THE LAND AND FRESHWATER SHELLS OF THE BRITISH ISLES.

J. B. Henderson
Washington

Ed. 1 (2nd issue)

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OF THE BRITISH ISLES.

WITH ILLUSTRATIONS OF ALL THE SPECIES.

BY

RICHARD RIMMER, F.L.S.

LONDON:
W. H. ALLEN & CO., LIMITED,
13, WATERLOO PLACE, S.W.

TO

THOSE OF MY FELLOW-COUNTRYMEN,

AMONG THE WORKING CLASSES,

WHO WISELY EMPLOY THEIR LEISURE HOURS

IN THE

PURSUIT OF USEFUL AND ELEVATING KNOWLEDGE,

WITH THE

HOPE THAT OTHERS, AMONG THEIR RANKS,

MAY BE INDUCED TO

FORSAKE THE PATHS OF PROFITLESS AND DEGRADING

DISSIPATION,

This Volume

IS, WITH EVERY GOOD WISH,

Dedicated

BY THE AUTHOR.

PREFACE.

On several occasions I have been taken, or (as I would fain hope) mistaken, for a lunatic. On the last occasion I had wandered forth with the twofold object of escaping for a time from the din and turmoil of our British Babylon, and of enjoying a "ramble in search of shells."

Pursuing a path that led across some meadows, I came upon a little band of working men, who, seated under a hedge, were spending their Saturday afternoon holiday in the full enjoyment of the "fragrant weed," and of an occasional "pull" at a soda-water bottle containing a liquid not unlike water in colour, and very like "Old Tom" in fragrance.

After passing the happy group, a very few paces brought me to a likely-looking spot wherein to find some of the objects of my search, to wit, a deep and tolerably dry ditch; so down I went into it and disappeared. I well knew what would follow; the men who had witnessed the mad-like act followed and peered at me as I "grubbed" about the bottom of the ditch.

After a few moments of awful silence, one of the

party, bolder than the rest, ventured to ask, "What are you doing there?" "I am looking for shells." "Shells!" he exclaimed, at the same time casting a glance full of meaning towards his companions. "Shells! If you want shells you should look for them on the sea-shore; there are none here. You had better come out of that ditch and go home."

My reply was a silent one, but it was convincing. I picked up a stone and handed it to him; on the side which had lain next the damp ground there were two or three specimens of *Zonites nitidus*. The men stared first at the shells and then at me, in evident astonishment; and from the remarks they made to one another it was clear that, even if they still believed me to be insane, the thought was beginning to dawn upon their minds that there might perhaps, after all, be "some method" in my madness. To be brief, I most gladly complied with their request that they might be permitted to accompany me in my ramble. On parting from them in the evening, they one and all declared they had spent "a happy day," and expressed their determination to employ, for the future, some of their leisure hours in studying the habits of the creatures the outlines of whose history I had, during our walk, endeavoured to trace.

Great, however, was their disappointment when, in answer to their inquiries, I confessed my inability to recommend them a book containing descriptions and illustrations of all the species at present known, which could be purchased at a price suited to their means; and after I had left them I began, for the first time,

to think I really must be mad, for in my eagerness to console them I had rashly promised to write one.

After this statement of the reason which induced me to undertake this work, it is probable that some, at least, of my readers will expect to find that it has been written in what is termed a "popular style," that all Latin words have been carefully excluded from its pages, and that it will, in short, open up a new and easy cut whereby they may speedily and without fatigue arrive at a thorough knowledge of the subject upon which it treats. I am sorry to disappoint them. A "Royal road to learning" is as great a myth as the "Philosopher's stone"; knowledge, worthy of the name, can only be acquired by gradual and diligent study. It must not, however, for a moment be supposed that I would say a single word in disparagement of popular works on Natural History; many of them are charmingly written, and they are all, more or less, calculated to create a taste for it. This I take to be their mission, and when it has been fulfilled the reader will naturally thirst for further and more precise information. To supply this I have ventured to "rush into print," and I trust this little volume may be found of use as a stepping-stone between works in which the subject is treated of in a popular manner, and those, such as 'British Conchology,' by Dr. Gwyn Jeffreys, in which it is more fully and far more ably handled.

