (Fér.), in which the shell is hyaline, greenish or pale brown, and polished. It appears, from the observations of Mr. W. Thompson, to which I have before referred, that, judging from the characters afforded by the dentition, the animal of *Z. radiatus* (one of the *Verticillatæ*) is a true Helix; but that in four species of the *Hyalinæ* examined by him, the animals would form a connecting link between *Vitrina* and the true Helices. Professor E. Forbes and Mr. Hanley, in their 'History of British Mollusca,' restrict the genus to the Hyaline species.

(*Helicella*, Lamarck,) is somewhat discoidal, with a slightly elevated spire formed of about four whorls, generally rounded or bluntly convex, but which, in two casts of fully grown individuals in my cabinet, present a sub-carinated periphery. The surface is covered with numerous regular raised lines, separated by shallow rounded sulci; the lines are oblique, undulating, and rounded. The margins of the depressed semilunar aperture are simple and unreflected. The umbilicus is moderately wide.

Mr. S. Wood, in his 'List of Shells from Hordwell Freshwater Bed,' has referred this shell to the North American species, *H. striatella*, Anthony; but, although I feel great hesitation in dissenting from his opinion, the differences between the two render it difficult to maintain their identity, at all events, before we are better acquainted with the influence of external conditions in modifying the forms of the animal and its shell. I should add that I have only one specimen with the shell preserved, (the one referred to by Mr. Wood, and which he has been kind enough to add to my collection,) and that this specimen is in an imperfect state. On comparing this shell with the recent *H. striatella*, it will be seen that in the latter species the spire is more elevated, the lineation sharper, the sulci not so deep, the whorls wider, rounder, and less embracing; the suture not so depressed, and the aperture larger. Similar differences exist between this and *H. ruderata*, a species from Cincinnati described by Binney. In *H. perspectiva*, Say, which it somewhat resembles, the spire is more depressed, the lineation, like that of *H. striatella*, is fainter and sharper, the volutions more numerous, the peritreme more distinctly carinated, and the umbilicus wider.*

A shell occurs in the Pleistocene freshwater deposit at Clacton, which is referred to *H. ruderata*: the striation resembles that of the present shell; but in other respects it very closely resembles the American shell. M. Deshayes has described a fossil shell from the upper freshwater formation of the Soissonnais (*H. Ferrantii*), to which this species presents a general resemblance; but it is separated from that shell by the more elevated spire, and the more numerous whorls; and in *H. Ferrantii* the raised lines appear to be fewer and less regular, and the umbilicus to be narrower.

Size.—Diameter $\frac{1}{4}$ of an inch, nearly; elevation 1-10th inch.

Localities.—Hordwell Cliff; Sconce.

* The *H. striatella* of Anthony is from Massachusetts, and, until recently, was considered to be merely a variety of Say's *H. perspectiva*, which is from Ohio and Lake Erie. Gould, in his 'Report on the invertebrate Animals of Massachusetts,' has pointed out the distinctions. The *H. ruderata* of Binney is from Cincinnati, and has also been considered as a variety of *H. perspectiva*; it appears to belong rather to *H. striatella*.

No. 20. HELIX LABYRINTHICA. Say. Tab. X, fig. 7 a—e.

HELIX LABYRINTHICA.	Say. Journ. Acad. Nat. Sc. Philadelphia, vol. 1, p. 124.
—	— Nicholson's Encycl. (Amer. Edit.), 4.
—	— Férussac. Hist. Natur. des Moll., tab. li B, fig. 1; Prodrömus, No. iii.
—	— Binney. Boston Journal Nat. Hist., vol. iii, tab. xxiv, fig. 1.
—	— Gould's Report of the Inverteb. of Massachus., p. 184.
— LABYRINTHICUS.	S. Wood. Lond. Geol. Journ., vol. i, p. 118.

H. testá minimá, globoso-conicá, transversim lineatá, umbilicatá; lineis obliquis, undosis, numerosis; spirá plus minusve elevatá, sexies circumvolutá; anfractibus convexis ad basin sub-planulatis: aperturá depresso-semilunari, peristomate reflexo: margine columellari uno dente lamelliformi instructo: umbilico magno, profundo.

This pretty and very rare Helix is a small, roundedly-conical shell, with a more or less elevated spire, composed of about six gradually increasing whorls, separated by a clearly defined suture, and ornamented with numerous, elevated, obliquely transverse, equidistant, raised lines, more or less prominent in different individuals. These lines are somewhat acute, slightly undulated, and, running into the umbilicus, cover the whole surface of the whorls. The base of the shell is but slightly convex; the aperture of a depressed semilunar shape, with the peristome reflected. The columella lip presents a large lamelliform tooth, prolonged within the aperture, and running parallel with the suture. The umbilicus is deep and wide, being about one third of the diameter. In one specimen in my cabinet, the spire is very much depressed, almost planorbular, and the apex more obtuse.

This species derives additional interest from the fact that, having survived through the inconceivably long spaces of time required for the deposit of the Miocene and the more recent formations, and having become extinct in the hemisphere in which it first appeared, it is now found among the living forms of North America. The recent *Helix labyrinthica*, first described by Say, is spread over a wide range of country, extending from Ohio to Florida, and from Missouri to Texas. Specimens from Texas, Ohio, and Florida are preserved in the British Museum; and, after a careful comparison with them of the fossil shells, it appears to me that differences of sufficient importance for specific distinction cannot be detected between them; I therefore fully concur with Mr. S. Wood in the opinion expressed by him of their specific identity, and I do not hesitate to refer the fossil shell to Say's species.

In order to facilitate an examination into this identity, it will be useful to give Say's description in his own words. It is as follows: "Shell conic, dark reddish-brown; body lighter; whorls five or six, with conspicuous, elevated, equidistant, obtuse lines across, forming grooves between them; apex obtuse; lip reflected,

rounded; pillar-lip with a large, lamelliform, elongated tooth, which appears to revolve within the shell parallel to the suture; a smaller raised line revolves nearer to the columella within the shell, but becomes obsolete before it arrives at the pillar-lip. Umbilicus large. Breadth 1-10th of an inch."

Taking the Texas shells, the form described by Say as the typical form of the American species, the fossil shell presents, on comparison, the following variations:

1st. The shell is somewhat smaller; the spire, except in the specimen I have noticed, is more elevated, the apex not so obtuse, and the whorls are less convex.

2d. The base of the shell is flatter, and the aperture not so rounded.

3d. The position of the larger raised line is more median, and the smaller raised line is wanting; and,—

4th. The peristome is simply reflected, and not "rounded" or thickened.

Now it will be seen that the differences firstly mentioned are such as frequently occur in a series of individuals of the same species. The variable height of the spire, evidenced in the fossil shells by the depressed form of the specimen before mentioned, is a character also found in the recent species; since Gould, in his work above cited, states expressly that "the shell varies considerably in the elevation of the spire, being sometimes much flattened, and again it has a pointed apex;" an observation, the accuracy of which the Florida specimens in the British Museum fully confirm; and this difference in the elevation of the spire will depend on, and in fact will denote, the less or greater convexity of the whorls.

With respect to the flatter base, and the consequently less rounded aperture, the same specimens from Florida exhibit a similar departure from the type; in one instance, indeed, the base is so much flattened as to impart a sub-carinated form to the basal periphery of the whorl.

The position of the larger tooth is equally variable in the Texas specimens; and, as regards the absence of the second or smaller raised line, Gould says that, "usually but one of them (*i. e.* of the raised lines) exists;" a statement, in fact, borne out by some of the specimens from Ohio in the British Museum, in which the second line is not perceptible.

It is evident, then, that these variations, occurring as they do in the recent shells, cannot afford sufficient grounds for a specific distinction of the fossil shell; and the only difference which apparently does not elude us on comparison, is the thickened or, as Say describes it, the rounded outer lip of the recent shells. To rest specific distinction on this character, one which, in general, is only an attribute of maturity, and which, even if constant, could, at the utmost, merely serve to designate a variety, would be an excess of refinement. But it cannot be affirmed that this variation is constant, and a larger series of the fossil shells may show that even the thickened outer lip is not wanting. Of the influence of varied conditions in modifying the form of shells, very little is known or even conjectured; but we may reasonably believe that

a change in the ordinary conditions of temperature, and of the nature and supply of food, will be attended with appreciable differences in the development, although not in the organisation, of the animal; and that these differences will be represented in, and will modify the form of the shell. And to such a cause, perhaps, may be attributable the distinction, trivial as it is, which, as we have seen, exists between the shell of the living *H. labyrinthica* and those of its Eocene representatives.

The identity in question exhibits an instance of a terrestrial species surviving important geological changes, and prolonging its existence through geological epochs of very great extent, but to the probable duration of which no approximation even can be made and yet preserving its normal form almost without modification; an instance unparalleled, if, as will probably prove to be the case, the various forms of Terebratula referred to the recent *T. caput-serpentis* belong to different species.

Brogniart, ('Ann. du Muséum d'Histoire Naturelle,' tom. xv, p. 380,) has described a small trochiform Helix from the neighbourhood of Mans (*H. Menardi*), which, in the general character of its lineation, resembles this species. It is, however, larger; and the whorls, although described as being "nearly equal," appear, from the figure given, to enlarge more rapidly. The aperture is neither described nor represented, and it is impossible, therefore, to form any opinion as to the identity of the shell with the present species.

Size.—Diameter, 1-10th in.; elevation 1-10th in.

Localities.—Hordwell Cliff; Headon Hill.

No. 21. HELIX SUB-LABYRINTHICA. *F. E. Edwards*. Tab. XI, fig. 4 *a—c*.

H. testá minimá, globoso-conicá, umbilicatá; spirá elevatá, apice obtuso: anfractibus sex, rotundato-convexis, gradatim majoribus, transversim lineatis: aperturá, obliqua, semilunari, simplici (?); umbilico parvo.

I possess only one specimen, and that merely a cast, of this small and very rare Helix. Although more pupiform than *H. labyrinthica*, it approaches so nearly to that shell that I feel great hesitation in referring it to a distinct species; on examination, however, differences appear which scarcely justify my describing the shell as merely a variety.

It is a small, globosely conical shell, with an obtuse apex, and formed of six roundedly convex whorls, increasing in size very slowly. The impression of the whorls in the matrix presents a faint lineation, too regular to be due to lines of growth merely. The aperture is oblique and semilunar, but is too imperfect to enable me to say whether the peristome was or was not thickened or reflected. On the outer lip of the penultimate whorl are two linear impressions similar to those produced by lamelliform teeth, to the presence of which they may, perhaps, be attributed; but

they are not continued towards, and do not appear at, the aperture. The columellar lip does not present any evidence of teeth. The umbilicus is rather small.

On comparing this shell with *H. labyrinthica*, the distinctions appear to be that, in the present species, the apex is more obtuse, approaching, in that character, more nearly to the recent specimens of that species; the whorls enlarge more slowly, are more roundedly convex, and but slightly, if at all, flattened on the base; the aperture, partaking of the character of the whorls, is rounder, and the teeth, if present, are on the outer lip, and not on the columellar lip, as in *H. labyrinthica*; the umbilicus is smaller, and, if the shell were preserved, would, I think, be nearly closed.

Having only seen the single specimen in my collection, I propose the species with hesitation, although the characters seem to me sufficient for specific distinction.

Size.—Elevation 1-10th in. nearly; diameter 1-10th in., nearly.

Locality.—Headon Hill.

No. 22. *HELIX HEADONENSIS.* *F. E. Edwards.* Tab. XI, fig. 5 *a—d.*

H. testá minutá, orbiculari, sub-depressá, umbilicatá; spirá prominulá; anfractibus sex, rotundatis, suturis perspicuis: aperturá rotundato-semi-lunari, obliquá; peristomate incrasato, reflexo; margine caterno tribus lamellis, penitissime decurrentibus, instructo: umbilico lato, profundo.

A very small depressedly orbicular shell, with a somewhat elevated spire, composed of six or seven rounded whorls, separated by a deep suture; the rounded aperture is oblique, and impinged upon by the body whorl, which gives to it a semi-lunar shape; the peristome is slightly thickened internally, and reflected; and the outer lip is furnished with three lamelliform teeth, extending far back into the whorls; the umbilicus is wide and deep.

The *H. Headonensis* is apparently extremely rare; my specimen, which I believe to be unique, is merely a cast, and the outward condition of the shell is not shown. The species presents some analogy with the depressed variety of *H. labyrinthica*; but the greater number of the whorls, and the different dentition of the aperture, distinguish it from that shell. In general appearance it resembles the recent *H. pulchella*; but the spire is more elevated, the whorls more numerous, and, in the latter species, the aperture is without the plaits which characterise the present shell. The species appears to be well marked and perfectly distinct.

Size.—Elevation rather more than 1-20th in.; diameter 1-10th in.

Locality.—Headon Hill.

Genus 7th. BULIMUS.* *Scopoli*, 1786.BULIMUS, *Brug.*, 1792; *Lam.*, 1801.COCHLEA, *Adanson*, 1757.COCHLOSTYLA, *Férussac*.

Gen. Char.—Shell oval, oblong, or turriculated, smooth, or longitudinally striated; spire obtuse, variable in length and in the number of the whorls, which are generally few, and for the most part sinistral; aperture entire, oval, rounded anteriorly; outer lip simple, generally reflected and confluent with the columella; inner lip reflected over the body whorl; columella smooth.

This genus, originally proposed by Scopoli, was adopted by Bruguière, and extended so as to comprise animals essentially different in their organisation; many genera have, in consequence, been since separated from it by Draparnaud, Lamarck, and others. The animal closely resembles that of *Helix*; but M. Deshayes states that it presents a modification of the organs of generation sufficient for generic distinction. The shells may be known from the *Helices* by their more elongated spiral form; from the *Limnææ* by the smooth columella, and from *Pupa* by the more regularly tapering spire.

The genus contains very many living species distributed over the equatorial, tropical, and warm temperate regions, as well of the new, as of the old, world. According to Mr. Lovell Reeve† the localities of nearly 600 species have been ascertained; and of these, three fifths inhabit the western hemisphere, principally central America; and a large proportion, rather more than one third, of the remaining species is found in the Phillipine Islands.

Several fossil species, from the Freshwater deposits of the Paris Basin, have been described by MM. Brard, Brogniart, Lamarck, Defrance, Matheron, and Deshayes; and two distinct species (*B. ellipticus*, Sow., and *B. politus*, nov. spec.) occur in the

* The etymology of this word is not ascertained. Adanson in 1757, in his 'Histoire Naturelle du Sénégal,' applied the name *Bulinus* to a species of the shells which afterwards formed part of Draparnaud's genus *Physa*, but which have since been separated by Dr. Leach, under the generic name *Aplexus*; and the writer of the article "Limneans," in the 'Penny Cyclopædia,' suggests, and apparently with much probability, that the word *Bulimus* was used by mistake by Scopoli and Bruguière for *Bulinus*. Studer seems to consider *Bulimus* to have been intentionally substituted for *Bulinus*, and says that the alteration is altogether inadmissible; and Hartmann and Mr. Broderip concur in rejecting the name. Herrmannsen fancifully derives the word from *βουλιμος*, *ingens famæ*, in allusion, I presume, to the voracity of the animal. The name *Bulimus*, however, whatever may be its origin or meaning, appears to be generally adopted, and I have therefore retained it.

† Mr. Lovell Reeve, "On the Geographical Distribution of the Bulimi," &c., 'Ann. and Mag. of Nat. Hist.,' 2d ser., vol. vii, p. 241.

contemporaneous deposits in England. The shell described by Mr. Sowerby ('Min. Con.,' vol. iv, p. 89 bis, t. 366), as *B. costellatus*, is an Achatina. Two of the French Eocene species have been found, mixed with marine remains, in the Faluns of Touraine; but, as yet, no species has been found below the Eocene formations.

No. 23. *BULIMUS ELLIPTICUS*. Sowerby. Tab. XI, fig. 2 *a—f*.

BULIMUS ELLIPTICUS. Sowerby. 1822. Min. Con., vol. iv, p. 46, t. 337.

— *TENUISTRIATUS*. G. Sowerby, jun., 1846. Lond. Geol. Journal, vol. i, p. 20.

B. testá sinistrorsá, ovali, elongatá; apice obtuso: anfractibus plano-convexis, superné sub-canaliculatis; transversim lineatis; lineis obliquis, irregularibus, plus minus-ve numerosis; aperturá sub-auriformi, peristomate simplici, margine columellari reflexo.

A sinistral, cylindrically-conical shell, with an apex more or less obtuse in different individuals; the whorls are slightly convex, depressed at the upper margin so as to form an obscure channel running parallel with the suture, and covered with numerous transverse raised lines, which are rounded, oblique, and vary considerably in number, frequently in the same specimen. The aperture is oblong and ovate; the sharp outer margin is slightly reflected where it joins the columella, and is frequently thickened as it spreads over the body-whorl.

Fig. 2*f* is taken from a specimen belonging to Mr. Wetherell, found in the excavations in the London Clay at Primrose Hill for the London and Birmingham Railway. The lineation of this fragment is fainter and more crowded, and the whorls appear to be more angular at the base than in *B. ellipticus*; these distinctions induced Mr. G. Sowerby to refer the shell to a distinct species. The faintness of the transverse lines is, however, due to the worn state of the shell, which has apparently lost the outer layer; and their number is a character too uncertain to be relied upon. The specimen represented by fig. 2*a*, from Mr. D'Urban's collection, shows on one side of the penultimate whorl, lines nearly as crowded as those on the Highgate specimen, while those on the opposite side of the same whorl are moderately distant; and I have in my own collection a specimen, beautifully preserved, in which the same discrepancy occurs. The angularity of the whorls is a character frequently found in shells in an early stage of their growth, and I have several young shells of this species, in which the whorls present a clearly defined angle running round the basal periphery. On these grounds I have referred the specimen in question to the present species.

A form occurs at Binsted, near Ryde, in which the whorls are flatter than in ordinary specimens, and sub-turritid; in other respects it agrees with this shell, of which, therefore, I consider it to be only a variety.

Size.—The specimens ordinarily found rarely exceed $2\frac{1}{2}$ inches in length by 9-10ths of an inch in diameter; one specimen, however, in my collection is above 3 inches long, and rather more than 1 inch and 2-10ths in diameter; and the shell from which fig. 2 *c* is taken, forming part of the valuable collection of the late Mr. Dixon now in the British Museum, must have exceeded even those dimensions.

Localities.—Shalcombe, Binstead, Sconce, in the Isle of Wight.

No. 24. BULIMUS POLITUS.

Tab. XI, fig. 1 *a—d*.

B. testá conicá, lævissimá, politá; apice deciduo; anfractibus sub-convexis; aperturá ob-ovali, anticé effusá, postice sub-angulatá, peristomate incrassato, reflexo.

The occurrence of this shell in the fluvio-marine deposit in Headon Hill in such abundance as almost to be inconsistent with the supposition that it is a land shell, suggests that it might be placed with those Paludinæ, in which the margins of the aperture are thickened or reflected, and of which an instance (*Paludina Chastellii*, Nyst,) occurs in a similar formation in Hampstead Cliff. The aperture, however, and the smoothness of the surface, place it, perhaps, more correctly in the present genus, although the latter character is frequently shown in well-preserved specimens of *Paludina* found in a somewhat similar matrix.

The shell is conical, with a smooth polished surface, on which faint lines of growth are barely perceptible; the apex is subject to decollation, leaving about four convex whorls; the last of which, somewhat like that of *Nematura*, is slightly contracted near the aperture, which is rounded and very effuse in front, and angulated behind; the peristome is thickened and reflected. The length of the aperture is about 2-5ths of that of the whole shell.

The specific name is one by which the shell is generally known. I do not know by whom it was imposed, but it well describes the smooth and polished appearance of the shell, and I have therefore retained it.

Size.—Elevation 2-10ths of an inch; Diameter 1-10th in.

Locality.—Headon Hill.

Genus 8th. ACHATINA.* *Lamarck.*COCHLITOMA, *Férussac.*

Gen. Char.—Shell oval or oblong, subturreted, with an elevated spire; generally smooth, but sometimes longitudinally striated: aperture oval or pyriform, generally greater in length than in width; outer lip thin, never thickened or reflected; columella

* Etym., Diminutive of *Αγαθος*, beautiful; or of *Αχαρης*, an agate.

smooth, inflected and truncated at its base, forming a slight notch where it joins the outer lip.

The third division made by Bruguière in his genus *Bulimus*, consisting of those species in which the columella is truncated at the base, was formed by Lamarck into the present genus. From this Montfort withdrew his genera *Liguus*, (*Chersina*, Humph.), consisting of the conical forms in which the aperture is short and nearly round; and *Polyphemus*, comprising the oblong sub-turreted species, with an undulating outer lip, to which Bolten had already given the name *Oleacina*, and which forms the genus *Glandina* of Schumacher and Say, and the sub-genus *Cochlicopa* of Férussac.

As some of the Bulimi present a sharp outer lip, the truncation of the columella appears to be the only character by which the Achatinæ can be separated from that genus, and the value of this character must depend on its being the result of some peculiarity of generic importance in the organisation of the animal. M. De Blainville states that he has observed in the animal of *Achatina zebra* an interruption in the collar where the two sides unite, as if caused by the exertion (saillie) of the columellar muscle, and to this he attributes the truncation of the columella; but, according to Férussac, this truncation is not the result of any peculiar organisation, as is the case in other molluscous animals, the columella of whose shells present this character; and that author therefore unites the Achatinæ to his genus *Helix*, of which they form the sub-genus *Cochlitoma*; and M. Deshayes, on account of the similarity of organisation presented by the animals of *Bulimus* and *Achatina*, proposes to re-unite *Achatina* with *Bulimus*. The genus, however, is very generally adopted as well by English as by foreign Malacologists, and I have therefore retained it.

The subdivisions proposed by Bolten and Montfort depend on the proportions and other characters in the shell, of trifling importance, which are generally considered as insufficient for generic distinction, however useful they may be for the division of a genus into sections. The recent species *A. glans*, and the cognate species which form the genus *Glandina*, are confined to the West Indian Islands, and the adjacent parts of the American Continent; and the peculiar form of the outer lip may be used with convenience, as one of the indications of the limits of geographical distribution of species.

The Achatinæ are generally large shells; some, in fact, attain a greater size than any other land shells at present known, and many are covered with an epidermis. Although generally dextral, they are in some species constantly sinistral. They are found chiefly in tropical climates, and, according to Blainville, in marshy lands. Some few are European, but only one or two small species occur in England. One fossil species (*A. pellucida*) has been described by M. Deshayes from Parnes; and Bouillett, in his catalogue of the fossil shells of Auvergne, has given another species, which he refers to the recent *A. acicula* (Lamarck).

NO. 25. ACHATINA COSTELLATA. *Sowerby*. Tab. XII, fig. 1 a—k.

BULIMUS COSTELLATUS. *Sow.* Min. Con., vol. iv, p. 89 bis, t. 336.

LIMNEA MAXIMA. *Sow.* Ib., vol. vi, p. 53, t. 528, fig. 1.

BULIMUS COSTELLATUS. *Morris.* Cat. of Brit. Foss., p. 140.

LIMNÆUS MAXIMUS. *Morris.* Ib., p. 148.

A. testá ovato-oblongá, apice sub-acuto; anfractibus sex convexiusculis, longitudinaliter costellatis, ad suturam adpressis et irregulariter sub-crenulatis; costellis parum obliquis, irregularibus: aperturá pyriformi, dimidium totius testæ in longitudinem feré æquanti, margine externo undato.

Var. ABBREVIATA. Fig. 1 i—k. *A. testá ventricosiori, breviori; anfractibus quinque, convexioribus; aperturá longiori, spiram in longitudinem superanti.*

Shell oval-oblong, with a somewhat acute apex; the six volutions, of which the spire is formed, are more or less convex in different individuals, and are longitudinally ribbed; the edges are slightly pressed against the preceding volution, so as to present a narrow band running round the spire, parallel with the suture; the ribs are rounded, irregular, rather oblique, and slightly thickened above the sutural band, giving a rough crenulated appearance to the edges of the volutions; they are crossed, saltierwise, by very faint obscure lines of growth, perceptible only in well-preserved specimens. The aperture is pear-shaped, and about half as long as the entire shell; the outer lip undulated. The truncation of the columella, a character which the imperfect state of the specimens figured by Mr. Sowerby did not enable him to detect, places the shells, described by that author as *Limnea maxima* and *Bulimus costellatus*, in the present genus. The volutions are variable, being in some specimens less convex than in others; and the aperture in the young state is comparatively longer than that of the mature shell. A similar change in the relative proportions of the spire and the aperture at different stages of growth is not of infrequent occurrence, and is exhibited in some of the recent species in this genus, particularly in *Achat. striata*, (*Glandina truncata*, Pfeiffer.) These considerations, confirmed by the examination of a long series of shells of the present species in different stages of growth, have induced me to consider *Bul. costellatus* as merely the young form of the shell figured as *Limnea maxima*. The more regularly conical form of the spire, the only distinction by which the former is separable from the latter, is mainly due to the preservation of the shell in the specimen figured, and is a character which cannot be relied upon.

The present species belongs to the group constituting the genus *Glandina*, and is another instance of the approximation of an European Eocene land Mollusc to the living forms of the Western world.

Size.—Axis $2\frac{1}{4}$ inches, nearly; diameter 9-10ths of an inch.

The specimen represented by figs. 1 i and 1 k, resembles the type in the crenulated

edges, and costellation of the volutions, in the shape of the aperture, and in the character of the columella; and I consider it, therefore, as merely a variety. It is a ventricose shell, with a shorter spire, and more convex whorls; the aperture is longer in proportion, exceeding the spire in length, owing probably to the shell not having attained maturity. The specimen, the only one I have seen, belongs to Mr. D'Urban's collection.

Size.—Axis 1 inch and 6-10ths; diameter, 1 inch, nearly.

Localities.—Sconce, Shalcombe, Binstead, Isle of Wight.

Genus 9th. PUPA.* *Lamarck*. 1801.

COCHLODONTA, (sp.), *Férussac*.

COCHLODINA, (sp.), *Férussac*.

COCHLOGENA, (sp.), *Férussac*.

Gen. Char.—Shell cylindrical, elongated, or sub-globose; apex generally obtuse, sometimes acuminate; whorls numerous, slowly increasing, the last smaller than the penultimate one; frequently striated or ribbed; aperture generally elliptical, sometimes sub-quadrate in front, and rounded behind; peritreme continuous, slightly incrassated and reflected; outer lip dentated; teeth variable in number; one or two plaits on the columella.

The present genus is one of the dismemberments effected by Lamarck of Bruguière's genus *Helix*. The organisation of the animal bears a strong general resemblance to that of the animals of *Helix* and *Bulimus*; and Férussac has reunited the genus to *Helix*, in which it is distributed among the sub-genera *Cochlodonta*, *Cochlodina*, and *Cochlogena*. The shell, however, prevents striking dissimilarities, and in the animal, according to M. Deshayes, the same modifications of the generative organs occur which distinguish the animal of *Bulimus*. The elongated cylindrical form of the spire, the proportion of the last whorl to the penultimate one, and the direction of the aperture which is parallel with the axis, distinguish the shell from *Helix*; and it is separated from *Bulimus* by the numerous and slowly increasing volutions, and by the teeth and folds with which the outer lip and the columella are furnished. It is to *Clausilia* that it bears the closest resemblance; but from that genus it is separated as well by the aperture as by the absence of the clausium, a character which, however, can seldom be available to the Palæontologist.

In the animals of several of the smaller species the peduncles only exist, the tentacles becoming obsolete. Some of these species are sinistral and hyaline, and form Müller's genus *Vertigo*. The animal, however, exactly resembles *Pupa* in everything but the absence of the tentacles, and, inasmuch as their disappearance is very gradual

* Etym., from a supposed resemblance to the Pupa or Chrysalis of some insects.

in the smaller species, M. Deshayes attributes but trifling value to that character, and proposes to suppress the genus altogether.

The living species are very numerous and widely disseminated, but the larger ones are confined apparently to tropical climates.

The fossil species are few; one species (*Pupa Defranci*) is described by Brogniart from the Freshwater deposits of the Paris basin. Bouillet, in his catalogue of the fossil shells of Auvergne, gives two others referred to recent species; and Matheron describes two more species from the South of France, one from the Freshwater formation at Baux, and the other from the middle beds of the lignite formation near Rognac.

No. 26. PUPA PERDENTATA. *F. E. Edwards*. Tab. XI, fig. 7 a—e.

P. testá cylindricá; apice . . . ? anfractibus planulatis, longitudinaliter costellatis, ad basin sub-angulatis; costellis acutis, numerosis, irregularibus, undulosis, parum obliquis; aperturá sub-quadratá, multis lamellis inequalibus, penitissimé decurrentibus, utroque margine instructá.

The imperfect state of my specimens, which are merely casts, will not enable me to do much more than to record the existence of this well-marked species. The dentition they present rather belongs to *Clausilia* than to *Pupa*; but as this is a dextral shell, and all the known *Clausilia* are sinistral, I refer it to the present genus. I possess six or seven specimens only, all without the apex, and the largest showing only the last three whorls. The characters, so far as they can be given from these fragments, are as follows:—Shell cylindrical, apparently elongated, and composed of many whorls; the whorls nearly straight, longitudinally costellated, and bluntly angulated at the base; the costellæ sharp, oblique, numerous, irregular, undulating, and separated by deep rounded sulci, and here and there one of them terminates abruptly, being cut short by the confluence of the sulci. The aperture, owing to the angular base of the body-whorl, assumes a subquadrate, or rather a lozenge shape; the outer lip presents no less than fourteen lamelliform teeth, six of which are large, having smaller teeth between them; the columellar lip is armed with three large lamelliform teeth, and four smaller. These teeth are not merely marginal, as is usually the case in this genus, but are continued, like those of *Clausilia*, far back into the whorls.

Size.—Axis . . . ? diameter, 2-10ths of an inch nearly.

Locality.—Sconce, where it is very rare.

No. 27. PUPA ORYZA. *F. E. Edwards.* Tab. XIV, fig. 3 a—b.

P. testá parvá, ovato-cylindraceut, ad utramque extremitatem equaliter attenuatá; apice sub-obtuso; anfractibus octonis, convexiusculis, longitudinaliter tenuissime costellatis; suturis profundis; aperturá ovato-oblongá, angustá, obliquá, quaternis dentibus magnis instructá.

A small cylindrical oval shell, tapering equally towards both extremities; the apex is rather blunt; the whorls, which are eight in number, are slightly convex, separated by a deep conspicuous suture, and transversely costellated; the costellæ are numerous, very slender, and oblique. The aperture is ovate-oblong, narrow, and somewhat oblique; the outer lip is furnished with four prominent lamelliform teeth, of which the two anterior are the longest.

I possess only one specimen, a cast, of this species; and the state of the aperture does not enable me to say whether the columellar lip is furnished with teeth. The species appears to be perfectly distinct.

Size.—Axis 2 lines; diameter 1 line.

Locality.—Headon Hill.

Genus 10th. CLAUSILIA.* *Draparnaud.* 1805.

Gen. Char.—Shell sinistral, cylindrical, elongated, consisting of numerous volutions, generally transversely striated; rather blunt at the apex, and enlarged towards the middle; aperture irregular, oval; peristome continuous, free, reflected, with several columellar and other tooth-like plaits, and furnished with an appendage, termed the *clausium*, attached to the columella, by which the aperture is partially closed when the animal is withdrawn into the shell.

The *clausium*, from which the present genus derives its name, answers the purpose of an operculum, with which, however, it presents no further analogy than that it serves to enclose and protect the animal within the shell. It consists of a narrow, flat, and very thin calcareous pedicle attached by the posterior extremity to the columella, and expanding at the opposite end into a linguiform plate, which nearly closes the aperture of the penultimate whorl, a small canal across the anterior part of the aperture being left uncovered, probably for the purpose of respiration. In some species when the outer lip presents teeth, the *clausium* is notched for their reception. This curious appendage is formed when the animal approaches maturity, probably at the same time with the projected reflected mouth. The pedicle is very flexible, and yields to the

* Etym. *Clausium*, (quasi *clausus*, closed, or *claustrum*, a door,) the appendage by means of which the animal is enclosed in the shell.

slightest pressure, as the animal emerges from the shell, and the clausium is then bent back against, and fits upon, the curved columella, but recovers its former position by the recoil of the pedicle on the removal of the pressure when the animal withdraws itself into the shell. This peculiar appendage was described first by D'Aubenton, and subsequently by Müller; and the group of shells characterised by its presence was formed by Draparnaud into the present genus.*

The animal of *Clausilia*, so far as its organisation is known, resembles that of Pupa, but Lamarck considered that the differences in the form and condition of the aperture to which I have already referred, were in themselves sufficient for generic distinction without reference to the presence of the clausium. On the other hand, Férussac has placed *Clausilia* in his genus *Helix*, where it forms part of his sub-genus *Cochlodina*; and M. Deshayes has been induced, by the resemblance between the external characters of the animals, by the similarity of their habits, and by the gradual passage from the one genus to the other by intermediate species, to propose the union of the two genera. Unless, however, peculiarity of structure or form in the shell is to be altogether disregarded, the presence of so singular an appendage as the *Clausium* must surely be considered as sufficient ground for the separation of this genus.

Nearly two hundred living species, mostly small shells, are known; several are found in this country, but they occur in great profusion in Southern Europe; the larger species belong to tropical climates.

Only three fossil species I believe have as yet been described; viz., *C. antiqua*, from the Freshwater limestone of Ulm; *C. maxima*, from the neighbourhood of Dax, and *C. campanica*, from the Freshwater limestone of Provins, in which the Paleotherian remains occur.

No. 28. CLAUSILIA STRIATULA. *F. E. Edwards.* Tab. XI, fig. 6 a—h.

Cl. testá subturrítá, cylindracea, ad utramque extremitatem attenuatá, transversim lineatá: anfractibus numerosis, plano-convexis, ultimo ad basin porrecto; aperturá ovato-pyriformi, obliquá; peristomate soluto, parum reflexo: lamellis quinque, duobus margine externo, tribus margine columellari, instructo.

A cylindrical, subturreted shell, attenuated at each extremity; the whorls are very slightly convex, and covered with numerous rather oblique raised lines, separated by broad rounded sulci, occasionally confluent; the last whorl detaches itself, and projects obliquely forward, terminating in an ovate, pyriform aperture, the margins of which are free, and a little reflected. The outer lip presents two unequal plait-like teeth, the smaller one near the middle, the larger one near the posterior angle of the

* A particular account of the Clausium has been given by Mr. Miller, in the 'Annals of Philosophy,' vol. iii, p. 378; and by Mr. J. E. Gray, in the 'Zoological Journal,' vol. i, p. 212.

aperture. On the columellar lip are three similar teeth, one, very large, close to the columella.

I have not been so fortunate as to meet with any specimen having more than fragments of the shell preserved; the description therefore is principally taken from casts. The chief characters presented by them, namely, the large pliciform teeth and the produced aperture, are, however, plainly shown. The specimen represented by figs. 6 *a* and 6 *b* is, I apprehend, the young shell.

Size.—My most perfect specimen of the mature shell has apparently lost the upper six or seven whorls; in its present state it presents six whorls only. The length of the axis is 6-10ths of an inch, nearly; the diameter 2-10ths, nearly. In a perfect state it was probably nearly an inch long.

Locality.—Sconce, where it is very rare.

Genus 11th. SUCCINEA.* *Draparnaud*. 1801.

AMPHIBULIMA, *Lamarck*, 1805; *Hartn.*, 1821.

AMPHIBULIMUS, *Montf.*, 1810.

COCHLOHYDRA, *Férus.*, 1819.

Gen. Char.—Shell ovate, or ovately conical, rather elongate; volutions few; spire short, pointed; aperture large, entire, longitudinally ovate, oblique; peristome sharp, not thickened nor reflected, and confluent with the columella; inner lip spread over a part of the body whorl; columella smooth, sharp-edged, with an imperforated axis.

This genus, first created by *Draparnaud*, has been received without question by all Malacologists except *Férussac*, with whom it forms the sub-genus *Cochlohydra* in his extensive genus *Helix*. The animals, like all others of this family, present a strong general resemblance to the typical *Helix*; but, according to *M. Deshayes*, they offer modifications of the generative organs, which differ alike from those of *Helix* and of *Bulimus*. *Lamarck*, in ignorance of *Draparnaud*'s genus, proposed his genus *Amphibulima*, which he afterwards suppressed, adopting the name given by *Draparnaud*. The shells are distinguished from *Bulimus* by the thin outer lip, and the rapidly enlarging whorls; and from *Limnæa*, to which they more nearly approach in general form, by the columella, which is thin, smooth, and sharp, and destitute of the oblique fold which characterises the columella of the latter genus.

The *Succineæ* are strictly land animals; for, although frequently covered by water and capable of long submersion, they live habitually on land in damp marshy places, near the margins of pools or ditches.

The living species are not numerous, and are found chiefly in temperate climates.

* Etym., *Succineus*, of amber, *i. e.*, amber-coloured.

The fossil species are very few. Two only have hitherto been described; both from the Pleiocene formations, and both referred to living forms, viz., *S. putris* and *S. oblonga*, from the Mammaliferous Crag, (Wood's 'Crag. Moll.,' p. 5). The latter species is also given by M. Nyst, ('Coq. Foss. de Belg.,' p. 446,) as occurring in the corresponding formation in Belgium.

No. 29. *SUCCINEA IMPERSPICUA*. *S. Wood*. Tab. XI, fig. 3 *a—d*.

S. IMPERSPICUA, *S. Wood*. 1847. Lond. Geol. Jour., vol. i, p. 118.

S. testá ovatá, ventricosá, tenui, lævi; spirá brevissimá, obtusá: anfractibus tribus, convexis, ad suturam sub-depressis: aperturá rotundato-ovatá, sub-verticali, bessem totius testæ in longitudinem superanti.

This exceedingly rare shell is thin, smooth, ovate, and composed of three ventricose volutions, rather depressed at the suture. The spire is very short and obtuse; the aperture large, nearly vertical, and in length fully equal to two thirds of the whole shell.

I have three specimens only of this shell: two from Hordwell, for which I am indebted to Mr. S. Wood; the third is from Headon Hill.

Size.—Axis rather more than 2-10ths of an inch; diameter, 3-10ths of an inch.

Section β . *Aquatica*, Fleming.

LIMNOPHILA, *Hartm.*

HYGROPHILA, *Féruss.*

Family—LIMNÆIDÆ.

Genus 12th. LIMNÆA.* *Lamarck*.

BUCCINUM, (sp.,) *Müller*, 1774.

BULIMUS, (sp.,) *Scopoli*, 1777; *Bruguière*, 1792.

LYMNEA, *Lamarck*, 1801; *Risso*, 1826; *Valenc.*, 1833.

LIMNEUS, *Draparnaud*, 1805; *Brogniart*, 1810.

LYMNEUS, *Brard*, 1809; *D'Orb.*, 1841.

LYMNUS, *Montfort*, 1810.

LIMNÆA, *De Férussac*, 1821; *Nilsson*, 1822; *Grateloup*, 1838; *Bronn*, 1838.

LIMNÆUS, *Oken*, 1815; *Rossmasler*, 1835; *Turton*, 1831.

STAGNICOLA, *Leach*, 1820.

GULNARIA, *Leach*, 1820.

* Etym., *Λιμναῖος*, belonging to, or growing in, pools or marshes.

LYMNÆA, J. Sowerby, 1818; De Blainville, 1825; Desmarest.

LIMNEA, G. Sowerby, 1822; Fleming, 1828; G. Sowerby, Jun., 1840.

— Swainson, 1837.

LEPTOLIMNEA, Swainson, 1840.

LYMNOPHYSA, Fitzinger, 1833.

LYMNULA, Rafinesque, 1819.

Gen. Char.—Shell ovate or elongated, frequently turreted, generally thin, smooth; spire always apparent, more or less elevated: volutions convex, somewhat depressed, sometimes ventricose, and rapidly enlarging; aperture large, entire, longitudinal, ovate, with a tortuous columella bearing an oblique fold; peristome sharp edged.

The shells forming this genus, constituted part of the genus *Bulinus* of Scopoli and of Bruguière; they had previously been separated by Müller from the other land and freshwater Molluscs under the generic name *Buccinum*, applied to them by Lister and Geoffroy. In lieu of this name, which has been applied by Linnæus to a group of marine branchiate Molluscs, Lamarck substituted that of *Lymnea*, etymologically *Limnæa*.

The animal carries on its head two compressed triangular tentacles, enlarged at their bases, at the inner and anterior parts of which the eyes are placed. Like most others of this order, the *Limnææ* are hermaphrodite, and although the union of two individuals is necessary for fecundation, as among the *Helicidæ*, yet impregnation is not mutual, as in that group; but the same animal performs the male and female functions successively with different individuals.

The genus, as at present defined, is composed exclusively of the thick dextral shells, with a fold on the columella, in which the inner lip is not extended over the body whorl; the genus *Amphipeplea*, (Nillson, the MS. genus *Myxas* of Dr. Leach,) having been proposed for the dextral forms with a plaited columella, in which the shell is thin and polished, and the inner lip expanded. The sinistral forms, without the columellar fold, have been separated under the generic names *Physa* (Draparnaud), and *Aplexus* (Fleming), the *Bulinus* of Adanson. The propriety of these subdivisions is questioned by Mr. G. Sowerby in his 'Genera of Shells;' but, besides the conchological differences above mentioned, there are zoological distinctions which are generally admitted as sufficient grounds for retaining them. These are, in *Physa* and *Amphipeplea*, the condition of the mantle, the edge of which is lobed and capable of extension, so as to cover the shell, which thence acquires the polished and shining surface characteristic of those genera; and the form of the tentacles, which are elongated and filiform, and not thick and triangular, as in the present genus. In *Aplexus* the edge of the mantle is, as in *Limnæa*, simple and not extendible over the shell; that genus, therefore, bears the same relation to *Physa* which *Limnæa* bears to *Amphipeplea*.*

* The propriety of these divisions is, to some extent, confirmed by the observations of Mr. W. Thompson, to which I have before referred. That author, speaking of the dentition in the different genera of the Pulmonata, states that "the character of *Limnæus* appears to be to have one small central tubercle, as it were,

The Limnææ are inhabitants of freshwater streams and pools, and occasionally of brackish marshes. The living species are found in all parts of the world, but principally in the temperate zones. In the fossil state, species have been found in the Wealden formations; and they occur in great profusion in the freshwater deposits of the Eocene epoch, and, in greater or less abundance, in nearly all the lacustrine formations above those deposits. In England, as in the Paris basin, the fossil Limnææ occur in very different conditions in the various deposits; in the limestone of the lower formation, called, from the abundance of their remains, the "Limnæan Limestone," specimens with the shell preserved are very rare; generally only the casts are found, the shelly matter having been absorbed. In the upper marls they occur in great profusion, and, although very fragile, usually in a beautiful state of preservation.