As to Latin names, it is obviously much more difficult to learn many languages than to acquire a knowledge of one. Hence it is that, throughout the

civilized world, the Latin language has by common consent been for centuries the medium through which scientific men of every tongue have communicated to one another their discoveries. Latin names have accordingly been given to all the various products of Nature, and he who does not wish to be debarred from intercourse with brother naturalists must learn the names employed by them.

If I write to a German correspondent who understands the English language, requesting him to oblige me with specimens of the "*Wry-necked Whorl Shell*," he will, in all probability, after spelling the unheard-of appellation, make a *wry face*, tear up my letter, and light his pipe with one of the pieces. Whereas, if I write to another correspondent, who cannot even read the English language, asking him for specimens of the same shell, but calling it by its proper name, *Vertigo pusilla*, he will, after my letter has been translated to him by some friend, proceed forthwith to comply with my request. When I warned the working men, above alluded to, that they must expect to encounter many words difficult to pronounce and by no means easy to remember, one of them remarked that several of his acquaintances, who collected insects and plants, invariably called the objects of their study by their Latin names, and that he saw no reason why he could not learn to do the same.

With respect to the illustrations required for this volume, very little difficulty was felt in selecting the method by which they have been produced. Having from my boyhood been a lover of the "black art," I

long ago foresaw that photography was destined, at no distant period, to hold a foremost rank among the means employed for book illustration. Of late years several processes have been discovered by which impressions, of absolute permanency, from photographic negatives can be printed in ink of almost any colour. My first intention was to have photographed the shells myself, and to have had impressions taken from the negatives by the "Albertype" process, but finding, on inquiry at the office of the company to which the patent right of that process belongs, that no saving of expense would be effected by my doing so, I abandoned the idea. Photographs of the natural size were therefore, in my presence, taken of all the shells at the company's establishment at Ealing, and the prints were afterwards produced by their "Albertype" process.

As it would be very difficult, if not impossible, to induce slugs to "sit for their portraits," the attempt to do so was not made; they have therefore been illustrated by lithographs from drawings copied from other works, principally from that by Moquin Tandon, entitled 'Histoire Naturelle des Mollusques terrestres et fluviatiles de France,' to which admirable book I am also indebted for the descriptions (of which I have made abbreviated translations) of the animals or soft parts of many of our land and fresh-water molluscs. The figure of *Testacella Haliotidea*, however, is from a drawing made by Mr. Foord of a living specimen in my possession, which obligingly sat for its likeness.

I have followed the author of 'British Conchology' in the method of arrangement as well as in the nomenclature which he has adopted. A long list of synonyms would have increased the size as well as the expense of the book, and the sight of it might have injuriously affected the nervous system of the reader. I have therefore refrained from giving one. In selecting the shells for illustration, I endeavoured to make choice of specimens which would, as nearly as possible, represent the usual or typical form and size; in one or two instances, however, I was unable to do so. The figures of both species of *Physa* are less, and those of *Limnæa stagnalis* rather larger than specimens of the usual size. As the camera was adjusted so as to produce photographs of the actual size of the shells, I deemed it unnecessary in describing each species to give its dimensions.

The shells of *Paludina contecta* and *P. vivipara*, which should have been figured on Plate IV., so as to show the apertures, were accidentally broken at the moment the sensitive plate was being placed in the camera. Figures of those species, showing the opercula, have therefore been given on Plate IX.

It only now remains for me to express my best thanks to those who have so kindly assisted me in this my self-imposed and pleasurable task. To my friends Dr. Gwyn Jeffreys, Mr. Ponsonby, the Rev. J. McMurtrie, and Mr. H. Groves, I am indebted for the loan of some of the rarer species, as well as for other kindly aid. To Mr. Groves my special thanks are due for the admirable enlargements of all the British

species of *Vertigo*, kindly made by him expressly for this work. Lithographic facsimiles of them will be found on Plate X., and I trust that by their aid the reader will be enabled, without much trouble, to identify the several species of these minute but very interesting molluscs.

12, WESTBOURNE CRESCENT, HYDE PARK, W.,
July 8, 1880.

EXPLANATION OF ABBREVIATIONS.

B.C. (British Conchology).

J.C. (Journal of Conchology).

J.G.J. (John Gwyn Jeffreys).

S.N. (Scottish Naturalist).

INTRODUCTION.