It is exceedingly difficult, as both Lamarck and De Blainville have observed, to distinguish the different species; the length of the spire, the contour of the volutions, and the size and shape of the aperture, characters by which species may be separated with tolerable certainty, in other genera, are, in this genus, exceedingly variable, and glide by imperceptible gradations from one extreme to another; so that reliance cannot be implicitly placed on them. The character which appears to exhibit the least variation is the columellar fold, although this also occasionally presents considerable differences in form and condition. By this character, however, the genus may be divided into two groups, one comprising the species in which the fold is flattened; the other consisting of the species in which it is rounded or sub-acute. Each of these groups may, again, be subdivided into two sections, according as the upper parts of the whorls, forming the sides of the spire, are convex or flat. By the use of these artificial distinctions, the separation of the species will be much facilitated.

Sect. *a*. Columellar fold compressed, generally bipartite.

No. 30. LIMNÆA CAUDATA. *F. E. Edwards*. Tab. XII, fig. 2 *a—c*.

L. testá ovato-acutá, ventricosá, lævi: anfractibus numerosis, convexiusculis, ultimo penultimoque rapidè crescentibus: ultimo obsoletè et irregulariter corrugato: spirá conico-

'squeezed up' between two very large lateral ones, each primary lateral having a very large apex internally, with a small external one, while, at the edge, they have altered to one thick prolonged apex projecting inwards, and irregularly lobed on its upper edge. Much the same arrangement prevails in *Amphipeplea*, where, however, the tubercle of the lateral teeth is even still larger in proportion to its plate. *Physa*, again, exhibits a multitude of teeth of a similar form, though different to any that I have seen in other genera." The dentition of *Aplexus* is not described.

subulatá: aperturá magná, in medio dilatatá, anticè coarctatá, spiram in longitudinem superanti: plicá columellari compressá, proeminenti, valde obliquatá, obscure sulcatá.

Var. ABBREVIATA; testá anfractibus septem vel octo; spirá breviori; aperturá longiori.

Shell ovate-acute, ventricose, smooth, composed of eight or nine convex volutions, of which the first five or six increase slowly, and the last enlarge rapidly; so that the spire assumes a conical awl-like shape, while the body-whorl is very ventricose. The last two volutions frequently present concentric, obscure, irregular corrugations, giving a crumpled appearance to the shell, similar to that which distinguishes the recent *L. stagnalis*. The aperture is large, effuse towards the middle, but contracted at the anterior part, and somewhat larger than the spire. The columellar fold is flat, prominent, rather strongly twisted, and generally obscurely sulcated.

A variety occurs (fig. 2 *c*) in which the shell is more ventricose, the whorls fewer, the spire shorter, and the aperture proportionally larger, equalling two thirds of the whole shell.

The *L. caudata*, in its general appearance and awl-like spire, much resembles *L. stagnalis*; but, in the latter species, the whorls are more convex, the body-whorl more ventricose, the posterior part of the aperture more effuse, and the columellar fold is rounded, smaller, and more oblique. Individuals occasionally occur which, from the small degree of convexity in the whorls would, at the first glance, be referred to *L. fusiformis*; but they may be easily separated by the columellar fold, which, in the latter species, is rounded, and presents a more graceful spiral than that of *L. caudata*.

Size.—Axis $2\frac{1}{4}$ inch, nearly; diameter 1 inch.

Localities.—Hordwell Cliff and Headon Hill.

NO. 31. LIMNÆA PYRAMIDALIS. *Desh.* Tab. XIII, figs. 2 *a—b*, and 3 *a—b*.

LIMNÆA PYRAMIDALIS. *Desh.* 1824—37. Desc. des coq. foss., &c., vol. ii, p. 95, t. 20, figs. 14, 15.

LIMNÆA „ *J. Sow.* 1825. Min. Con., vol. vi, p. 54, t. 528, fig. 3.

LIMNÆA „ *Bouill.* 1836. Catal., des coq. foss. de l'Auvergne, p. 124.

LYMNÉE PYRAMIDALE? *Brard.* 1810. Ann. du Mus., vol. xv, p. 407, t. 24, fig. 2.

LYMNEUS PYRAMIDALIS? *Fér.* 1814. Mém. geol., &c., p. 60, No. 3.

L. testá ovato-acutá, ventricosá, lævi; anfractibus septem vel octo convexis: aperturá magná, anticè dilatatá, spiram in longitudinem superanti; labio parum expanso; columellá marginatá; plicá columellari magná, compressá, obliquá, in medio sub-bipartitá.

A smooth, ovate-acute, ventricose shell, composed of seven or eight convex whorls, separated by a simple, well-defined, but not deep suture: the aperture, which is fully as long as the spire, is large and effuse; the inner lip but slightly spread over the body-whorl, and the columella presents a margin formed by the thickened inner lip, and bears a prominent oblique fold, obscurely sulcated.

The whorls enlarge more regularly in this species than in *L. caudata*, and the shell, consequently, is more pyramidal in its general form; and the columellar fold is not so prominent nor so much twisted as in that species. From *L. fusiformis* it is distinguished by the greater convexity of the whorls, and the flattened sulcated fold. The rounder whorls, the depression of the upper margin, and the acute fold of *L. cincta*, separate it, as clearly, from that species.

Although M. Deshayes, in his description of *L. pyramidalis*, cites Brard without comment, I feel great difficulty in referring his shell to Brard's *L. pyramidalis*. That shell, judging from the description and figure, is elongated and narrow, and corresponds, as well in the contour and proportion of the whorls and the form of the aperture, as in the character of the depressed columellar fold, with *L. longiscata*, to which species I think it belongs. It certainly appears to differ widely from the ventricose and comparatively short shell described by M. Deshayes, in which the aperture is large and effuse, and the fold prominent.* The English specimens referred to *L. pyramidalis* of M. Deshayes, agree very well with that author's description and figure, but not with Brard's; while, on the other hand, adult specimens of *L. longiscata* frequently occur, which correspond with Brard's *L. pyramidalis*.

The shell represented by fig. 3 *a—b*, for the use of which I am indebted to Mr. Sowerby, is narrower than the type of this species; and the volutions are so flat, and the general shape so fusiform, that, at first sight, it might be referred to *L. fusiformis*. The fold, however, is flattened and sulcated; and I therefore consider it to be merely an aberrant form of *L. pyramidalis*, combining the columellar fold of that species with the flat-sided spire and subfusiform shape of *L. fusiformis*.

Size.—Axis 2 inches; diameter, 9-10ths of an inch, nearly.

Localities.—Hordwell; Headon Hill; and in France, La Villette, Montmartre, and Vergnols, near Aurillac.

No. 32. LIMNÆA LONGISCATA. *Brard*. Tab. XII, fig. 3 *a—h*.

- LYMNÉE EFFILÉE. *Brard*. 1809. Ann. du Mus., vol. xiv, p. 432, t. 27, figs. 15, 16.
 — PYRAMIDALE, *Brard* (?) 1810. *Ib.*, vol. xv, p. 407, t. 24, fig. 2.
 LIMNEUS LONGISCATUS, *Brogn.* 1810. *Ib.*, p. 372, t. 22, fig. 9.
 — — *Brogn.* 1811. Jour. de Phys., &c., vol. 72, p. 421.
 LYMNÆUS LONGISCATUS, *Fér.* 1814. Mém. geol., &c., p. 59, No. 1.
 LIMNÆA LONGISCATA, *Sow.* 1823. Min. Con., vol. iv, p. 57, t. 343.
 LYMNÆA — *Desh.* 1824. Desc. des coq. foss., &c., vol. ii, p. 92, t. 11,
 figs. 3, 4.
 — — *Desh.* 1824. Encycl. Meth. Vers., t. 2, p. 356, No. 1.

* This want of resemblance between the *L. pyramidalis* of M. Deshayes and that of Brard is noticed by Bouillet in his Catalogue above referred to.

- LIMNEA LONGISCATA. *Lyell and Murch.* 1829. Mém. sur les dépôts lacustres tert. du Cantal.
- LIMNÆA — *Bouill.* 1836. Cat. des coq. foss., &c., p. 157, No. 6.
- — *Gratel.* 1838. Cat. des débris foss., &c., du Bassin de la Gironde, p. 33, No. 100.
- LYMNÆA — *Desh.* 1838. Lam. Hist. Nat. &c., 2d edit., vol. viii, p. 422, No. 7.

L. testā lævi, elongatā, sub-turritā, acuminatā: anfractibus sex aut septem, convexiusculis; suturis sub-depressis: aperturā ovato-acutā, anticè dilatatā, spiram in longitudinem vix æquanti; labro parum expanso; columellā marginatā; plicā columellari latā, compressā, parum eminenti, bipartitā.

Var. DISTORTA; testā longiori, angustiori, anfractibus plus decurrentibus; aperturā breviori.

This *Limnæa* is more abundant, and, although it presents many varieties of form, is, perhaps, better characterised than any other fossil species. It is a smooth, elongated, narrow, subturritid shell, composed of seven or eight convex whorls, somewhat depressed at the suture. The aperture is oval, rather effuse in front, and, in the typical form, is a little shorter than the spire; the inner lip is thick, but does not extend much beyond the aperture. The columellar fold is broad, flat, not very prominent, and widely but not deeply sulcated.

A variety frequently occurs (fig. 3 *e—h*), in which the line of the suture runs below the wide part of the whorl, giving an irregular distorted appearance to the shell, and shortening the aperture, the length of which barely equals two fifths of the whole shell.

Although there can be but little doubt that this is the true *Lymnée effilée* of Brard, the columellar fold does not correspond with the description given by M. Deshayes, in which it is represented to be small and rounded; but in the few French specimens which I have had an opportunity of examining, the columellar fold corresponds with that of the English specimens. I presume, therefore, that the form described by M. Deshayes was a modification of the more general form.

The shell figured and described by Brard as *L. pyramidalis*, appears to me, as I have already stated, from its elongated narrow shape, the form of the aperture, and the slight elevation of the fold, to be merely an adult specimen of this species—similar to that represented by fig. 3 *c* and *d*. The “double suture,” or “narrow spiral ribband,” running along the edge of the suture, which Brard mentions as distinguishing *L. pyramidalis*, frequently occurs in this, as well as in other species; it is not, however, a constant character in any, and cannot be relied upon as a specific distinction.

A form occurs, rather plentifully, in Hordwell Cliff, which Mr. Wood ('Lond. Geol. Journ.' vol. i, p. 118,) has referred to *L. strigosa*, (Brogn.) That species, apparently, was proposed from casts or mutilated specimens, and is a questionable

one; M. Deshayes, in fact, ('Descr. des Coq. Foss.,' &c. vol. ii, p. 92,) has suggested that it may be merely a variety of *L. longiscata*. The Hordwell shells, like the French, are shorter, and the whorls are more convex; but they present the characteristic fold of the present species, of which I consider them to be, therefore, only a variety.

Size.—Axis, 2 inches; diameter, 8-10ths of an inch.

Localities.—Hordwell; Headon Hill; Sconce. *French*: Belleville; Saint-Ouen; Fontainebleau; Rochechouart; Veurs, and Vergnols, near Aurillac; Dax.

NO. 33. LIMNÆA SULCATA. *F. E. Edwards.* Tab. XIV, fig. 4 *a—b*.

L. testá ovatá; anfractibus quinque vel sex, convexiusculis, substriatis; spirá mediocri, acutá; aperturá ovatá, spiram in longitudinem superanti; margine externo parum obliquo; plicá columellari compressá, vix eminenti, profundè sulcatá.

An ovate shell, composed of five or six slightly convex whorls on which the lines of growth are very conspicuous, imparting a sub-striated appearance to the surface; the spire moderately elevated and pointed. The aperture is ovate, and rather longer than the spire; the outer lip but slightly oblique, and the columellar fold compressed, not very prominent, and more deeply sulcated than in any other species.

In general appearance this species resembles *L. arenularia*; but it may be distinguished by the flat and deeply sulcated fold.

Size.—Axis, rather more than 1 inch; diameter $\frac{1}{2}$ an inch.

Localities.—Hordwell; Headon Hill.

NO. 34. LIMNÆA GIBBOSULA. *F. E. Edwards.* Tab. XIV, fig. 8—*c*.

L. testá ovatá, sub-turritá; spirá brevi, sub-acutá; anfractibus sex, gibbosulis, ultimo magno, suturis profundis: aperturá acuto-semi-ovali, amplá, basi effusá, bessem totius testæ in longitudinem superanti; labro reflexo; plicá columellari parvâ, parum tortuosâ, sub-compressâ, obscurè sulcatâ.

An ovate sub-turreted shell, with a moderately elevated and rather obtuse spire; volutions six, somewhat gibbous, separated by a deep suture, and, in some specimens, flattened round the upper margin; the last volution is proportionally large. The aperture is semi-oval, dilated in front, acute behind, and exceeds in length two thirds of the whole shell; the inner lip is reflected; the columellar fold small, somewhat compressed, not much twisted, and obscurely sulcated.

This species resembles *L. sublata* more than any other; but the shell is larger, the spire not so much elevated, the volutions more equally gibbous, the aperture much longer and more effuse at the base, the fold not so much twisted and the outer

lip not so oblique. From *L. tumida* it is separated by the shorter spire and the flat sulcated columella.

Size.—Axis, 1 inch and 7-10ths; diameter, 9-10ths of an inch nearly.

Locality.—Headon Hill.

No. 35. LIMNÆA SUBLATA. *F. E. Edwards*. Tab. XIII, fig. 4 *a—b*.

L. testá ovato-acutá, ventricosá: anfractibus sex, convexis, lævibus; aperturá rotundato-semi-ovali, per-obliquá, amplá, spiram in longitudinem paulo superanti; margine externo reflexiusculo; plicá columellari compressiusculá, angustá, parum eminenti, valde tortuosá.

A smooth, ventricose shell, with a moderately elevated spire, and an acute apex: the six whorls of which it is formed are convex, and separated by a conspicuous but not deep suture; the aperture is roundedly semi-oval, effuse, and a little longer than the spire. The outer lip is very oblique, and slightly reflected; the inner one scarcely extends beyond the aperture; the columella is much twisted, and the small narrow fold is compressed and very little prominent.

Owing to the great obliquity of the aperture, the shell must have been carried by the animal with the spire more raised than is usually the case in this genus; from this peculiarity the specific name has been taken.

The present species approaches nearly to *L. gibbosula*, but the spire is longer and more pointed, the whorls more ventricose, and the aperture shorter in proportion, and more oblique. The greater convexity of the whorls, the shorter spire, the narrow, slightly projecting fold, and the effuse and oblique aperture, distinguish it from *L. pyramidalis*. It appears to be rare.

Size.—Axis $1\frac{1}{2}$ inch; diameter 8-10ths of an inch.

Locality.—Headon Hill.

No. 36. LIMNÆA MIXTA. *F. E. Edwards*. Tab. XIII, fig. 5 *a—b*.

L. testá ovato-acutá; spirá elevatá; anfractibus sex vel septem, convexiusculis, longitudinaliter striatis, ultimo magno, sub-ventricoso: aperturá ovali, anticè coarctatá, bessem totius testæ in longitudinem ferè æquanti; plicá columellari sub-rectá, angustá, compressiusculá, parum eminenti, obscure sulcatá.

An ovate shell, with a moderately elevated pointed spire; volutions six or seven, slightly convex, almost flat on the upper parts composing the sides of the spire, and marked more strongly than usual in this genus by conspicuous irregular lines of growth; the body whorl large and rather ventricose. The aperture is oval, contracted in front, and, in length, nearly equal to two thirds of the whole shell; the columellar fold is very little twisted, narrow, slightly flattened, barely prominent, and obscurely sulcated.

I propose this species with hesitation; it may be only a variety of *L. pyramidalis* or of *L. gibbosula*, but the characters it presents are so mixed, that it is difficult to determine to which species it should be referred. The narrow, flat, and nearly straight fold resembles very closely that of *L. gibbosula*; but the spire is more elevated, more pyramidal, the volutions more regularly convex, and the aperture not so effuse. It is distinguished from the typical *L. pyramidalis*, not only by the columellar fold, which in the latter species is larger, more oblique, and more prominent, but also by the flatness of the sides of the spire, and the greater length of the aperture; and from the variety of that species, by the more contracted aperture. In the character of the spire, and the contracted aperture, it approaches *L. fusiformis*; but it is separated from it by the columellar fold, which in that species is rounded, prominent, and more twisted.

Size.—Axis, 1 inch and 6-10ths; diameter, 8-10ths of an inch.

Locality.—Headon Hill.

No. 37. LIMNÆA OVUM? *Brogn.* Tab. XIV, fig. 12 a—b.

LIMNEUS OVUM, *Brogn.* 1810. Ann. du Mus., vol. xv, p. 374, tab. 22, fig. 13 A, B.

— — *Brogn.* 1811. Journ. de Phys., &c., p. 422.

LYMNEUS — *Férus.* 1814. Mém. geol., &c., p. 60, No. 6.

LYMNEA — *Desh.* 1824—37. Desc. des coq. foss., &c., vol. ii, p. 97, tab. 11, figs. 15, 16.

— — *Desh.* Encyc. Méth. Vers., vol. ii, p. 361, No. 16.

— — *Bouill.* 1836. Cat. des coq. foss. d'Auv., p. 131, No. 13.

L. testá ovali, sub-ventricosá, acuminatá, sub-lævi; anfractibus sex, convexis, ultimo magno: aperturá mediocri, ad basin sub-dilatatá; columellá marginatá; plicá columellari parvá, compressá, sulcatá, anticé angulatá, parum tortuosá.

As I have not had an opportunity of comparing the English with French specimens of this species, the identification cannot be altogether free from doubt. The English shell is nearly smooth, ovate, and sub-ventricose, with a moderately elevated and pointed spire; volutions six or seven, separated by a conspicuous but not deep suture. The aperture is not wide, but is a little dilated in front, and is about half the length of the entire shell: the columellar fold is small, compressed, obscurely sulcated, very slightly twisted, and scarcely projects into the aperture; the anterior margin presents an acute ridge, formed by the prolongation of the sharp edge of the peristome; the inner lip is slightly reflected.

The aperture is not so contracted in front as M. Deshayes describes that of the French shell to be; it agrees very well with Brogniart's figure, but not with that given by M. Deshayes, although the latter was taken from Brogniart's specimen. In other respects the English shells do not appear to differ from the French.

In the general contour, and in the proportions of the aperture, the present species closely resembles *L. convexa*; but the small, flat, sulcated fold separates it from that species.

Size.—Axis, 1 inch and 3-10ths; diameter, rather more than 6-10ths of an inch.

Localities.—Headon Hill. *French*: Pierrelaie.

Sect. *b*. Columellar fold rounded or sub-acute.

No. 38. LIMNÆA FUSIFORMIS. *J. Sowerby*. Tab. XIII, fig. 8 *a—g*.

LIMNÆA FUSIFORMIS, *J. Sow.* 1818. Min. Con., vol. ii, p. 155, tab. 169, figs. 2-3.

LIMNÆA — *G. Sow.* Genera of Shells.

— — *Lyell and Murch.* 1829. Sur les dépôts lacustres, &c., du Cantal.

L. testá ovato-acutá, sub-fusiformi, lævi; anfractibus septenis vel octonis, sub-planis, ultimo ventricoso: aperturá ovatá, spiram in longitudinem vix æquanti; columellá marginatá; plicá columellari rotundatá aut sub-acutá, parum tortuosá.

Var. DEFORMIS, (fig. 8 *c—e*.) *testá breviori; anfractibus sex vel septem, ventricosioribus: aperturá rotundato-ovali, spiram in longitudinem superanti; plicá columellari rotundatá, eminentiori.*

A smooth ovate-acute shell, formed of seven or eight whorls, the upper sides of which are nearly straight, giving a regular conical form to the spire, which is elevated and pointed; the last whorl is ventricose; the lines of growth conspicuous and sharp. The aperture is ovate, moderately large, and nearly as long as the spire; occasionally the anterior part is somewhat contracted, imparting a sub-fusiform shape to the shell. The columellar fold is thick, and, generally, rounded; but sometimes it presents a rather sharp anterior margin; it is slightly and gracefully twisted.

Of this species, as of *L. caudata*, a variety occurs (fig. 8 *c—e*) in which the shell is much shorter, the volutions very ventricose, the aperture roundedly ovate, and the fold rounded and prominent.

The contraction of the anterior part of the aperture, causing the fusiform shape to which Mr. Sowerby refers, frequently occurs, but it is not by any means a constant character; in fact, the aperture is more generally somewhat effuse, as represented in the figure 8.

This species approaches *L. pyramidalis* more nearly than any other of the fossil *Limnææ*; but the flatness of the sides of the spire, and the rounded fold, are characters by which it may easily be distinguished. The variety resembles the short variety of *L. caudata*; but the whorls are more ventricose, and the fold is not compressed and sulcated, as in that species.