"Better for man
Were he and Nature more familiar friends!
His part is worst that touches this base world.
Although the ocean's inmost heart be pure,
Yet the salt fringe that daily licks the shore
Is gross with sand."—*Alexander Smith.*

WITH the exception of the Inspired Writings, no book is so eminently calculated as that of Nature to elevate the mind, to create within it a thirst for all that is pure and ennobling, and, above all, to fill the heart with a thankful and abiding trust in Him "who feeds the young ravens when they cry," and "whose tender mercies are over all His works."

Nor are the grander works of creation alone worthy of our consideration: the contemplation of the vast firmament ablaze with untold myriads of glistening orbs, or of the mighty deep now slumbering with unruffled surface, now hurling its maddened billows against the rock-bound coast, may well, indeed, entrance and awe the soul; but humbler things than these demand of us more than a mere passing thought: the tiny moss that creeps upon the wall, the spider's web, insects innumerable, of every form and hue, that flit on gladsome wing, as well as countless millions of creatures far too small for unaided human vision to

descry—these too, in language "silent, but more eloquent than words," proclaim the astounding majesty and never ceasing beneficence of the Great Creator.

We are too often apt to look down contemptuously, if not with feelings of disgust, upon some of the objects by which we are surrounded, forgetful of the fact that nothing which the Almighty has seen fit to create can possibly be unworthy of our admiration, and that

> "Each shell, each crawling insect holds a rank
> Important in the plan of Him who framed
> This scale of beings; holds a rank, which lost
> Would break the chain and leave behind a gap
> Which Nature's self would rue."

It is impossible to acquire an accurate knowledge of any subject unless our investigations are conducted in an orderly manner, and after some settled plan; naturalists have therefore divided the products of our Earth according to their structure, and arranged them systematically in groups. The Animal Kingdom is divided into Sub-kingdoms, Classes, Orders, Families, Genera, and Species.

Mollusca.—The creatures which form the subject of the following pages belong to a Sub-kingdom, to which the name of *Mollusca* has been given. The Mollusca,* or Molluscs (as they are usually called), are invertebrate animals, that is, they are unprovided with a *vertebral column* or back-bone; their bodies are soft and fleshy, and, except in the case of the *Cephalopods* (of which the cuttle-fish is an example), entirely destitute of a skeleton, bones, or joints of any kind,

* From *mollis* (Latin), soft.

and are enveloped in a muscular covering called the mantle. Their *nervous system* is broken up into several pieces, which are disposed in various parts of the body and connected together by stout nerve-cords.

Most molluscs are provided with a shell which is formed by a secretion of the mantle, composed chiefly of carbonate of lime with an admixture of more or less animal matter.

The Mollusca are divided into *Acephalous* (headless) and *Cephalic* (having a head). The shells of the former are *Bivalve*, those of the latter *Univalve.*

Acephala.—All the Acephala are aquatic; some of them inhabit fresh water, but by far the greater number are marine, and of these, the oyster and cockle will serve as examples.

They have no distinct head; the *mouth* is seated within the folds of the mantle, and consists of a slit or opening with two flattened lips. The *mantle* which envelops the body consists of two parts or *lobes* united at the back. Gwyn Jeffreys admirably describes it as like "the cover of a book;" it is attached to the inner margin of each valve of the shell by a series of muscles; in some cases it is open on all sides (except the back); in others it is more or less closed in front, but there is always an opening sufficiently large to admit of the passage of the *foot*, which is tongue-shaped, flexible, and often capable of being considerably extended beyond the shell. But in the case of the *Brachiopoda* (a very remarkable class of marine headless molluscs) the animals have no foot, they are sessile, being attached to stones, seaweeds, or other objects, either by a foot-stalk or the outer surface of

the lower valve of the shell. Each lobe of the mantle is provided with a spirally coiled arm, which is furnished with filaments (*cirri*).

The *respiratory organs* of the Acephala are gills of a leaf-like form, and consist of a network of blood-vessels; a continuous stream of water traverses the gills, and a fresh supply of oxygen is thus imparted to the blood. Many of these molluscs are furnished with eye-like protuberances (*ocelli*) on the mantle, which vary, according to the species, in number, arrangement, and colour. The mantle of the clam (*Pecten maximus*) is fringed with ocelli of a greenish-blue or purplish colour; they are arranged in two rows, those in the front row being larger than the others.

The *organ of hearing* in the headless molluscs consists of a sac containing small stone-like bodies called *otolites*.

With regard to the *reproductive system* of the Acephala, it has been generally believed that the sexes are in all cases united, and that each individual is capable of fertilizing itself; recent investigations, however, lead to the conclusion that in some instances each animal is either male or female only. Some kinds are oviparous, and others ovoviviparous.