Size.—Axis, 2 inches nearly; diameter, 8-10ths of an inch.

Localities.—Hordwell, Headon Hill, Sconce. *French*: Aurillac in the Cantal.

No. 39. LIMNÆA TUMIDA. *F. E. Edwards.* Tab. XIII, fig. 6 *a—b*.

L. testā ovato-acutā, ventricosā, sexies vel septies circumvolutā; spirā elevatā, apice acuminato; anfractibus convexis, ultimo tumido: aperturā ovatā, amplā, bessem totius testæ in longitudinem fere æquanti; margine columellari reflexo; plicā parum tortuosā, eminenti, rotundatā, in medio sub-callosā.

An ovate, ventricose shell, with an elevated, pointed, rather subulate, spire; volutions six or seven, the early ones increasing in size slowly, the last two more rapidly; the upper parts forming the sides of the spire are rather flattened, as in *L. pyramidalis*; the body whorl large and tumid. The aperture is ovate, and in length nearly equal to two thirds of the whole shell; the anterior margin, where it joins the columella, is slightly reflected; the columella itself is not much twisted, and the fold is prominent, round, and thickened towards the middle.

This species may be distinguished from *L. gibbosula*, by the round columellar fold and longer spire; and from *L. fusiformis*, by the more convex volutions, the tumid body whorl, the longer aperture, and the nearly straight fold.

Size.—Axis, 1 inch and 8-10ths nearly; diameter, 11-10ths of an inch.

Locality.—Headon Hill.

No. 40. LIMNÆA COLUMELLARIS. *J. Sowerby.* Tab. XIII, fig. 9 *a—b*.

LIMNÆA COLUMELLARIS, *Sow.* 1826. *Min. Con.*, vol. vi, p. 53, t. 528, fig. 2.

— — ? *Lyell and Mur.* 1829. *Sur les dépôts lacustres, &c., du Cantal.*

L. testā ovato-ventricosā, sub-turritā, quinquies vel sexies circumvolutā; spirā brevi, apice acuto; aperturā ovali, dilatatā, bessem totius testæ in longitudinem fere æquanti; plicā columellari rotundatā, callosā, valde contortā, pro-eminenti.

I am indebted to Mr. Sowerby for the use of the original specimen described by him of this species. It is a ventricose, oval shell, with a short pointed spire, and formed of five or six very convex whorls, rather depressed at the suture, whence the shell presents a subturreted appearance; the aperture is large, effuse, and nearly as long as two thirds of the whole shell; the thick, callous-like fold is round, very prominent, and much twisted.

If it were not for the convexity of the whorls and the size of the aperture, I should be inclined to consider this shell to be only a variety of *L. fusiformis*; and that the unusual contortion of the fold, a character to which individuals of that species occasionally approach very nearly, is accidental. But in this species, the pyramidal shape, which always distinguishes the spire of *L. fusiformis*, is altogether wanting. From *L. tumida*, which it resembles in the size of the aperture, it is also separated by the

greater flatness of the sides of the spire and the less prominent and less oblique fold of that species. It appears to be very scarce.

Size.—Axis, rather more than 1 inch; diameter, $\frac{1}{2}$ an inch.

Locality. Hordwell. *French*: Aurillac in the Cantal.

No. 41. LIMNÆA SUB-QUADRATA. *F. E. Edwards*. Tab. XIII, fig. 1 *a—b*.

L. testá ovato-oblongá, turrítá, lævi; spirá mediocri, apice acuto: anfractibus sex aut septem plano-convexis: aperturá ovatá, anticé dilatátá, spiram in longitudinem superanti; labio incrassato reflexo; columellá subrectá, plicá parvá, vix eminenti, sub-acutá.

Shell ovate, oblong, turreted, smooth, with six or seven rather flatly-convex volutions; spire moderately elevated, with an acute apex; aperture ovate, somewhat effuse in front, and rather more than half the length of the whole shell; the inner lip thickened, and a little reflected; the columella nearly straight, and presenting a small, rather sharp fold, which scarcely projects into the aperture.

The turreted and depressedly convex form of the whorls gives a sub-quadrate appearance to this shell, by which, as well as by its nearly straight columella, and sharp and barely prominent fold, it may be distinguished from *L. convexa*, which it most nearly resembles.

Size.—Axis, rather more than $1\frac{1}{2}$ inch; diameter, 8-10ths of an inch.

Locality.—Headon Hill.

No. 42. LIMNÆA CONVEXA. *F. E. Edwards*. Tab. XIII, fig. 7 *a—b*.

L. testá ovato-ventricosá, sexies circumvolutá; anfractibus convexis, lævibus; spirá elevatá, apice sub-acuto: aperturá ovatá, anticé effusá, spiram in longitudinem superanti; labio reflexo; plicá columellari pro-eminenti, tortuosá, rotundatá.

An ovate ventricose shell, formed of six smooth convex volutions, with a moderately elevated and pointed spire: aperture ovate, effuse in front, and rather longer than the spire; the inner lip slightly reflected; the columellar fold round, prominent, and very oblique.

This species somewhat resembles *L. sub-quadrate*; the whorls, however, are more regularly convex, and do not present the turreted appearance which characterises that shell; and the round columellar fold is much more prominent, and more strongly twisted. In the convexity of the whorls it approaches *L. pyramidalis*, but the flat sulcated fold separates that species from this.

Size.—Axis, 1 inch and 3-10ths; diameter, 6-10ths of an inch.

Locality.—Headon Hill. In Mr. D'Urban's collection.

No. 43. LIMNÆA COSTELLATA. *F. E. Edwards.* Tab. XIII, fig. 10 *a—b*.

L. testá ovato-ventricosá, sub-turritá; spirá mediocri, acuminatá; anfractibus quinque vel sex, convexis, longitudinaliter sub-costellatis, et lineis incrementi subtilissimé striatis; costellis obscuris, irregularibus, remotiusculis: aperturá ovatá, amplá, spiram in longitudinem superanti; labio reflexo; plicá columellari vix tortuosá, rotundatá, parum eminenti.

The striated *Limnææ* generally acquire that character from the conspicuous lines of growth; but the present species presents obscure costellæ, as well as the striation due to the lines of growth. It is an oval, ventricose, sub-turreted shell, with a moderately elevated spire and pointed apex, and formed of five or six convex volutions, very finely striated by the lines of growth, and also longitudinally costellated; the costellæ are obscure, irregular, and separated by broad shallow sulci, in which the lines of growth are perceptible. The aperture is ovate, rather dilated, and a little longer than the spire; the columellar margin strongly reflected, and the fold rounded, slightly twisted, and but little prominent.

Independently of its costellated character, this species presents differences which prevent its being confounded either with *L. strigosa* (Brogn.), or *L. substrinata* (Desh.). In the first species, the shell is more elongated, the aperture smaller, and the columellar fold resembles that of *L. longiscata*, of which I think it is merely a variety; in the latter, the spire is more elevated, the aperture much contracted in front, and altogether narrower; and the fold is prominent and strongly twisted.

The present appears to be a well-marked species.

Size.—Axis, rather more than 1 inch; diameter, 4-10ths of an inch.

Localities.—Hordwell; Headon Hill.

No. 44. LIMNÆA FABULUM. *Brogniart.* Tab. XIV, fig. 10 *a—b*.

- LIMNEUS FABULUM. *Brogn.* 1810. Ann. du Mus., vol. xv, p. 375, t. 22, fig. 16.
 — — *Brogn.* 1811. Journ. de Phys., &c. vol. lxxii, p. 423.
 LYMNEUS — *Fér.* 1814. Mém. geol., p. 61, No. 13.
 LIMNEA — ? *Lyell and Murc.* 1829. Sur les dépôts lacust. tert. du Cantal.
 LYMNEA FABULA. *Desh.* 1824—37. Desc. des coq. foss., &c., vol. ii, p. 96; t. 11, figs. 11-12.
 — — *Desh.* 1830. Ency. Méth. Vers., vol. ii, p. 361.
 LYMNEUS FABULUM. *Defr.* 1835. Dict. des Sci. Nat., vol. xxvi, p. 462.
 LIMNEA FABULA. *Nyst.* 1836. Rech. coq. foss. de Hoesselt, &c., p. 20, No. 49.
 LYMNEA FABULA. *Desh.* 1838. 2d edit. Lam. Hist. Nat., vol. viii, p. 223, No. 9.
 LIMNEUS FABULA? *Nyst.* 1843. Desc. des coq. &c. foss. des Terr. tert. de Belg., p. 469, t. 38, fig. 18.

L. testá ovato-ventricosá, lævi, acuminatá; anfractibus quinque vel sex, convexiusculis: aperturá ovato-acutá; plicá columellari sub-acutá, parum tortuosá.

A smooth, ovate, ventricose shell, with a short pointed spire, and formed of five or six slightly convex whorls; the aperture pointedly ovate, and the columellar fold somewhat angular and prominent, but not much twisted.

I have not had an opportunity of comparing the English with the French shells, and I have therefore some hesitation in pronouncing as to their identity. My specimens, however, agree very well with the description and figures given by M. Deshayes, (which it must be remembered are taken from casts merely,) except that the French shell is described as formed of four whorls only, and as having the aperture contracted at the base; but the figures show six whorls, and the aperture, as drawn, is scarcely more contracted than that of the English shell.

Size.—Axis, rather more than 8-10ths of an inch; diameter, 4-10ths of an inch.

Localities.—Hordwell. *French*: Jouy; Saint-Prix, Montmorency; Pierrelaie and Lavergnol in the Cantal. *Belgian*: Kleyn-Spauwen.

No. 45. LIMNÆA CINCTA. *F. E. Edwards*. Tab. XIV, fig. 5 *a—b*.

L. testá elongato-ovatá, sub-turritá, sexies vel septies circumvolutá; spirá exsertá, acuminatá; anfractibus convexis, substriatis: aperturá rotundato-ovatá, amplá, spiram in longitudinem æquanti; plicá columellari parvâ, angustâ, rotundatâ, parum tortuosâ, proeminenti.

An elongated ovate shell, with an elevated pointed spire; volutions six or seven, very convex, almost ventricose, the edges of which are depressed along the suture, and, generally, present a sharp stria running round them, parallel with and at a short distance below the suture,—similar to that mentioned by Brard as characterising his *L. pyramidale*: the lines of growth are so strongly marked that the surface of the shell almost appears to be striated. The aperture is roundedly ovate, somewhat effuse, and barely exceeds the spire in length; the columellar fold is narrow, rounded, not much twisted, and prominent.

The line of suture frequently runs below the wide part of the whorl, giving a distorted appearance, resembling that which is sometimes seen in *L. longiscata*, and in fact the present shell presents a close analogy with that species. It is, however, distinguished from *L. longiscata*, as well as from *L. pyramidalis* (Desh.), by the round columellar fold, and the greater convexity of the whorls.

Size.—Axis, $1\frac{1}{2}$ inch; diameter, rather more than $\frac{1}{2}$ an inch.

Locality.—Headon Hill.

No. 46. LIMNÆA ANGUSTA. *F. E. Edwards*. Tab. XIV, fig. 6 *a—b*.

L. testá angustá, elongatá, sub-turritá, quinquies vel sexies circumvolutá; spirá elevatá, acuminatá; anfractibus convexis, lineis incrementi obscuré striatis: aperturá ovato-oblongá, anticé sub-dilatátá, spiram in longitudinem parum superanti; plicá columellari crassá, tereti, parum eminenti, sub-tortuosá.

If it were not for the thick, round, columellar fold, and the elongated aperture, I should refer this species to *L. longiscata*, which it much resembles. It is a narrow, elongated, sub-turreted shell, formed of five or six convex volutions, obscurely striated by the lines of growth; the spire elevated and pointed. The aperture is a longish oval, equal to half the length of the shell, and rather spread out in front; the columellar fold is thick, round, not very prominent, and but slightly twisted.

The long narrow shape of this shell separates it from every species except *L. longiscata*; from the latter shell it is easily distinguished by the fold, so opposite in character to the broad, flat, sulcated fold which characterises that species.

Size.—Axis, $1\frac{1}{4}$ inch; diameter, not quite $\frac{1}{2}$ an inch.

Localities.—Hordwell; Headon Hill.

No. 47. LIMNÆA ARENULARIA. *Brard*. Tab. XIV, fig. 13 *a—b*.

LYMNÉE DES GRES. *Brard*. 1810. Ann. du Mus., vol. xv, p. 409, t. 24, fig. 5-6.

LYMNEUS ARENULARIUS. *Féruss*. 1814. Mém. geol. &c. p. 61, No. 15.

LYMNÆA ARENULARIA. *Desh*. 1824—37. Desc. des coq. foss., &c., vol. ii., p. 93, t. 11, figs. 7-8.

L. testá ovato-acuminatá, sub-turritá, lævi; anfractibus septenis, convexiusculis, suturis conspicuis: aperturá amplá, semi-ovali, spiram in longitudinem superanti; plicá columellari rotundatá, minimá, parum contortá, sub-proeminenti.

A smooth, ovate, oblong sub-turreted shell, with a moderately elevated and taper spire; volutions seven or eight, slightly convex, separated by a conspicuous, but not deep, suture, and occasionally striated by faint lines of growth: the aperture rather large, semi-oval, a little dilated in front, and longer than the spire; the columellar fold rounded, small, slightly twisted, and not very prominent.

The English shells correspond so nearly with M. Deshayes's figures, and with some French specimens, for which I am indebted to that gentleman, as not to leave any doubt as to this identification, notwithstanding that M. Deshayes describes the aperture as very oblique, and the columellar fold as much twisted, characters which I have not found prominent either in the English or French specimens.

Size.—Axis, 4-10ths of an inch; diameter, 7-20ths of an inch.

Localities.—Hordwell; Headon Hill. *French*: Beauchamp, near Pointoise, Valmondois.

No. 48. LIMNÆA MINIMA. Sowerby. Tab. XIV, fig. 9 a—c.

LIMNÆA MINIMA. Sow. 1817. Min. Con. vol. ii, p. 156, t. 169, fig. 1.

L. testá minimá, ovato-elongatá, lævi; anfractibus quinque aut sex, convexiusculis: aperturá ovali, spiram in longitudinem vix æquanti; margine columellari reflexo; plicá sub-rectá, rotundatá, parum eminenti.

It is not unlikely that this, as Mr. Sowerby has suggested, may be the young shell of some species already described, probably of *L. arenularia*, to which, in its regularly taper spire and rounded fold, it presents a close approximation. It is a very small, smooth, elongated, ovate shell, with five or six rather convex volutions, separated by a moderately deep suture: the aperture is ovate, and rather less than half the length of the entire shell; the inner lip is strongly reflected, and the fold is round, nearly straight, and very little prominent.

The figures are taken from the original specimen described by Mr. Sowerby in 'Mineral Conchology.'

Size.—Axis, 3-10ths of an inch nearly; diameter, 2-10ths nearly.

Locality.—Headon Hill.

No. 49. LIMNÆA RECTA. F. E. Edwards. Tab. XIV, fig. 7 a—b.

L. testá ovato-ventricosá, sub-turritá; spirá mediocri, apice acuto; anfractibus sex aut septem, convexis: aperturá ovali, amplá, anticé dilatatá, longiori quam spira; margine columellari sub-reflexo; plicá parvâ, vix tortuosâ, parum eminenti.

The convexity of the whorls, the pointed spire, and the nearly straight rounded fold, distinguish this from every other fossil species. It is a short ovate shell, with a moderately elevated spire, and an acute apex; volutions six or seven, very convex, the last one rather ventricose: the aperture large, of a roundedly ovate form, effuse in front, and longer than the spire; the inner lip slightly reflected, and the small rounded fold nearly straight, and scarcely impinging upon the aperture.

This shell much resembles *L. ovum* (Brogn.); but the volutions are fewer and more ventricose, and the aperture is more effuse. It does not appear to me to be referable to any other species; and I have therefore, although reluctantly, described it as a distinct species.

Size.—Axis, 1 inch and 1-10th; diameter, 5-10ths of an inch.

Locality.—Headon Hill.

No. 50. LIMNÆA TENUIS. *F. E. Edwards.* Tab. XIV, fig. 11 *a—b.*

L. testá tenui, ovato-ventricosá, sub-turritá; anfractibus sex, convexis, ultimo magno; apice acuto: aperturá ovatá, effusá, in longitudinem bessem totius testæ feré æquanti; plicá columellari brevi, angustá, rotundatá, parum tortuosá.

This species presents so close an analogy with *L. tumida*, that it would be difficult to separate the two, if it were not for the great difference in size. The shell is very thin, ovate, and formed of six convex volutions, depressed round the suture, which character imparts to it a sub-turreted appearance; the spire is somewhat elevated and pointed; the body-whorl large and ventricose: the aperture ovate, effuse, and nearly as long as two thirds of the entire shell; the columellar fold short, narrow, rounded, and not much twisted.

Size.—Axis, 8-10ths of an inch; diameter, 4-10ths of an inch.

Locality.—Headon Hill.

Genus 13th. PLANORBIS. *Geoffroy.*

CORETUS, *Adanson*, 1757.

PLANORBIS, *Geoffroy*, 1767; *Guettard*, 1770; *Müller*, 1773-4.

Gen. Char.—Shell discoidal, spire depressed; volutions apparent above and below, convoluted upon a nearly horizontal plane, thin, generally smooth, ventricose, sometimes carinated: aperture simple, lunate, crescent-shaped or sub-quadrate, impinged upon by the preceding volution; outer lip generally thin, sharp edged, sometimes thickened or reflected; columellar lip slightly spreading over the body whorl. No operculum.

The animals belonging to this genus were placed by Linnæus among the Helices; they had, however, been separated, as a distinct group, by Lister, nearly a century previously, and formed the third section of the Lacustrine shells of that author. Shortly before the publication of the *Systema Naturæ*, Adanson described a small species to which he gave the generic name *Coretus*. The genus was afterwards defined by Geoffroy under the present name *Planorbis*; and Müller, to whom it has been generally attributed, only adopted Geoffroy's name.

The animal of *Planorbis* is elongated, slender, and strongly rolled up; the head is furnished with two long contractile tentacles, at the internal bases of which the eyes are placed; the orifices are on the left side; the organs of generation distinct.

Whether the shell of *Planorbis* is dextral or sinistral is a question which has been much discussed, and, by some authors, is considered as still undecided. By Linnæus, Müller, and subsequent writers to the time of Cuvier, it was regarded as dextral, and was described as *supra umbilicata*. The transposition in *P. corneus* of the

orifices and the heart, all of which are on the side contrary to that in which they are placed in the animals of dextral shells, induced Cuvier to consider that species as sinistral: and in this opinion many eminent naturalists have concurred. M. Desmoulins, however, has ascertained, by a careful anatomy of the animal of *P. corneus*, that, although the orifices and the heart have an abnormal position, the organs of digestion and generation, in fact, retain the position they hold in dextral molluscs; and that author, therefore, maintains that nearly all the known species of *Planorbis*, as well living as fossil, are dextral. M. Deshayes concurs in this opinion; and, after remarking that the upper side may be distinguished from the under side by the obliquity of the aperture, the superior margin of which is more produced, cites the observations of M. Desmoulins as explaining the apparent anomaly of a sinistral animal in a dextral shell, and how, in reality, the animal is dextral as well as the shell; there not being any other derangement in the relation of its organs than with regard to the heart and the termination of the digestive and generative organs. With regard to the shell, it will be seen at once, on observing the manner in which it is carried by the animal, that it is dextral, and that, as Mr. Benson has stated,* if it be viewed practically as sinistral, and placed as such, the animal will be on its back, and will have to twist its body half round in order to gain the ground with its foot. Mr. Benson, therefore, proposes to consider that face as containing the apex, in discoidal shells, which is contiguous to the back of the animal; and, he adds, this side may invariably be known in *Planorbis* by the greater projection of the lip in that part, by the deeper depression of the central umbilicus, and by the more considerable involutions of the whorls occasioning a greater depth of suture. Mr. G. Sowerby, on the other hand, asserts† that the shell is sinistral, and that it is only needful to observe on which side of the shell the very apex of the spire is actually to be seen, and, taking that side for the upper, in conformity with the strict rules of analogy, it will immediately be evident that the aperture is on the left side. This criterion, however, is seldom available; for, in general, the apex is concealed by the involution of the whorls, and the shell presents, on each face, what may be easily mistaken for an umbilicus; and the difficulty in determining which face contains the apex, and which the true umbilicus, is not removed. It is well known that testaceous molluscs, when placed in conditions unfavorable to healthy development, frequently depart from their normal form; and that their shells, in consequence, are distorted, and become what are usually called monstrosities. Thus, in *Planorbis*, the animal, under such conditions, frequently loses, to a greater or less degree, its strong convolution on a horizontal plane; and the shell assumes, in conformity, a more or less elongated spiral form, with an elevated apex. M. Desmoulins cites these monstrosities in support of his opinion, observing that, when they occur, the whorls gradually glide from left to right, down the imaginary

* Journal Asiat. Soc. Bengal, vol. v, p. 744.

† Genera of Shells. Gen. *Planorbis*.

axis. A series of such distorted specimens of *P. complanatus*, taken from a pond near Swansea, formed, I believe, by the waste water from a steam-engine, and of a high temperature, is in the British Museum. These specimens have all assumed an elevated spiral form; and the aperture is in every case dextral. Several specimens of *P. vortex*, in Mr. Sowerby's Museum, are similarly distorted; and in them also the apertures are dextral. On the whole, the better opinion appears to be that the shell, as well as the animal, is dextral, notwithstanding the abnormal position of the heart and the orifices; and in the following descriptions, therefore, I have considered the shell as dextral, and I have applied the term *upper* to that disc which is uppermost when the shell is placed with the mouth on the right side of the spectator, and the term *under* to the opposite disc.

The *Planorbis* live in fresh water; more frequently in stagnant water or standing pools, although, occasionally, they are found in gentle streams. They are widely diffused, but abound principally in temperate climates. I believe that at present there is not any species known as living in salt or brackish waters; and the specimens found in the crag formation, and described by Mr. Wood, are referred to recent species which are known to be pure fresh-water animals; and these shells are therefore considered to have been accidentally introduced.

Four species also occur in the estuarine or fluvio-marine deposits of the Eocene epoch: viz., *P. hemistoma* (Sow.); *P. obtusus* (Sow.); *P. biangulatus* (nov. spec.); and *P. elegans* (nov. spec.); but, like the crag specimens, they have, probably, been deposited there by the agency of some river: they all occur in the pure fresh-water or the transition formations.

Fossil species are numerous, but they abound principally in the formations of the tertiary epoch; Prof. E. Forbes, however, states, (Brit. Mol., vol. iii, p. 146,) that representatives of the genus, differing but slightly from species still living, are found in fresh-water strata of even the oolitic epoch.

No. 51. PLANORBIS EUOMPHALUS. Sowerby. Tab. XV, fig. 6 a—c.

PLANORBIS EUOMPHALUS. J. Sowerby. Min. Con., vol. ii, p. 92, t. 140, figs. 7—9.

— — G. Sowerby. Genera of Shells, fig. 5.

— — Deshayes. Lam. Hist. Nat., 2d edit., vol. viii, p. 397, No. 9.

P. testá supra sub-planá, ad peripheriam angulatá, subtus latè et profundè cavatá; anfractibus sex, sub-trigonis, vix involventibus, transversim lineis incrementi notatis, aliquandoque concentricè striatis; subtús ad marginem umbilicalem obtusè angulatis; striis concentricis numerosis, irregularibus: aperturá per-obliquá.

This well-known species, which at present appears to be confined to the fresh-water formations of England, is easily distinguished from the other fossil *Planorbis*. It is a large discoidal shell, nearly flat on the upper face, and presenting a wide and

deep umbilical cavity beneath; the six or seven volutions of which the shell is formed, are flat, or nearly so, above; convex below; and each but slightly embracing the preceding volution; the apex is concealed by the involution of the whorls. A clearly defined and rather acute angle, almost forming a keel, runs round the periphery of the shell, and separates the upper from the under disc. This angle is always very conspicuous in young shells; but as they approach maturity, it becomes more and more obtuse, and frequently altogether disappears; the whorls then assume a transversely oval form, approaching nearly to that presented by *P. rotundatus*. On the under surface, the inner margins of the whorls are bent rather suddenly towards the preceding whorl, and present, in consequence, an obtuse angle, which runs round and defines the umbilicus. Transverse lines of growth are very conspicuous; and frequently the surface of the shell also presents more or less numerous concentric raised lines, some of which are larger and more prominent than the rest. The aperture is sub-trigonal, slightly impinged upon by the preceding volution, and very oblique.

This species presents a general resemblance to *P. rotundatus*; but, even when the characteristic angle has become obsolete, it may easily be distinguished by the greater breadth, and the flatness of the upper surfaces, of the whorls, the much larger concavity on the under side of the shell, and the subtrigonal and more oblique aperture. From *P. discus* it is separated by the more compressed form of that species, caused by the greater width of the whorls, and the comparative flatness of their under sides; and in that species the whorls are more embracing than in this.

Size.—Diameter, 1 inch and 6-10ths.

Localities.—Headon Hill; Hordwell.

No. 52. PLANORBIS ROTUNDATUS. *Brard*. Tab. XV, fig. 4 a—c.

- PLANORBE ARRONDI. *Brard*. 1809. Ann. du Mus., vol. xiv, p. 433, t. 27, figs. 19, 20.
 PLANORBIS ROTUNDATUS, *Brogn*. 1810. *Ib.*, vol. xv, p. 370, t. 22, figs. 4, 5.
 — — — *Ib.* 1811. Jour. de Phys., vol. lxxii, p. 419, figs. 4, 5.
 — SIMILIS. *Fér*. 1814. Mém. geol., p. 61, No. 1.
 — ROTUNDATUS. *Fér*. 1814. *Ib.*, No. 2, var. A.
 — — — *Desh*. 1824—37. Desc. des coq. foss., vol. i, p. 83, t. 9, figs. 7, 8.
 — — — *Desh*. 1824—37. Encycl. Meth. Vers., &c., vol. iii, p. 778, No. 2.
 — — — *Bowd*. Elem. of Conch., t. iv, fig. 7.
 — — — *Lyell and Mur*. 1829. Sur les dépôts, &c. du Cantal.
 — — — *Bouillet*. Desc. hist. et scient. de la Haute Auver., p. 18, figs. 6, 7.
 — — — *Ib.* 1836. Cat. des coq. viv. et foss. de l'Auver., p. 115, No. 2.
 — — — *Gratel*. 1838. Cat. des deb. foss., &c., du bassin de la Gironde, p. 33, No. 102.
 — — — *Desh*. 1838. Lam. Hist. Nat., 2d edit., vol. viii, p. 394, No. 1.

P. testá levi sub-striatáve, supernè sub-planá, subtus concavá; anfractibus sex vel septem, rotundatis, via involventibus, infernè ad marginem umbilicalem sub-angulatis; suturis profundis: aperturá parum obliquá.

A rather large shell, formed of six or seven nearly round volutions, separated by a deep suture, and each slightly impinged upon by the preceding one; the volutions are flatly convex on the upper sides, convex beneath, and, like those of *P. euomphalus*, present an angle running round the inner margins near the umbilicus, which, as the shell approaches maturity, becomes almost obsolete. The upper face is nearly flat; while the under side presents a moderately deep and wide concavity. The aperture is transversely oval, and but slightly oblique. The striæ of growth are very conspicuous; and occasionally, although very rarely, the shells present fine concentric lines, similar to those which characterise *P. euomphalus*; in this species, however, the lines are finer and more crowded, and seldom extend beyond the first three or four volutions.

Brard states that, in *P. arrondi*, the whorls are perfectly round, and do not impinge upon the succeeding whorls; and in these respects his shell does not agree with the English specimens; but the figures, apparently, are taken from a cast, and the disagreement may probably be attributed to that circumstance. Brogniart's fig. 4, (var. A, of that author,) agrees very well with our specimens, except that the aperture is more oblique. In the figure given by M. Deshayes, the whorls are wider and more flattened on the upper surface, and the upper margin of the aperture appears to be more produced than in any English specimen I have seen; the shell, too, is larger than our shells, and, in fact, strongly resembles those specimens of *P. euomphalus* in which the characteristic angle round the whorls has become obsolete.

The general resemblance and the distinctions between the present species and the recent *P. corneus*, have been pointed out by the French authors cited; and, on comparing the two, it will be seen that in the latter species the whorls are fewer, rounder, and enlarge more rapidly, and that in consequence, the shell is deeper and more largely umbilicated than the fossil species.

MM. Férussac and Deshayes mention a variety (probably the var. B of Brogniart) in which the shell is smaller, rather more compressed, and nearly equally concave above and below; I have not met with this variety among the English specimens.

Size.—Diameter, 1 inch and 2-10ths.

Localities.—*English*: Sconce; Headon Hill; Hordwell. *French*: Aurillac, La Vissiere, Lavergnol, in the Cantal; Saint-Prix; Palaiseau, Milon near Versailles; Triel; Fontainebleau; La Villette.

No. 53. PLANORBIS OBTUSUS. *Sowerby*. Tab. XV, fig. 1 *a—e*.

PLANORBIS OBTUSUS. *Sow.* 1818. *Min. Con.*, vol. ii, p. 91, t. 110, fig. 3.

P. testá depressá, lævi; supernè convexiusculá, subtús concavá: anfractibus quinis, obtusé-ovalibus, sese partim involventibus; suturis profundis: aperturá per-obliquá, obcordatá.

This very pretty shell has a smooth, shining, nearly polished surface; it is depressed, nearly flat on the upper side, and moderately concave beneath. The volutions are five, separated by a deep suture, slightly convex on both faces, but rather more compressed on the under side than on the upper, obtusely rounded at the periphery, and each nearly half concealed by the succeeding volution. The aperture is very oblique and bluntly heart-shaped.

In the general form and rounded whorls, this species much resembles *P. sparnacensis* (Desh.), but the whorls are not so numerous, and the aperture is more oblique. The lenticular form and angulated margin of *P. lens*, will prevent its being confounded with that species.

Size.—Diameter, 7-10ths of an inch.

Localities.—Sconce; Headon Hill; Upper mar., Hordwell.

No. 54. PLANORBIS DISCUS. *F. E. Edwards*. Tab. XV, fig. 7 *a—d*.

P. testá valde compressá, quinque circumvolutá, supernè planá, subtus profundè cavatá: anfractibus sex, rapidè crescentibus, parum involventibus, subtus convexiusculis, ad marginem umbilicalem angulatis: aperturá per-obliquá, elongato-cordatá.

This well-marked species appears to be peculiar to the fresh-water formation at Sconce. It is a much compressed discoidal shell, nearly flat on the upper side and deeply hollowed out below. The five or six whorls of which it is formed enlarge rapidly, and each is slightly embraced by the succeeding one; they are much flattened above, slightly convex below, and obtusely rounded at the outer edge. In the young state, the inner margin is bent rather abruptly towards the preceding whorl, and presents an obtuse angle which defines the umbilicus, similar to that presented by *P. euomphalus* and *P. rotundatus*. As the shell approaches maturity, the under side assumes an almost regularly convex form, and the angle becomes obsolete. The aperture is very oblique, and of an elongated heart-shape.

The species which most resemble the present are *P. euomphalus* and *P. oligyratus*. From the first of these, it is distinguished by its more compressed discoidal form, and the rounded periphery. The whorls also enlarge more rapidly, and are consequently fewer and broader; and they embrace more of the preceding one than do those of *P. euomphalus*. The umbilical cavity also is not so wide. It is more difficult to

separate the present species, in the young state, from *P. oligyratus*; but, in the latter, the axis is longer, the whorls are more convex on the upper side, and the obtuse angle which runs round the periphery, near the upper surface, gives a subtrigonal form to the whorls and the aperture, quite distinct from the transversely oval form in the present species.

Casts of this Planorbis occur in great abundance, but specimens with the shell preserved are extremely rare.

Size.—Diameter, 1 inch and 6-10ths.

Locality.—Sconce.

NO 55. PLANORBIS OLIGYRATUS. *F. E. Edwards*. Tab. XV, fig. 3 a—e.

P. testá supernè sub-planá, subtus cavatá: anfractibus quaternis, rapidè crescentibus, parum involventibus, ad peripheriam obtusè angulatis: subtus ad marginem umbilicalem angulatis: aperturá sub-trigoná, parum obliquá.

The present, like the preceding species, is apparently confined to the fresh-water formation at Sconce; but it is not so plentiful as *P. discus*. It is a moderately-sized shell, formed of four rapidly increasing whorls, somewhat convex above, and rather acutely angulated round the inner margins on the under side, just above the umbilicus. The periphery, near the upper surface, presents an obtuse angle, from which the whorls slope rather abruptly towards the umbilicus, assuming, in consequence, a sub-trigonal form. The aperture is slightly oblique and bluntly obcordate, in consequence of its being impinged upon by the preceding whorl. The umbilical cavity is deep, but not very wide.

This species somewhat resembles the young shell of *P. discus*; but the greater convexity of the under side of the whorls, and the small degree of obliquity, and the shape of the aperture, will distinguish it. The adult shell of *P. discus* is easily separated by its greater size and compression.

The specimens ordinarily found are, like those of the preceding species, casts merely; with the shell preserved they are very rare.

Size.—Diameter, 7-10ths of an inch.

Locality.—Sconce.

NO. 56. PLANORBIS PLATYSTOMA. *S. Wood*. Tab. XV, fig. 2 a—d.

PLANORBIS PLATYSTOMA. *S. Wood*. Lond. Geol. Journ., vol. i, p. 118.

P. testá parvá, utrinque fere equaliter cavatá; anfractibus trinis, rotundatis, tumidis, rapidè crescentibus, supra depressiusculis, subtus convexis, singulo fere dimidium antecedentis involventi: aperturá magná, per-obliquá, obtusè obcordatá, peristomate aliquando reflexo.

A small smooth shell, formed of three tumid rapidly-enlarging whorls, each embracing about one half of the preceding one; the whorls are rounded, almost equally convex above and below, but a little compressed on the upper side. The apex is wholly concealed by the involution of the whorls. The aperture is wide, very oblique, and bluntly heart-shaped; sometimes, in the adult shell, the peristome is reflected. The upper side is slightly concave, and the under side presents a wide and moderately deep umbilicus.

This species, which appears to have been first noticed by Mr. Wood, is so well marked that it cannot be confounded with any other. It somewhat resembles the young shell of *P. oligyratus*; but, in the latter shell, the whorls are not so embracing, the upper side is more flattened, and the under side is not so regularly convex. The aperture, also, is narrower and much less oblique. The reflected lip, which frequently occurs in the present species, evidences the maturity of the shell; and the difference between the size of such specimens and that of the fully formed shell of *P. oligyratus* confirms the separation of the two species. In addition to these distinctions, it may be stated that the present species is found plentifully both in Headon Hill and at Hordwell; but that as yet no specimen of *P. oligyratus* has been found at either of those localities.

Size.—Diameter 3-10ths of an inch.

Localities.—Hordwell; Headon Hill; and Sconce.

No. 57. PLANORBIS LENS. *Brogniart*. Tab. XV, fig. 8 a—d.

- PLANORBIS LENS. *Brogn.* 1810. Ann. du Mus., vol. xv, p. 372, t. 22, fig. 9.
 — — *Ib.* 1811. Journ. de Phys., &c. vol. lxxii, p. 421.
 — — *Fér.* 1814. Mém. geol., p. 61, No. 10.
 — — *Sow.* 1818. Min. Con., vol. ii, p. 91, t. 140, fig. 4.
 — — *Desh.* 1824—37. Desc. des coq. foss., &c., vol. ii, p. 87, t. 9, figs. 11—13.
 — — *Bouill.* 1836. Catal. des coq. foss. de l'Auvergne, p. 115.
 — — *Desh.* Ency. Méth. Vers., &c., vol. iii, p. 783, No. 16.
 — — *Ib.* 1838. Lam. Hist. Nat., 2d edit., vol. viii, p. 396, No. 7.
 — — *Morris.* 1843. Cat. Brit. Foss., p. 156.
An. PLANORBE ANGULEUX? *Brard.* 1810. Ann. du Mus., vol. xiv, p. 435, t. 27, figs. 23-4.

P. testá parvá, lenticulari, levi, utrinque parum, sed plus superne quam subtus, cavatá; anfractibus quaternis, singulo fere dimidium antecedentis involventi; supra convexiusculis, subtus plano-convexis, ad peripheriam acutè angulatis; aperturá parum obliquá, elongato-cordatá.

Mr. Sowerby, when he gave the name *P. lens* to a British fossil, appears not to have been aware that that name had previously been dedicated by Brogniart to a shell from the Paris basin; but, by a singular coincidence, the shells described by

these authors appear to agree so closely that they must be referred to the same species. I have not, it is true, had an opportunity of comparing the English with the French shells; the identification, therefore, rests entirely on the figures and descriptions given by MM. Brogniart and Deshayes; but, forming my opinion from them, I cannot see any sufficient reason for considering the English shells as distinct. The present species is a small lenticular shell, slightly concave on each disc, but more so on the upper than on the under side: the whorls are four or five, each embracing nearly one half of the preceding whorl; they are slightly convex on both surfaces, but more so above than beneath, and acutely angulated round the periphery, a little below the middle of the whorl. The aperture is of an elongated heart-shape, and not very oblique.

Brogniart describes his shell as swelled out (*bombé*) and lenticular rather than umbilicated; and this, owing to the slight concavity of the discs, may be taken as the general character of the English shell. M. Deshayes, whose figures are drawn from the original specimen, states that in Brogniart's figure the shell is represented with the sides too much swelled out, and with the marginal angle too near the middle. Making due allowance for these errors, it will be seen that the contour of the shell and the form of the aperture represented by Brogniart's middle figure, agree very well with those of the English specimens.* In the figure given by Mr. Sowerby the aperture is represented as very obcordate, and it conveys the idea of the whorls and the shell being more convex than they really are. M. Bronn, in his '*Lethæa geognostica*,' (p. 1011,) states that the shell described by Mr. Sowerby is more depressed than that of the typical *P. lens*, and he refers it to a distinct species, which he has named *P. Sowerbyi*. I fear that M. Bronn had not authentic specimens of our *P. lens* before him; for the figures he has given (Tab. XL, fig. 17 *a—c*,) do not correctly represent that shell; but they, as well as his description, agree closely with another of our Eocene *Planorbis*, which I have therefore referred to his species. The *P. lens* of '*Mineral Conchology*' appears to me, as I have already stated, to correspond so closely with Brogniart's *P. lens*, that the two cannot be separated.

Férussac quotes Brard's *Planorbe anguleux* as a synonym; but whether the present species really is the same cannot well be determined without reference to the original specimen, as both the description and the figure given by Brard are too imperfect for the purpose of identification. I have, however, followed the example of MM. Brogniart and Deshayes, in quoting Brard with a query.

Size.—Diameter, 3-10ths of an inch nearly.

Localities.—Hordwell, and Headon Hill, where it is moderately plentiful. *French*: Saint-Chaumont, Pantin, Limagne, Cournon.

* Judging from the aperture, Brogniart's figures are reversed, probably owing to an oversight of the artist.

No. 58. PLANORBIS TROPIS. *F. E. Edwards.* Tab. XV, fig. 10 *a—d.*

P. testá minutá, depressá, lævi, superne parum concavá, subtus late umbilicatá: anfractibus quaternis vel quinis, lente crescentibus, supra convexiusculis, infra sub-planis, ad peripheriam carinatis, singulo dimidium antecedentis obtegenti: aperturá obliquá, angusticordatá.

Mr. Wood ('London Geol. Journ.,' vol. i, p. 118,) has referred this species to *P. planulatus* (Desh.), observing, however, that "the figure by Deshayes is not so flat and carinated as the English specimens, which more resemble the *P. exacutus* (Gould)." I have not seen any French specimens of *P. planulatus*; but, on comparing the English shells with the description and figures given by M. Deshayes, I cannot concur in referring them to that species. *P. tropis* is a minute, compressed, polished shell, a little sunk round the apex, and widely but not deeply umbilicated; the four or five volutions, of which it is formed, are slightly convex above, nearly flat beneath, and compressed near the outer margin so as to present a prominent keel, which runs round the periphery a little below the middle of the whorl. The whorls are much concealed, each embracing about one half of the preceding one; the aperture is very oblique and of a longish heart shape.

Although the general resemblance between this species and *P. planulatus* must be admitted, yet there are, I think, sufficient grounds for specific distinction. In the present species, the whorls increase more slowly and are more concealed; they are not so convex above nor so flat beneath, and, consequently, the keel is near the middle of the shell, and the aperture assumes an elongated heart shape; whereas, in *P. planulatus*, owing to the greater flatness of the under surface of the whorls, the marginal angle (for, judging from the figure given by M. Deshayes, the term *keel* is not applicable,) runs round the base of the shell, and the aperture is sub-trigonal. The English shell also appears to be smaller than the French one. On these grounds, notwithstanding the distrust I feel at dissenting from Mr. Wood's opinion, I consider the present to be a distinct species. In the character and position of the keel, *P. tropis* corresponds with *P. exacutus*; but in the recent shell, the whorls enlarge more rapidly and are more convex, both above and below; the umbilicus is deeper, and the aperture wider, than in the present species.

Size.—Diameter, not quite 3-20ths of an inch.

Locality.—Hordwell.

No. 50. PLANORBIS HEMISTOMA. *Sowerby.* Tab. XV, fig. 11 *a—d.*

PLANORBIS HEMISTOMA. *Sowerby.* 1818. Min. Conch., vol. ii, p. 91; t. 140, fig. 6.

P. testá minutá, depressá, lævi, superne profundé cavatá, subtus subplaná, ter quaterve circumvolutá; anfractibus vix involventibus, ad peripheriam sub-angulatis, supra convexi-

usculis, ad marginem sinistram acutè angulatis; infra subplanis; aperturá parum obliquá subtrigoná.

A minute, smooth, much depressed shell, deeply concave on the upper side, almost flat on the under side: volutions three or four, very slightly convex above, nearly flat beneath, and compressed, almost angulated at the periphery above the middle of the shell. The whorls can scarcely be described as embracing, inasmuch as the under surface is wholly exposed, although the upper surface is partly concealed by the succeeding whorl; the inner margin is bent, rather abruptly, towards the apex, and presents a conspicuous angle, which runs round the cavity. The aperture is oblique, but not much so, and subtrigonal, having the lower margin rounded.