Cephalic Molluscs.—Cephalic Molluscs are of a higher organism than the *Acephala;* their nervous system is more fully developed; they have a distinct head, and usually, tentacles or feelers, on the tips, or sometimes at the base of which the eyes are placed; in some cases, however, the animals are eyeless. Their organs of hearing, like those of the Acephala, consist of stone-like bodies or otolites, which are contained

in a sac or capsule, and vary both in form and number. In 'British Conchology,' Introduction, p. 28, it is stated that Frey "counted as many as two hundred otolites of different sizes in one of the auditory vessels (of which there were two) in an adult snail."

The *mantle* consists of a single flexible lobe which covers the front part of the body and usually forms a sort of collar round the head. The *foot* consists of a muscular disc adapted for crawling or sometimes for floating. The *reproductive system* of the Cephalic molluscs is very remarkable: in some cases the sexes are distinct, each animal being either male or female only; in others the sexes are united in the same individual which, though capable of performing the functions of both, is unable to fertilize itself. In a few instances the animal which at its birth is either male or female only, on arriving at maturity finds itself to be both.

A great number of Cephalic molluscs are marine, others inhabit fresh water, many live entirely on land, and some are amphibious; this being the case, their *respiratory* organs are, as might be expected, variously constructed, according to their requirements. All the British Cephalic molluscs which inhabit land or fresh water belong to the *Gasteropoda*, and are comprised in two of the many orders into which that class has been divided, viz. *Pectinibranchiata* and *Pulmonobranchiata.*

The *respiratory apparatus* of the animals belonging to the first of these orders consists of comb-like gills which have a single, or more rarely, a double plume,

and are situated on the upper part of the head or on either side of it, and covered by the mantle.

The *Pectinibranchs* treated of in this volume, inhabit fresh water only, with the exception of *Neritina*, which occurs sometimes also in brackish or even salt water.

The *organs of breathing* in molluscs which belong to the second order (*Pulmonobranchiata*) consist chiefly of a network of vessels seated within a sac formed by a fold of the mantle, and are adapted for the respiration of atmospheric air. The greater number of the British *Pulmonobranchs* live on the land (very few are marine), but some inhabit fresh water, in which case they are provided with additional branchial organs which enable them to extract air from the water; but as they require atmospheric air also, they frequently rise to the surface to inhale it, or sometimes leave the water altogether for a time.

Jaw and Lingual Ribbon.—It has already been stated that all the British land and fresh-water molluscs which are provided with a head belong to the *Gasteropoda.* The mouths of Gasteropodous molluscs are furnished with arched jaws of a horny substance, and frequently with a tongue-like organ armed with teeth, which is called the *lingual ribbon.*

The *jaw* varies in form; in some cases it is more strongly arched than in others; sometimes it is coarsely ribbed and has a notched margin, and in other instances it is smooth and more or less prominently beaked in front.

The *lingual ribbon* is also very variable, in different

genera and species, as to the arrangement, number, and form of the teeth with which it is armed. This curious and very interesting organ consists of a muscular tongue furnished with plates upon which the teeth are arranged in transverse and longitudinal rows. The plates are divided into three areas; the central one is termed the *rachis*, and the two lateral or side areas are called the *pleuræ;* the teeth on the former are called *median* (central), or *rachidian*, those on the latter *uncini*.

The number and arrangement of the teeth may be illustrated by numeral figures; the following formula, which represents the system in the lingual ribbon of *Helix aspersa*, will serve as an example—52 . 1 . 52. The figures denote that each transverse row contains one central or *rachidian* tooth, with fifty-two *uncini* or lateral teeth on each side of it; and as there are, in this instance, one hundred and thirty-five rows, the complete formula stands thus:—

$$\frac{52 \cdot 1 \cdot 52}{135} = 14{,}175 \text{ teeth.}$$

The lingual ribbon of molluscs is well worthy of investigation, for, apart from its affording characters which are useful in determining the position which some genera and species should occupy, it forms a most beautiful and interesting object for observation under the microscope. Being unable to use that instrument for any length of time without inconvenience or even risk to my eyesight, I have unfortunately been prevented from examining, except in a very cursory

manner, the lingual apparatus of our land and fresh-water Gasteropods, and have therefore, in a few instances, given the form of the jaw and number of teeth as described in Tate's 'British Mollusks.'