This species somewhat resembles *P. elegans*; but it is smaller and more compressed, and the subangulated periphery and flatness of the whorls impart a triangular form to the aperture very different from the roundish, heart-shaped aperture of that species. In *P. biangulatus*, the whorls are more convex, and the aperture is consequently almost obcordate.

Size.—Diameter, 1-10th of an inch nearly.

Localities.—Hordwell; Plumstead; Sundridge; Rotherhithe.

No. 60. PLANORBIS ELEGANS. *F. E. Edwards.* Tab. XV, fig. 12 *a—d.*

P. testá minutá, politá, superne profundè cavatá, subtus parum cavatá; quater vel quinques circumvolutá, anfractibus lineis incrementi notatis, ad peripheriam rotundatis; supra convexis, ad marginem sinistram angulatis; infra convexiusculis; singulo fere trientem antecedentis obtegenti: aperturá parum obliquá, obcordatá.

This very elegant little Planorbis is found in great abundance on Headon Hill, in a deposit immediately above the upper fluvio-marine formation, associated with *Bulimus politus*, *Melanopsis carinatus*, *Melanopsis buccinoidea*, a species of *Neritina*, as yet undescribed, and *Melania muricata*. It is a small polished shell, deeply but not widely hollowed out on the upper disc, and slightly concave, almost flat, beneath: volutions four or five, rounded on the periphery, marked by conspicuous lines of growth nearly perpendicular to the axis, very convex, and presenting a sharpish angle running round the inner margin, on the upper surface, and but slightly convex beneath; each volution embraces nearly a third of the one preceding it. The aperture is of a roundish heart shape, and very slightly oblique.

Size.—Diameter, 3-20ths of an inch.

Localities.—The deposit in which this *Planorbis* principally occurs is a transition bed between the upper fluvio-marine and the pure fresh-water formations in Headon Hill. I have also found it, but very sparingly, in the upper fluvio-marine formation at Hordwell, and in the lower fluvio-marine or transition bed which intercalates the upper series of the true marine and the lower fresh-water formations at Mead End.

No. 61. PLANORBIS BIANGULATUS. *F. E. Edwards*. Tab. XV, fig. 13 *a—d*.

P. testá parvá, compressiusculá, utrinque parum, sed fere equaliter cavatá: anfractibus quinis, singulo antecedentem paucillulo involventi; supra convexis, ad marginem sinistram angulatis; subtus convexiusculis, ad marginem externam obscurè crenulatis: aperturá irregulariter obcordatá, vix obliquá.

A small, somewhat depressed shell, slightly and nearly equally hollowed out on both sides, but rather more so above than beneath. It is formed of four or five volutions, convex on the upper side, and obtusely angulated round the cavity in consequence of the somewhat abrupt inflection of the inner margin toward the preceding volution; nearly flat on the under side, and obscurely crenulated near the outer margin. The periphery presents two angles; one, rather obscure, near the middle; the other, more prominent, runs round the margin of the lower disc. The aperture is slightly oblique, and of a short heart shape, but irregular in its form, owing to the greater convexity and the angulated inner margin of the upper surface of the whorl.

This appears to be a well-marked species; the double angle on the periphery and the crenulated under surface are characters which are not found in any other of the Eocene species.

Size.—Diameter, 2-10ths of an inch.

Localities.—Hordwell, as well in the pure fresh-water, as in the upper fluvio-marine formation; and at Mead End, in the lower fluvio-marine or transition bed before mentioned.

No. 62. PLANORBIS SOWERBYI. *Bronn*. Tab. XV, fig. 9 *a—d*.

PLANORBIS SOWERBYI. *Bronn*. 1838. *Lethæa geognost.*, p. 1011, t. xl, fig. 17 *a—c*.

P. testá parvá, depressá, utrinque parum et fere equaliter cavatá: anfractibus ternis vel quaternis, rapidè crescentibus; supra convexis, infra subplanis, ad peripheriam carinatis, singulo dimidium antecedentis obtegenti, cariná inferiori; aperturá elongato-cordatá, per-obliquá.

The present species appears to be rare. It is a small depressed shell, slightly and nearly equally hollowed out on both surfaces; but the umbilical cavity is the wider and deeper of the two. The volutions are three or four, enlarging rapidly, convex above, nearly flat beneath, and bearing a sharpish keel on the periphery, formed by the compression of the outer margins, a little below the middle of the shell. The whorls are much concealed, each embracing nearly half of the preceding one, and the aperture is very oblique, and of an elongated heart shape.

This shell appears to me, as I have already stated, to have been mistaken by M. Bronn for that described by Mr. Sowerby as *P. lens*, and to have been correctly

referred to a distinct species. It certainly presents a general resemblance to *P. lens*; but the upper side is more arched, the under side flatter, the whorls enlarge more rapidly, and the margins are more compressed and more acutely carinated than in that species; the umbilical cavity, also, is not so deep, and the aperture is of a more oblique and of a more elongated heart shape.

In the rapidly increasing size of the whorls and the condition of the marginal keel, the present species presents an analogy with the recent *P. exacutus* (Gould); but in the latter shell, the upper sides of the whorls are not concealed, the under sides are more convex, the umbilical cavity is deeper, and the aperture is almost obcordate. In *P. tropis* the shell is more compressed, the whorls enlarge more slowly, and the umbilical cavity is wider.

Size.—Diameter, 2-10ths of an inch.

Locality.—Sconce.

PLANORBIS CYLINDRICUS.—Mr. Sowerby has described a shell under this specific name, (Min. Conch., vol. ii, p. 90, t. 140, fig. 2,) the distinguishing characters of which are the vertically flattened, adpressed volutions, concentrically striated on the under surfaces, and the oblong quadrangular aperture. I have not met with any specimen which presents these characters; and as the original specimen, unfortunately, has been broken, I cannot give any description or figure of the species. It is not improbable that the shell described by Mr. Sowerby was a fragment, consisting of the early volutions of one of the larger species I have described, possibly of *P. rotundatus*, in which the whorls, in the young state, are somewhat adpressed and the aperture is subquadrate.

Genus 14th. ANCYLUS.* *Geoffroy*.

ANCYLUS, *Geoffroy*, 1767; *Müller*, 1774; *Draparnaud*, 1805; *De Roissy*, 1805; *Férussac*, 1819; *Lamarck*, 1820; *Blainville*, 1825; *Guilding*, 1821.

PATELLA (spec.), *Linnæus*, *Bruguière*, *Montagu*.

HELICION (spec.), *Montfort*, 1810.

ANSULUS vel ANSYLUS, *Gray*, 1840.

Gen. Char.—Patelliform, thin, obliquely conical, sinistral; apex rather pointed, compressed, not lengthened nor spiral, turned sidewise towards the right margin and backwards, not marginal: aperture oval or oblong, margins simple.

This genus, first withdrawn by Geoffroy from the *Patellæ*, was rejected both by Linnæus and Bruguière, but was revived by Draparnaud, and placed near the *Limnæidæ*, on account of the similarity between the animal and those of *Limnæa* and *Planorbis*. Férussac, who had noticed the occasional ascent of the animal to the surface of the

* Etym. Ἀγκύλος, crooked, twisted.

water, and assumed that this was for respiration, also placed the genus among the aquatic Pulmonata. On the other hand, Lamarck and Blainville, although they adopted the genus, retained it, provisionally, the former among the *Calyptracea*, the latter among the *Scutibranchia*. Subsequently, the Rev. Mr. Guilding, in his 'Zoology of the Caribbean Islands,'* gave the generic characters of the animal, and described the respiratory apparatus as consisting of a small branchial plume placed on the left side, near the excretory orifice; and M. Deshayes, misled by this description, has, in the 2d edition of Lamarck's 'Histoire Naturelle,' rejected the supposition of the animal being a pulmonated mollusc. The more recent observations of the Rev. G. M. Berkeley† have shown, however, that the animal, in its organs of respiration, resembles those forming the present order, and that it is, in fact, a true pulmonated mollusc. The respiratory orifice is protected by a valvular enlargement of the margin of the mantle, which, it is conjectured, was mistaken by Mr. Guilding for a branchial plume. The genus, as originally proposed, embraced as well dextral as sinistral species. The dextral species have been withdrawn by Mr. Gray, under the generic name *Velletia*, (*Acroloxus*, Beck;) a division the necessity for which has been questioned, but which, for the reasons stated under the genus *Velletia*, I have adopted, and the present genus is therefore confined to the sinistral species.

The animal is hermaphrodite, but the union of two individuals is necessary for fecundation: the head is furnished with two cylindrical or triangular retractile tentacles, oculated at their bases; the foot is short, and attached to the abdominal mass, and the mantle is large and free, with a simple continuous margin. The living species are not numerous; one only, *A. fluviatilis*, is found in this country and in central and southern Europe; the rest occur principally in central America. They live in fresh-water, preferring gentle streams.

Four fossil species have been described and referred to this genus, all from the Eocene formations, viz. *A. elegans* (Sow.), from Hordwell; *A. depressus* (Desh.), from the neighbourhood of Versailles; *A. deperditus* (Desmar.), from the fresh-water limestone of Ulm; and *A. compressus* (Nyst.), from the neighbourhood of Antwerp. The first two are *Velletiæ*; the descriptions and figures of the last two are insufficient for determining to which genus they belong.

No. 63. ANCYLUS? LATUS. *F. E. Edwards*. Tab. XIV, fig. 15 a-b.

A. testá conoideá, depressá, latá; vertice submediano: aperturá oblongá, obovatá.

The imperfect state of the only specimen I possess, prevents my doing much more than to record the occurrence of this shell, which I refer to the present genus with hesitation. It is distorted at the posterior extremity, and presents the appearance of

* 'Zoological Journal,' vol. iii, p. 535.

† Ibid., vol. v.

a sinus somewhat resembling that in the shells of the *Limacina*, but greatly exaggerated; this, most probably, is due to the accident which produced the distortion, or to some cause similar to that to which Mr. Gray attributes the sinus in Michaud's *A. sinuosus*. The shell also is thicker than is usual in this genus; but the shelly matter has been absorbed and replaced by carbonate of lime, and a slight thickening may have taken place in that process. It may be described as sub-conical, and much depressed, with the vertex about half way between the margin and the middle; the aperture is oblong and widely obovate. In the great depression of the shell this species resembles *A. (Velletia) depressus*, Desh.; but the aperture is more equally rounded at the extremities.

Size.—Length about $\frac{1}{4}$ of an inch; width, about 2-10ths.

Locality.—Sconce.

Genus 15th. VELLETTIA.* Gray.

ACROLOXUS, Beck, 1837.

VELLETTIA, Gray, 1840.

Gen. Char.—Dextral, with the apex turned sidewise towards the left margin; in all other respects resembling *Ancylus*.

The dextral forms referred to *Ancylus* were first withdrawn by Beck, under the generic name *Acroloxus*, but without any description; the genus was afterwards defined by Mr. Gray under that of *Velletia*. The animal, so far as its organisation is known, as well as the shell, resembles *Ancylus*, except that it is dextral and not sinistral; and the genus has not been received without question, inasmuch as, apparently, it depended on a character insufficient in itself for generic distinction. Mr. W. Thompson, however, in his 'Remarks on the dentition of British Pulmonifera,' to which I have before referred, states that, in their dentition, "*Ancylus* and *Velletia* present widely distinct characters, clearly showing that they do not belong to one genus. In *Ancylus* there are thirty similar lateral teeth in a straight line on each side of the central tooth, and then there is a slight curve through a series of six more teeth, where a trifling change in their form occurs. In *Velletia*, on the contrary, no part of the horizontal row is straight; its central part is much arched, and is composed of the central tooth and twelve lateral teeth on each side, which do not alter much in form. Then comes one tooth of a different form, and lastly, six more on each side, which latter are in a slight curve." A closer examination of the comparative anatomy of the two animals will probably afford additional reasons for the separation of the present genus; in the meantime, I have retained it on the ground of the different characters of the dental apparatus recorded by Mr. Thompson.

The living species are very few: one, *V. lacustris*, is found in this country; the

* A name without signification, used by Mr. Gray on the principle advocated by Fabricius.

others occur principally in the West Indies and South America. The two species before mentioned, *V. elegans* (Sow.), and *V. depressa* (Desh.), are, I believe, the only fossil species hitherto described.

No. 64. VELLETTIA ELEGANS. *Sowerby*. Tab. XIV, fig. 2 *a—d*.

ANCYLUS ELEGANS. *Sow.* 1826. *Min. Con.*, vol. vi, p. 64, t. 533.

— — *Lyell and Murch.* 1829. *Sur les dépôts, &c. du Cantal.*

— — *Bouillet.* 1836. *Cat. des coq. foss. de l'Auvergne.*

A. testá convexá, subconicá, radiatim subtilissime striatá; vertice obliquo, excentrico, sub-marginali: aperturá longitudinali, ob-ovali.

This elegant shell, for the discovery of which we are indebted to Sir Charles Lyell, is convex and subconical, with an oblique excentric vertex, placed near the posterior extremity. The surface, under a high magnifying power, presents exceedingly fine striæ, radiating from the vertex towards the margin; the mucro is frequently eroded. The aperture is longitudinal and obovate, the wider part being the anterior extremity.

The shell, in this species, is not so oblong and compressed as in the recent *V. lacustris*, and the vertex is nearer the margin. In the French species, *V. depressa*, (Desh.) the shell is more depressed, the anterior extremity is wider, the posterior extremity is narrower, and the vertex is more nearly central.

Size.—Elevation rather more than 1-20th of an inch; length rather more than 3-20ths; greatest width 2-20ths.

Localities.—Hordwell. *French*: Veurs in the Cantal.

Family—AURICULIDÆ.

Genus 16th. MELAMPUS. *Montfort*.

VOLUTA, (sp.) *Linn.*

MELAMPUS, *Montf.*, 1810; *Beck*, 1837; *Gray*, 1840.

CONOVULUS, *Lam.*, 1812; *Cuvier*, 1817; *Beck*, 1837.

AURICULA, (sp.) *Lam.*

ALEXIA, *Leach*, 1819

CONOVULA, *Féruss.*, 1819.

PEDIPES, (sec. C.) *Blainville*, 1825.

MELAMPUS, *Lowe*, 1832.

CONOVULUM, *G. Sowerby, jun.*, 1841.

RHODOSTOMA and MELAMPUS, *Swain*, 1840.

Gen. Char.—Shell oval or elongate, sub-cylindrical; generally smooth, and with a short conoidal spire: aperture rather long and narrow; peritreme continuous, with two

or three folds upon the columella; outer lip sometimes simple and sharp, sometimes thickened, and occasionally denticulated within.

The genus *Auricula*, as described by Lamarck, was confined to land shells; and that of *Conovulus*, proposed by him for certain shells which he considered to be fluviatile, he afterwards suppressed under the impression that they also were land shells. The animals which have been referred to the genus *Auricula* have, however, various habitats: some are terrestrial; others live in ponds or fresh-water marshes; and others, again, are inhabitants of the sea, or are found in brackish water near the mouths of rivers, or in salt-water marshes. Some of these groups are distinguished by peculiarities in the animals or their shells; and they, accordingly have been withdrawn from *Auricula* as distinct genera. The present genus, which corresponds with Lamarck's *Conovulus*, was first separated by Montfort for a shell from the shores of Cayenne. The animal resembles that of *Limnæa*; the head is probosciform, notched in front, and furnished with two filiform contractile tentacles, slightly annulated, and oculated at their inner bases; the foot is obovate and obtuse before and behind; the mantle united to the neck, with the exception of a perforation at the junction of the outer and inner lips. The *Melampodes* are strictly marine animals, although they are frequently found in brackish waters near the mouths of rivers or salt-water marshes; they are capable of living out of water for a long period, and Mr. Lowe, in fact, characterises them as amphibious.

The living species are not numerous; three are inhabitants of our own shores; the others are found principally in warm climates. The fossil species hitherto described are from the Eocene and later formations, and have for the most part been referred to *Auricula*.

The peculiarity, observed by Montagu in *Auricula denticulata*, of the columella not extending further than the upper part of the body whorl, is stated by Mr. Gray to be common to most species in the family; and to be caused generally by the animal absorbing the septa which separate the upper whorls, and thus converting the spire into a single cavity, as it enlarges the shell at the edges of the aperture.

No. 65. MELAMPUS TRIDENTATUS. *F. E. Edwards*. Tab. X, fig. 4 *a—b*.

M. testá ovato-ventricosá, crassá, lævi; spirá conico-depressá, apice obtusiusculo; anfractibus sex vel septem, sub-cylindræis, superne depressiusculis: aperturá auriformi, angustá, labro interne incrassato, antice reflexo: columellá marginatá, tridentatá.

A thick, smooth, ovate, ventricose shell, with a short conical spire and a bluntish apex; volutions six or seven, sub-cylindrical, and somewhat depressed round the suture; the aperture long, narrow, and ear-shaped; the outer lip rather enlarged and inflected in front, and thickened internally, presenting an elevated sharpish ridge, which extends from a little above the middle of the whorl to the columellar lip. The colu-

mella is furnished with three distinct folds, of which the middle one is the largest and the posterior one the smallest; the outer lip is slightly reflected, but not so as to cover the umbilicus.

This species, in its general form, much resembles *C. pyramidalis* (Sow.), but the whorls are not so convex, and the sutures are nearer to each other, so that the spire is shorter and the aperture longer and narrower. The columella also presents three folds, instead of the two which distinguish the crag species.

The shell figured is, I believe, unique; it is one of the many valuable additions made to our Eocene fauna by the "English Natural History Society," under the able direction of Mr. Charlesworth. It forms part of the collection in the Museum of the Philosophical Society of York, who have kindly allowed me the use of it for description.

Size.—Axis, 7-10ths of an inch nearly.

Locality.—High Cliff, Hampshire.

Genus 17th. PEDIPES.* *Adanson*.

PEDIPES, *Adanson*, 1757.

— *Féruss.*, 1819; *Menke*, 1828; *Desh.*, 1832; *Beck*, 1837; *Bronn*, 1838; *Gray*, 1839; *Swain.*, 1840; *G. Sow., jun.*, 1842; *Desh.*, 1843.

— (sec. B), *Blainville*, 1825.

POLYDONTA (sp.), *Fischer*.

BULIMUS (sp.), *Bruguière*.

TORNATELLA (sp.), *Lamarck*.

AURICULA (sp.), *Reeve*.

Gen. Char.—Shell small, thick, sub-globose or oval; spire pointed, not much elevated: aperture sub-ovate or linear; outer lip thin, sharp, with one or two folds within; columella with two folds; one large fold on the penultimate whorl.

This genus was proposed by Adanson on a small marine shell from the coast of Senegal; and, although it was confounded by Bruguière with *Bulimus*, and by Lamarck with *Tornatella*, it appears to have been generally adopted. The animal, which Adanson describes as very small in comparison with the shell, is furnished with two filiform tentacles, oculated at their inner bases; the muzzle is rounded and notched in front, as in *Melampus* and *Limnæa*; the foot is elliptical and divided into lobes separated by a deep transverse furrow; the anterior lobe is transverse, wider than long, and rounded in front; the posterior one longer than wide, and somewhat narrowed

* Etym. Adanson gave the name *Pietin* (quasi *pieton*, a walker,) to this genus on account of the singular way in which the animal walks, and the Latin name, *Pedipes*, imposed by him, has probably reference to this peculiarity.

behind. The mode of progression, as described by Adanson, is as follows: the animal, having attached itself by the posterior lobe, protrudes the anterior lobe as far as the hollow part of the foot, which is capable of considerable extension, will permit; and the posterior lobe is then advanced until it touches the anterior one. This movement, quickly repeated, enables the animal to advance with a rapidity apparently disproportioned to its size. Adanson states that, on the animal emerging from or withdrawing into the shell, the lobes pass one on each side of the large posterior fold, which, being continued into the interior of the shell, keeps them constantly separated.

Only three or four living species are known, all from tropical regions. Of fossil species, M. D'Orbigny, in his 'Prodrome de Paléontologie,' cites five, which he refers to this genus, from the Eocene formations in France.

No. 66. PEDIPES GLABER. *F. E. Edwards*. Tab. X, fig. 9 a—c.

P. testá minutá, ovali, ventricosá, glabrá; anfractibus quaternis vel quinis, ad suturam adpressis; spirá mediocri: aperturá semiovali; labro uniplicato, antice intus incrassato; plicá columellari posteriori, angulatá, flexá.

A minute, oval, ventricose and smooth shell; volutions four or five, adpressed at the posterior margins so as to form a narrow band round the suture; the spire moderately elevated: the aperture semioval; the outer lip with a sharp edge, and furnished with a fold placed about the middle, and in front of which the lip is thickened internally; the large columellar fold on the penultimate whorl is angulated and bent so as to present a slight concavity on the anterior surface, and a corresponding convexity on the posterior one.

This exceedingly rare and interesting shell forms part of Mr. D'Urban's valuable collection.

Size.—Axis, 2-20ths of an inch nearly; diameter, rather more than 1-20th.

Locality.—High Cliff.

SUB-ORDER—*PHANEROPNEUMONA* (Gray), *OPERCULATA*, (Férussac.)

Family—CYCLOSTOMIDÆ.

Genus 18th. CYCLOTUS.* *Guilding*.

CYCLOTUS, *Guild.*, 1840, (fide *Swainson*.)

POTERIA, *Gray*, 1840.

APEROSTOMA, *Troschel, Pfeiffer*, 1847.

CYCLOTUS, *Gray*, 1850.

* Etym., *κυκλωτος*, rounded.

Gen. Char.—Spire sub-turbinate, depressed, or discoidal; apex obtuse; whorls rounded: aperture nearly circular, with a small siphon at the posterior extremity; peristome simple, sometimes reflected; widely umbilicate: operculum thick, calcareous, formed of two laminæ with a groove on the edge between them; outer surface rather concave; whorls numerous, enlarging gradually, with the outer edge reflected, forming a spiral fringe.

The genus *Cyclostoma*, as originally proposed by Lamarck, rested entirely on the circular form of the aperture, a character which applied as well to land as to marine and fresh-water species, and brought together animals essentially different, not only in their organisation, but in the structure of their shells. From this heterogeneous group, Draparnaud withdrew the marine species, and restricted the genus to the land and fresh-water species; and Lamarck afterwards formed for the marine and fresh-water species the genera *Scalaria*, *Delphinula*, *Paludina* and *Valvata*, and confined the genus to the free-air breathing land species. The animal is unisexual and operculated, with a probosciform head, furnished with two subulate annulated tentacles, oculated at their external bases; the respiratory opening, unlike that of the preceding sub-order, is largely open in front, resembling that of many of the branchiated molluscs. These characters separate the genus and its sub-genera as a distinct group among the pulmonated molluscs. The modification of the organs of respiration, to which many zoologists have attached great importance, has been considered by others as a character of comparatively small value; and the resemblance which the animal of *Cyclostoma* presents to that of *Turbo*, in many important particulars, induced Cuvier to disregard the peculiarity of the respiratory apparatus, and to place the genus in the same family as *Turbo*; and M. Deshayes* has suggested that the *Cyclostomidæ* should form a distinct group near to or among the *Turbinacea*. Such an arrangement, however, cannot consistently be adopted in any system in which the mode of respiration is admitted as an ordinal character; and consequently the *Cyclostomidæ* are retained, almost universally, among the pulmonated molluscs.

As ultimately restricted by Lamarck, the genus *Cyclostoma* comprised two groups, which presented distinct forms of the operculum; that appendage being formed, in one group, of a few rapidly enlarging whorls, and, in the other, of numerous slowly increasing whorls. Each of these groups comprised species in some of which the shells were more or less widely umbilicated, and in others imperforate, or nearly so. Montfort availed himself of the condition of the umbilicus, a character in itself of little generic value, and separated the widely umbilicated species under the generic name *Cyclophorus*, retaining the imperforate species for his genus *Cyclostomus*; but the characters presented by the opercula were altogether overlooked or disregarded. Each genus, therefore, comprised species presenting different forms of operculum;

* Lam. Hist. naturelle, 2d edit., vol. viii, p. 351.

and numerous genera and sub-genera have, in consequence, been withdrawn by Gray, Guilding, Troschel, Pfeiffer, and others, on characters taken principally from modifications of the operculum. The present genus was separated by Mr. Guilding, from *Cyclophorus*, for some shells from the West Indies; it is distinguished by the thick calcareous operculum, formed of two distinct layers. The animal, so far as it is known, resembles that of *Cyclostoma*.

The recent species are not very numerous. Mr. Gray, in his Nomenclature of Molluscous Animals, &c., in the British Museum, part "Cyclophoridae," gives a list of twenty-eight species, all of which are from the West Indian Islands, or from Central or South America.

No. 67. *CYCLOTUS CINCTUS*. *F. E. Edwards*. Tab. X, fig. 1 *a—c*.

C. testá conico-depressá, lineis tenuibus spiraliter cinctá; anfractibus quinque vel sex, rotundatis, ultimo paullo decurrenti: umbilico magno; aperturá sub-circulari.

This remarkably elegant shell is conical and somewhat depressed, formed of five or six rounded whorls, and ornamented with numerous, irregular, rather sharp, spiral, raised lines, some of which are more elevated than the rest; these lines are spread over the whole surface of the shell; but they are more crowded on the upper than on the under surface, and are very prominent in the umbilicus, where they are sometimes strongly decussated by the lines of growth. The last whorl is slightly decurrent; the aperture is nearly round, with the peristome a little reflected, but not much so; and the umbilicus is very wide, being nearly one third of the diameter of the shell.

Two or three detached opercula have been obtained by Mr. D'Urban, which present all the leading characters of the opercula of the living species; but, as yet, it cannot be determined to which of the two fossil species they belong. They are thick, testaceous, slightly concave externally, formed of five or six slowly enlarging whorls with the external fringe deeply grooved. One of them is represented by fig. 12 *a—b*, Tab. X.

This species has hitherto been found only at Sconce, where it occurs rather plentifully; but specimens with the shell preserved are rare.

Size.—Axis, 5-10ths of an inch; diameter, rather more than 6-10ths of an inch.

No. 68. *CYCLOTUS NUDUS*. *F. E. Edwards*. Tab. X, fig. 11 *a—b*.

C. testá ovato-conicá, levi; spirá mediocri; anfractibus quinque convexis: aperturá rotundatá, umbilico parvo.

A smooth ovately-conical shell, with a moderately elevated spire, formed of five convex volutions: aperture nearly circular; umbilicus narrow but deep.

The surface of the shell in this species is perfectly devoid of ornament, a character

which at once separates it from the preceding species; the casts, in which state specimens are most commonly found, may be distinguished by the more elevated spire, the less effuse base, and the narrower umbilicus.

Size.—Axis, half an inch; diameter, nearly the same.

Locality.—Sconce, where, although it is not by any means rare, it is not so common as *C. cinctus*.

Genus 19th. CRASPEDOPOMA.* Pfeiffer.

CRASPEDOPOMA, Pfeiff., 1847.

VALVATA (sp.), Menke.

BOLANIA, Gray, 1842.

Gen. Char.—Shell sub-turbinate; last whorl slightly produced, straight, attenuated towards the aperture, which is circular; peristome continuous, simple, slightly thickened; axis imperforate or narrowly umbilicate.

This is one of the genera, separated by Pfeiffer, (*Zeitsch. für Malak.*) depending principally on the characters presented by the operculum. That appendage in the present genus differs from the operculum of *Cyclotus*, in being horny instead of calcareous; and in having, on the outer edge of the internal disc, a circular prominence which overlaps the margin of the aperture; the external disc is also flat, and not concave, as in *Cyclotus*. The shell is distinguished by the attenuation of the last whorl, which gives a contracted appearance to the aperture, a character not found in any other group of the *Cyclostomidæ*. Only two living species are known; both are from Madeira.

No. 69. CRASPEDOPOMA ELIZABETHÆ. *F. E. Edwards*. Tab. XIV, fig. 14 a—c.

C. testá parvá, conicá, perforatá; lineis spiralibus, numerosis, tenuissimis, ornatá; apice obtusiusculo: anfractibus quinis, rotundatis, ultimo decurrenti: aperturá circulari, intus incrassatá; umbilico angusto.

A small trochiform shell, ornamented with numerous fine, spiral, raised lines, and formed of four or five rounded volutions, the last of which is attenuated towards the aperture and slightly decurrent; the spire is moderately elevated, with a somewhat blunt apex: the aperture is nearly circular, and slightly thickened internally; the umbilicus is narrow.

Without the assistance to be derived from the operculum, it is scarcely possible to determine correctly to what genus the present shell should be referred. It has much the appearance of a *Valvata*; but the thickened peristome indicates its affinity to the

* Etym., *κράσπεδον*, a rim or border; *πωμα*, a lid, (the operculum.)

Cyclostomidæ, and the attenuation of the last whorl induces me to place it in the present genus, apparently the only one in the family to which that character belongs. I refer it, however, to *Craspedopoma* provisionally only, until, by the acquisition of more perfect specimens, its true position may be ascertained.

This elegant shell was discovered by Mr. D'Urban and myself, on a recent visit to the Isle of Wight, accompanied by Miss D'Urban, to whom, in commemoration, I have ventured to dedicate it. It is apparently very rare, and although we procured several specimens, not one had the shell preserved.

Size.—Axis, 4-20ths of an inch; diameter, 3-20ths nearly.

Locality.—Sconce.

HELICINA.—The shell described by Lamarck as *Helicina dubia* is found in the High Cliff sands, and at Barton; it is, however, a *Rotella*, and will be described in its proper place.

In order that this account of our Eocene pulmonated molluscs may contain all the species at present known, I subjoin the description of a shell acquired by me since the early part of this monograph was printed, and which I have referred to *Bulimus*, although the aperture is of a form unusual in that genus.

No. 70. BULIMUS HETEROSTOMUS. *F. E. Edwards*. Tab. XIV, fig. 1 *a—d*.

B. testá parvá, conicá; spirá elevatá, acutiusculá, apice deciduo; anfractibus septenis vel octonis, rotundatis, transversim regulariter lineatis; lineis tenuissimis, numerosis, per-obliquis: aperturá rotundo-ovatá, peristomate reflexo.

This shell has so much of the character and appearance of *Truncatella*, that I should be inclined to refer it to that genus; but it is found associated with land and true fresh-water shells only, in a formation which does not present any trace of marine origin. The nearly circular aperture resembles that of *Cyclostoma*; the transverse lination, however, is a character which, I believe, is not ever found in that genus. I have referred it to *Bulimus*, but with some hesitation. It is a small conical shell, with an elevated, tapering, pointed, spire, the apex of which is subject to decollation; the seven or eight whorls of which it is formed, are rounded, separated by a deep suture, and ornamented with fine transverse raised lines, which are numerous, regular, and very oblique; the aperture is roundedly ovate, apparently thickened within, and with

the margin slightly reflected. In specimens which have not attained the full size, the bases of the whorls are flattened and sharply angulated at the outer margins.

This species appears to be well characterised; it is separated by the striation and the form of the aperture, from the several small fossil species described by Lamarck and by Deshayes.

Size.—Axis 3-10ths of an inch; diameter not quite 3-20ths.

Localities.—Sconce and Headon Hill; apparently, it is very rare.

I cannot close the present Monograph without noticing certain oviform substances which occur, rather plentifully, in the fresh-water formation at Sconce, as to the nature and origin of which various opinions have been entertained. I have been fortunate enough, however, to obtain lately, specimens which appear to me to remove all doubt on the subject, and to show conclusively that these substances are, in fact, the remains of the eggs of some animal. The condition in which they most usually occur, is that of casts formed of the same material as the rock in which they are imbedded; they present great regularity of form, and resemble, in every respect, the internal cast of an egg. Occasionally only a hollow space, the impression of the egg, is found without the internal cast, and without the calcareous covering, which has been wholly absorbed; and sometimes, though more rarely, the covering of the egg itself occurs; but in that case the calcareous matter has always been replaced by carbonate of lime, and in this state the inside is sometimes empty—sometimes it is filled with the matrix. The absorption of the calcareous matter, and its occasional replacement by carbonate of lime, are the conditions in which, as we have already seen, the testaceous remains of Mollusca imbedded in the same formation are frequently found. The hypothesis that these substances are the casts or remains of eggs, appears to me to be the only one by which the different states in which they are found can be satisfactorily explained. Where the egg has been broken, the cavity of the shell has been filled by the fluid matrix, and the internal cast is formed. The eggs may, in some instances, have been broken accidentally; but they appear almost universally to have been broken by the young animal on effecting its escape; for one end of the casts is free, smooth, and regular in form; while the other end, apparently broken by the animal, is irregular and connected with the external matrix. If, on the other hand, the egg has been imbedded unbroken, only the cavity formed by it in the matrix remains; or if the covering of the egg is found, it is either quite empty, or small globules of the carbonate of lime, by which the shell has been replaced, are found attached to the sides. I assume therefore that the substances in question are the remains of eggs, but of what animals it is more difficult to determine. They are of different sizes, varying in length from 2-10ths of an inch to nearly two inches; in shape they are oval, rounded equally at both

TAB X.

Fig.

1. *Cyclotus cinctus*. No. 67, *p.* 117.
 - a.* Back view of specimen with the shell preserved.
 - b.* Front view of a cast.
 - c.* Back view of ditto.

2. *Helix globosa*. No. 16, *p.* 63.
 - a.* Front view of a cast of a shell in an intermediate stage of growth.
 - b.* Front view of a cast of a young shell.
 - c.* Back view of an adult specimen with the shell partly preserved.
 - d.* Front view of ditto.

3. *Helix tropifera*. No. 18, *p.* 64.
 - a.* Front view of a cast.
 - b.* Upper surface of ditto.
 - c.* Under surface of ditto.

4. *Melampus tridentatus*. No. 65, *p.* 113.
 - a.* Front view.
 - b.* Back view

5. *Helix D'Urbani*. No. 15, *p.* 62.
 - a.* Front view, nat. size.
 - b.* Ditto, magnified.
 - c.* Under surface, magnified.
 - d.* Upper surface „

6. *Helix omphalus*. No. 19, *p.* 65.
 - a.* Front view, natural size.
 - b.* Ditto, magnified.
 - c.* Upper surface, ditto.
 - d.* Under surface, ditto.
 - e.* Portion of a whorl, magnified.

Fig.

7. *Helix labyrinthica*. No. 20, *p.* 67.
 - a.* Back view, natural size.
 - b.* Under surface, magnified.
 - c.* Back view, ditto.
 - d.* Front view, ditto.
 - e.* Portion of the whorl magnified.

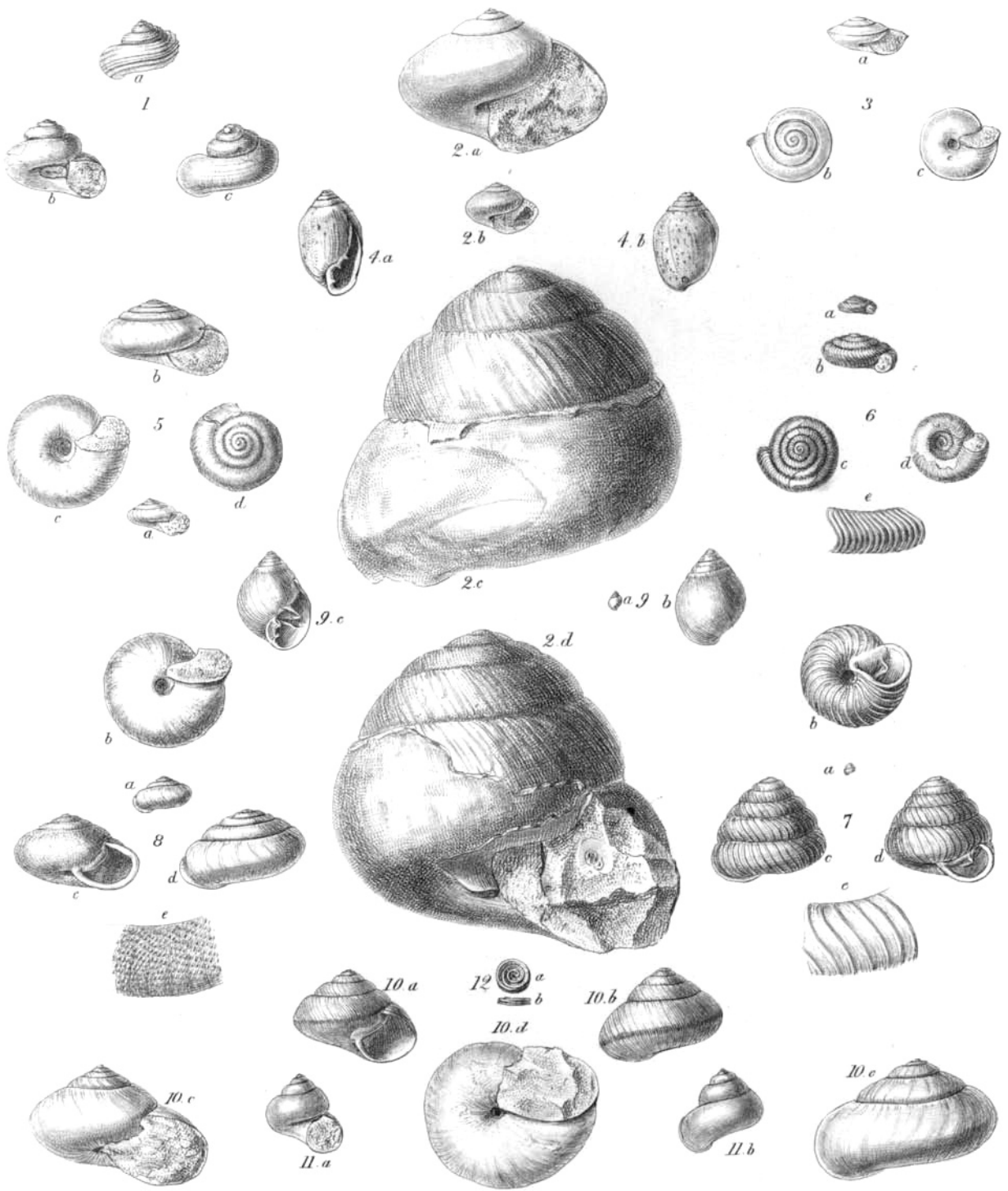
8. *Helix Vectiensis*. No. 14, *p.* 62.
 - a.* Back view, natural size.
 - b.* Under surface of a cast, magnified.
 - c.* Front view, magnified.
 - d.* Back view of a cast, ditto.
 - e.* Portion of the whorl, magnified.

9. *Pedipes glaber*. No. 66, *p.* 115.
 - a.* Back view, nat. size.
 - b.* Ditto, magnified
 - c.* Front view, ditto.

10. *Helix oclusa*. No. 17, *p.* 64.
 - a.* Front view of a specimen with the shell preserved.
 - b.* Back view of ditto.
 - c.* Front view of a cast.
 - d.* Under surface of ditto.
 - e.* Back view of ditto.

11. *Cyclotus nudus*. No. 68, *p.* 117.
 - a.* Front view.
 - b.* Back view.

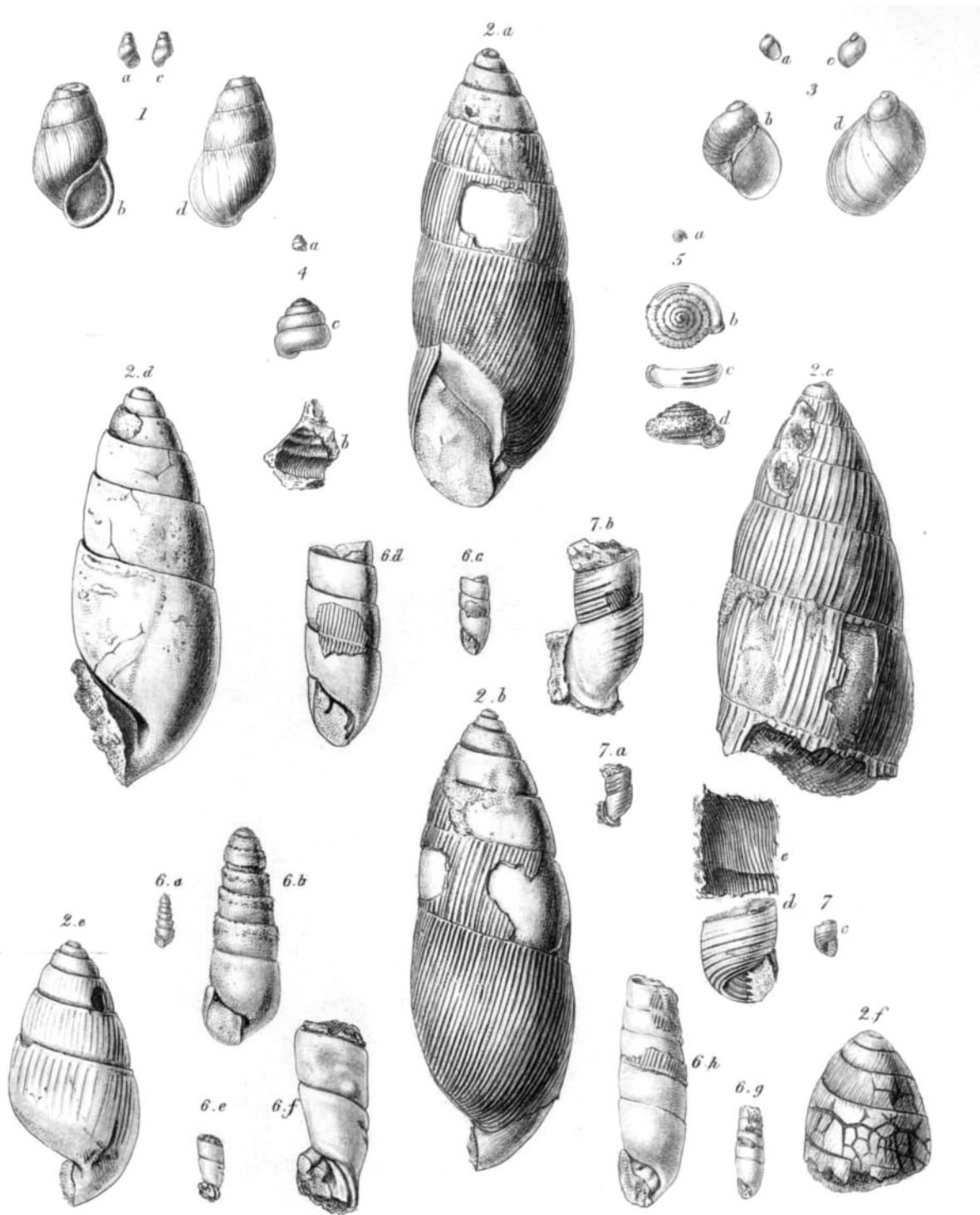
12. Operculum of *Cyclotus*.
 - a.* View of the outer disc.
 - b.* Side view.



TAB. XI.

Fig.

1. *Bulimus politus*. No. 24, *p.* 73.
 - a.* Front view, natural size.
 - b.* Ditto, magnified.
 - c.* Back view, natural size.
 - d.* Ditto, magnified.
2. *Bulimus ellipticus*. No. 23, *p.* 72.
 - a.* Front view
 - b.* Side view.
 - c.* Fragment of a large specimen in the Brit. Mus.
 - d.* Side view of a cast.
 - e.* Side view of a cast, young.
 - f.* Fragment from Primrose Hill. (*B. tenuistriatus*, G. Sow.)
3. *Succinea imperspicua*. No. 29. *p.* 81.
 - a.* Front view, natural size.
 - b.* Ditto, magnified.
 - c.* Back view, natural size.
 - d.* Ditto, magnified.
4. *Helix sub-labyrinthica*. No. 21, *p.* 69.
 - a.* Front view of a cast, natural size.
 - b.* Impression of the whorl, magnified.
 - c.* Back view, magnified.
5. *Helix Headonensis*. No. 22, *p.* 70.
 - a.* Upper surface of a cast. Natural size.
 - b.* Ditto, ditto, magnified.
 - c.* Portion of the whorl of ditto, magnified.
 - d.* Front view of ditto, magnified.
6. *Clausilia striatula*. No. 28, *p.* 79.
 - a.* Front view of a cast of a young shell, nat. size.
 - b.* Ditto ditto, magnified.
 - c.* Front view of cast with parts of the shell preserved, nat. size.
 - d.* Ditto, ditto, magnified.
 - e* and *g.* Views of casts of adult shells, showing the aperture, nat. size.
 - f* and *h.* Ditto ditto, magnified.
7. *Pupa perdata*. No. 26, *p.* 77.
 - a.* Back view of a cast (shell partly preserved), natural size.
 - b.* Ditto ditto, magnified.
 - c.* Front view of ditto, natural size.
 - d.* Ditto ditto, magnified.
 - e.* Impression of the whorls in the matrix, magnified.



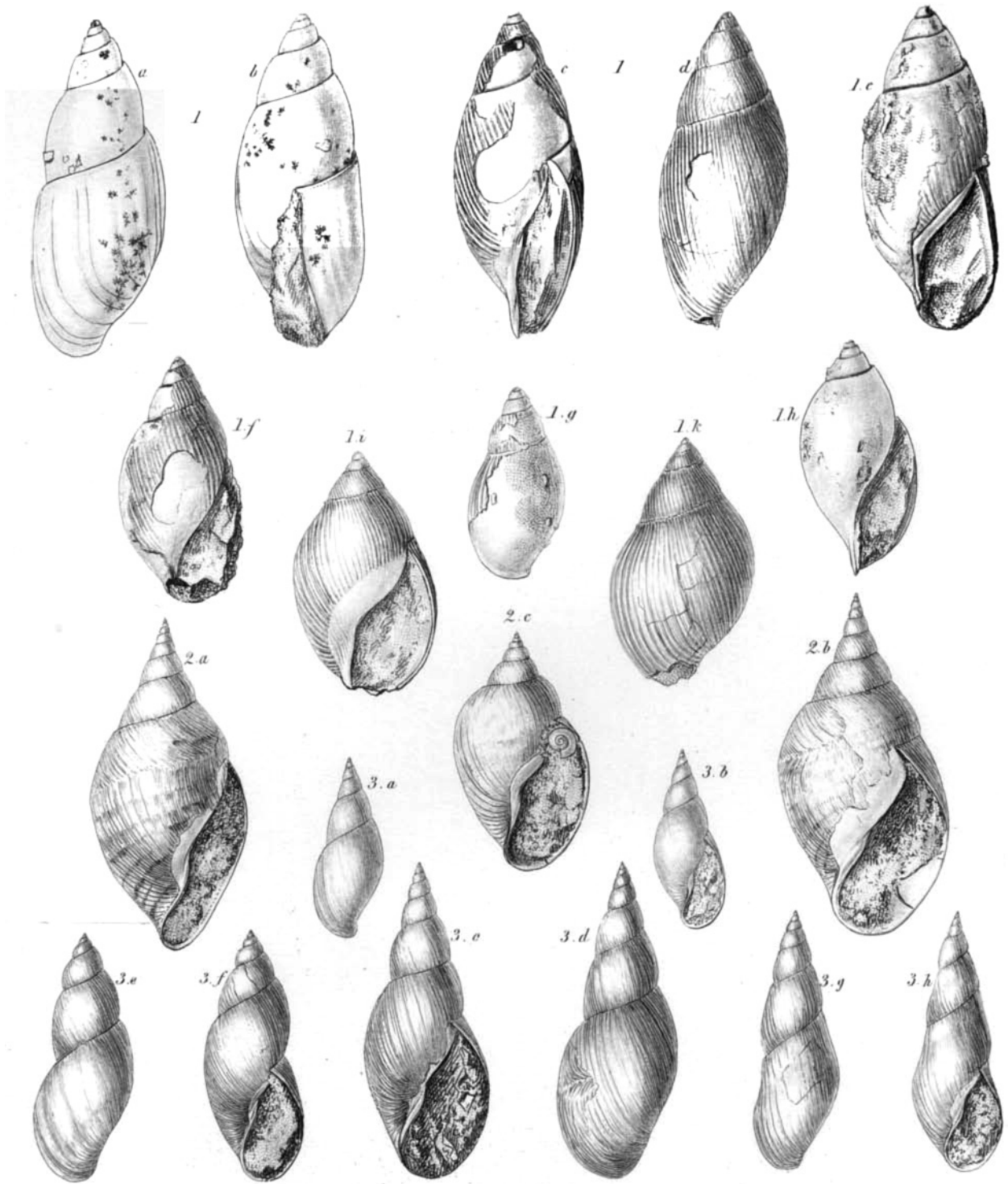
TAB. XII.

Fig.

1. *Achatina costellata*. No. 25, p. 75.
 - a.* Back view of a cast.
 - b.* Side view of ditto.
 - c.* Front view of a specimen with the shell partly preserved.
 - d.* Back view of ditto.
 - e.* Front view of a cast.
 - f.* Ditto of ditto, shell partly preserved. Young shell.
 - g.* Back view of a cast of a young shell.
 - h.* Front view of ditto.
 - i.* Back view, var. *abbreviata*.
 - k.* Front view, ditto.

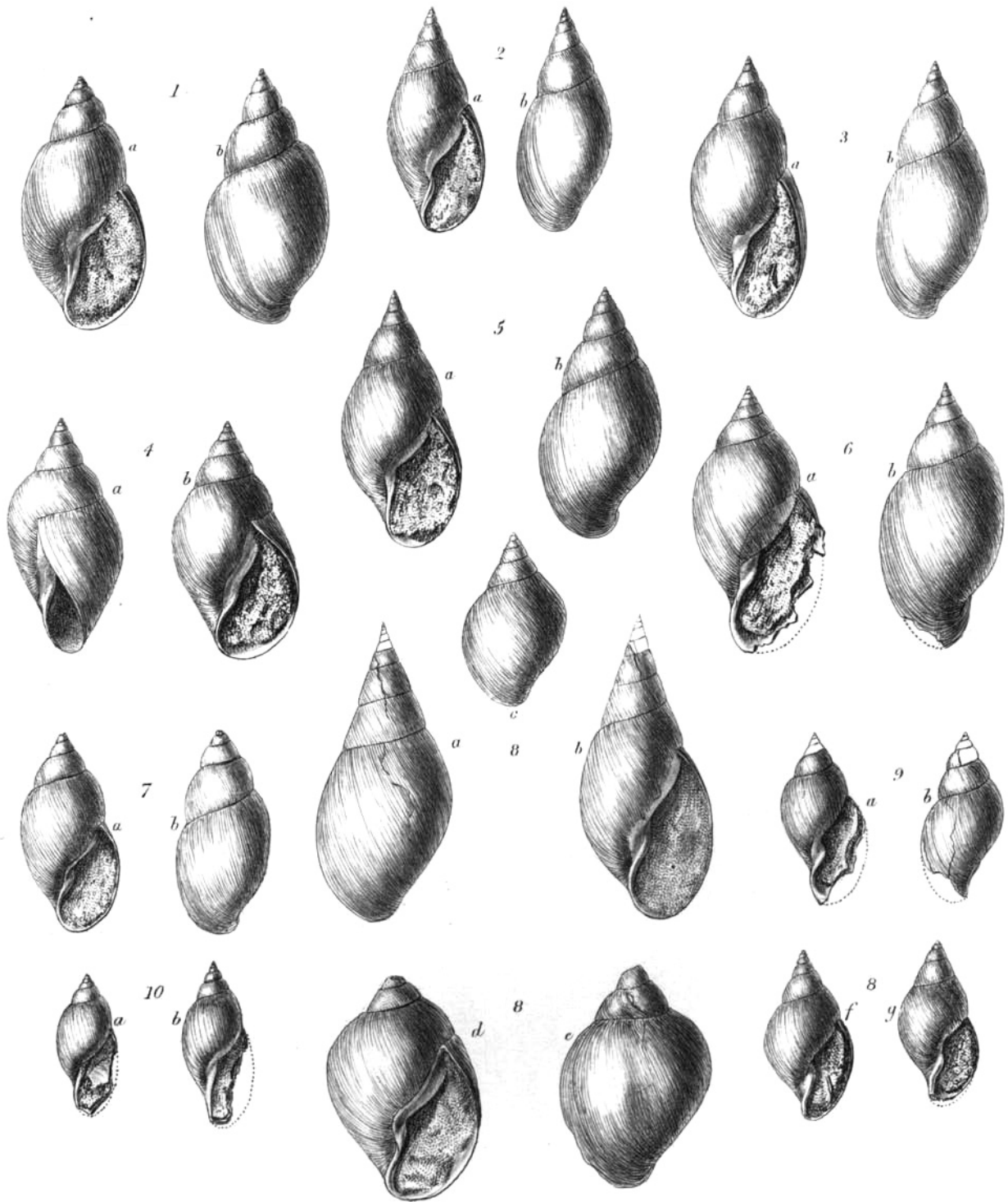
2. *Limnæa caudata*. No. 30, p. 83.
 - a.* Side view.
 - b.* Front view.
 - c.* Ditto, var. *abbreviata*.

3. *Limnæa longiscata*. No. 32, p. 85.
 - a.* Back view, intermediate state of growth.
 - b.* Front view, ditto.
 - c.* Front view, adult shell.
 - d.* Back view, ditto.
 - e* and *g.* Back views, var. *distorta*.
 - f* and *h.* Front views, ditto.



TAB. XIII.

- Fig.
1. *Limnæa subquadrata*. No. 41, *p.* 92.
 a. Front view.
 b. Back view.
- 2 and 3. *Limnæa pyramidalis*. No. 31, *p.* 84.
 a, a. Front views.
 b, b. Back views.
4. *Limnæa sublata*. No. 35, *p.* 88.
 a. Side view.
 b. Front view.
5. *Limnæa mixta*. No. 36, *p.* 88.
 a. Front view.
 b. Back view.
6. *Limnæa tumida*. No. 39, *p.* 91.
 a. Front view.
 b. Back view.
7. *Limnæa convexa*. No. 42, *p.* 92.
 a. Front view.
 b. Back view.
8. *Limnæa fusiformis*. No. 38, *p.* 90.
 a. Back view of specimen from Headon Hill.
 b. Front view, ditto.
 c. Back view of ditto. Var. *deformis*, intermediate size.
 d. Front view of ditto ditto adult shell.
 e. Back view of ditto ditto ditto
 f, g. Front views of shells from Sconce. Intermediate stage
 of growth.
9. *Limnæa columellaris*. No. 40, *p.* 91.
 a. Front view.
 b. Back view.
10. *Limnæa costellata*. No. 43, *p.* 93.
 a and *b.* Front views.



TAB. XIV.

Fig.

1. *Bulimus heterostomus*. No. 70, *p.* 119.
 - a.* Front view of a cast, nat. size.
 - b.* Ditto, magnified.
 - c.* Side view of ditto of the aperture, magnified.
 - d.* Impression of the whorls in the matrix, magnified.

2. *Velletia elegans*. No. 64, *p.* 112.
 - a.* View from above, nat. size.
 - b.* Ditto, magnified.
 - c.* Side view, ditto.
 - d.* View of the aperture, ditto.

3. *Pupa oryza*. No. 27, *p.* 78.
 - a.* Side view, nat. size.
 - b.* Ditto, magnified.

4. *Limnæa sulcata*. No. 33, *p.* 87.
 - a.* Front view.
 - b.* Back view.

5. *Limnæa cincta*. No. 45, *p.* 94.
 - a.* Front view.
 - b.* Back view.

6. *Limnæa angusta*. No. 46, *p.* 95.
 - a.* Front view.
 - b.* Back view.

7. *Limnæa recta*, No. 49, *p.* 96.
 - a.* Front view.
 - b.* Back view.

8. *Limnæa gibbosula*. No. 34, *p.* 87.
 - a* and *b.* Front views.
 - c.* Back view.

Fig.

9. *Limnæa minima*. No. 48, *p.* 96.
 - a.* Back view, nat. size.
 - b.* Front view, magnified.
 - c.* Back view, ditto.

10. *Limnæa fabulum*. No. 44, *p.* 93.
 - a.* Front view.
 - b.* Back view.

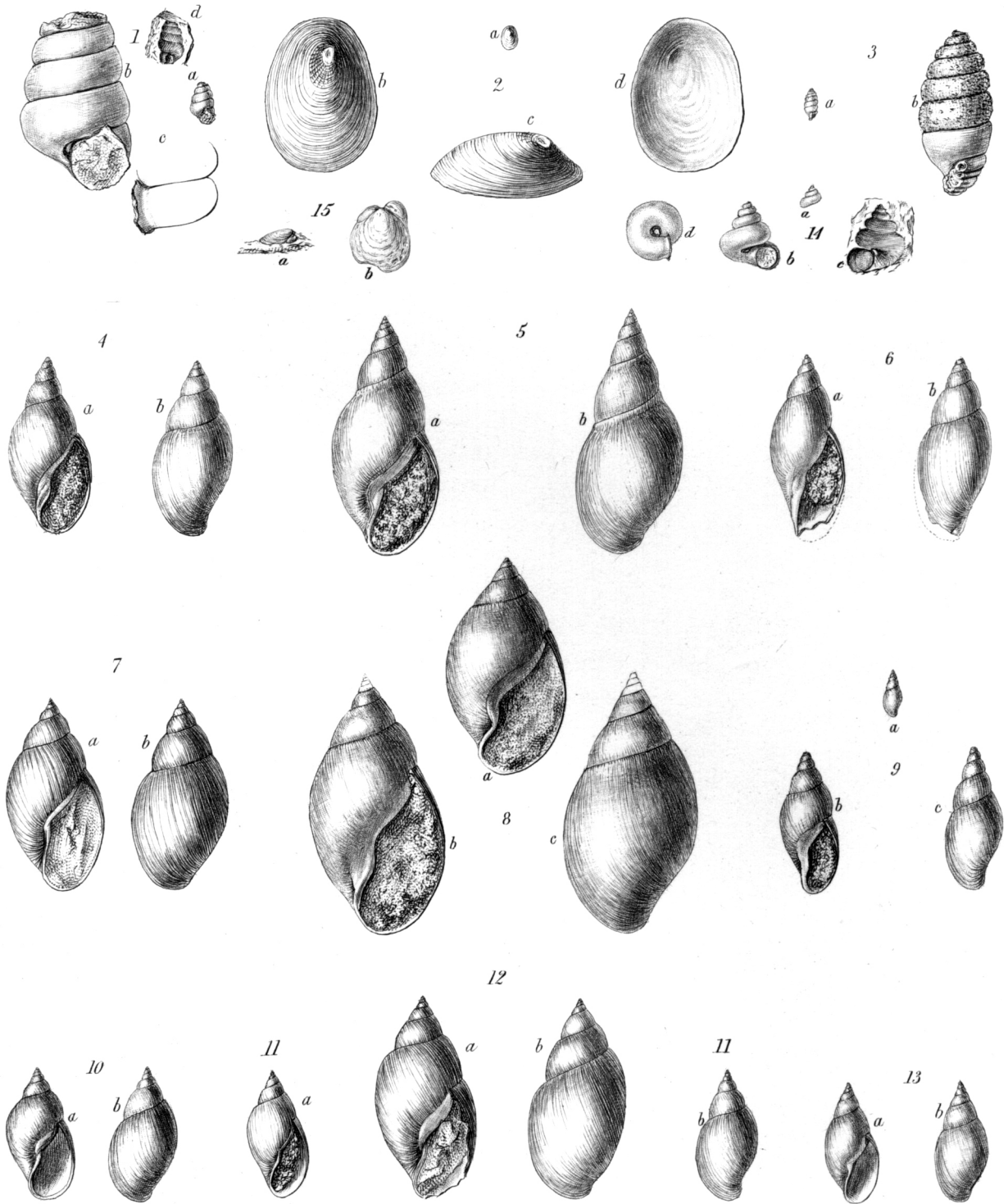
11. *Limnæa tenuis*. No. 50, *p.* 97.
 - a.* Front view.
 - b.* Back view.

12. *Limnæa ovum?* No. 37, *p.* 89.
 - a.* Front view.
 - b.* Back view.

13. *Limnæa arenularia*. No. 47, *p.* 95.
 - a.* Front view.
 - b.* Back view.

14. *Craspedopoma Elizabethæ*. No. 69, *p.* 118.
 - a.* Front view, nat size.
 - b.* Ditto, magnified.
 - c.* Impression in the matrix, magnified.
 - d.* View of the base ditto.

15. *Ancylus?* *latus*. No. 63, *p.* 110.
 - a.* Side view, nat. size.
 - b.* View from above, magnified.



TAB. XV.

Fig.

1. *Planorbis obtusus*. No. 53, *p.* 102.
 - a.* View of the upper disc (distorted specimen).
 - b.* Side view.
 - c.* Ditto (distorted specimen).
 - d.* View of the under disc.
 - e.* View of the upper disc.
2. *Planorbis platystoma*. No. 56, *p.* 103.
 - a.* View of the upper disc, nat. size.
 - b.* View of the under disc, magnified.
 - c.* View of the upper disc ditto.
 - d.* View of the aperture ditto.
3. *Planorbis oligyratus*. No. 55, *p.* 103.
 - a, b.* Views of the aperture.
 - c.* View of the under disc.
 - d.* View of the upper disc.
 - e.* View of the under disc of a cast.
4. *Planorbis rotundatus*. No. 52, *p.* 100.
 - a.* Side view showing the aperture.
 - b.* View of the under disc.
 - c.* View of the upper disc.
5. *Planorbis euomphalus*. No. 51, *p.* 99.
 - a.* View of the upper disc. Young shell.
 - b.* Ditto ditto ditto.
 - c.* Side view, showing the aperture in ditto.
 - d.* View of the under disc of ditto.
6. *Planorbis euomphalus*. No. 51, *p.* 99.
 - a.* Side view of adult shell.
 - b.* View of the under disc of ditto.
 - c.* View of the upper disc of ditto.
7. *Planorbis discus*. No. 54, *p.* 102.
 - a.* View of the upper disc, with the shell preserved (intermediate stage of growth).
 - b.* View of the under disc of a cast.
 - c.* Side view of a cast.
 - d.* View of the upper disc of a cast.

8. *Planorbis lens*. No. 57, *p.* 104.
a. View of the upper disc, nat. size.
b. Side view, magnified.
c. View of the under disc, ditto.
d. View of the upper disc, ditto.
9. *Planorbis Sowerbyi*. No. 62, *p.* 108.
a. View of the upper disc of a cast, nat. size.
b. Ditto ditto magnified.
c. Side view of ditto, showing the aperture, ditto.
d. View of the under disc of ditto, magnified.
10. *Planorbis tropis*. No. 58, *p.* 106.
a. View of the under disc, nat. size.
b. Ditto ditto magnified.
c. Side view of ditto ditto.
d. View of the upper disc ditto.
11. *Planorbis hemistoma*. No. 59, *p.* 106.
a. View of the under disc, nat. size.
b. Ditto ditto magnified.
c. Side view of ditto ditto.
d. View of the upper disc ditto.
12. *Planorbis elegans*. No. 60, *p.* 107.
a. View of the under disc, nat. size.
b. Ditto ditto magnified.
c. Side view of ditto ditto.
d. View of the upper disc ditto.
13. *Planorbis biangulatus*. No. 61, *p.* 108.
a. View of the upper disc, nat. size.
b. Side view of ditto magnified.
c. View of the under disc ditto.
d. View of the upper disc ditto.