The jaw and lingual ribbon of the larger species may be easily extracted with a pair of finely pointed scissors, the animal having been previously killed in boiling water; they should then be immersed in a solution of caustic potash until all fleshy matter has been removed, and afterwards thoroughly washed in several changes of water. In the case of the smaller species it is necessary, after killing the animal, to remove the head and place it in a test tube with caustic potash. After a few days the solution will have become turbid, and should be carefully poured off; this is best effected by filtering it through blotting-paper, which, when all the liquid has run through, must be examined to make sure that the jaw and lingual ribbon have not escaped from the tube, into which a fresh supply of potash solution must be poured; this process is to be repeated from time to time until all fleshy matter is removed. A much quicker and less tedious mode of procedure is to boil the solution by placing the test tube over a spirit lamp, but in this case great caution is necessary, as the potash is very apt to boil over and destroy almost everything with which it may come in contact.

Shells.—It has already been stated that the shells of molluscous animals are formed by a secretion of the mantle, and that their composition consists chiefly of carbonate of lime, with a small proportion of animal

matter; in all cases their form resembles more or less that of a cone.

According to Dr. Gray, "the shells of Mollusca appear to be coeval with the first formation of the animal; they may be observed covering the embryo on its first development in the egg, even before it has acquired its proper shape or any of its internal organs." *

This first formed portion of the shell is called the *nucleus;* it constitutes the apex of all shells whether bivalve or univalve, and usually remains attached to them during all the stages of their growth.

After the animal has emerged from the egg, it gradually enlarges its shell as its body increases in size, by adding, from time to time, fresh deposits formed by the secretion of the mantle; the place where each successive deposit has been attached to the preceding one is indicated by a line which is called the *line of growth.* In most cases the shell consists of two layers or coats: the outer one is membranaceous or horny, and is called the *epidermis;* the inner one is calcareous, and constitutes the shelly part.

The structure of univalve shells is more uniform than that of bivalves, and usually contains less animal matter. In 'British Conchology,' vol. iii. p. 202, Gwyn Jeffreys says, "A univalve shell consists of three layers of cellular plates, each of the upper two layers lying unconformably on the one immediately below it, and every plate being composed of a single series of elongated prismatic cells which cohere lengthwise." And in the Introduction (p. 47) to the same

* 'Philosophical Transactions' for 1833.

work, he makes the following remarks respecting the growth of shells: "Owing to the difficulty which exists in keeping and observing molluscs in a state of confinement for any length of time, and especially those which live in the open sea, very little is known as to the mode and rate of their increase. Some interesting experiments on the growth of land-shells were, however, made by Mr. E. J. Lowe, and communicated to the Royal Society in 1854. The result of his observations is as follows:—1st. The shells of *Helicidæ* increase but little for a considerable period, never arriving at maturity before the animal has once become dormant (or hibernated). 2nd. Shells do not grow whilst the animal remains dormant. 3rd. The growth of shells is very rapid when it does take place. 4th. Most species bury themselves in the ground to increase the dimensions of their shells. *Helix pomatia* and many other shells retreat for that purpose in summer, having their heads and the mouths of their shells downwards (this position being reversed during hibernation); *H. rotundata* burrows into decayed wood for the same purpose; while *Pupa umbilicata*, *Clausilia nigricans* (*C. rugosa*), and *Bulimus obscurus* bury their heads only while the increase takes place."

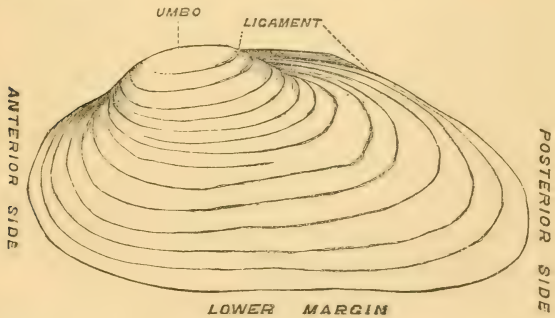
The colouring matter which imparts so many beautiful and varied tints to the surface of shells, is secreted by glands in the mantle, which are specially designed for the purpose. When the secretion happens to be defective or wanting, the shell is more or less deficient in colour, and is called a white variety.

Operculum.—The aperture of many univalve shells

is closed by a lid called the *operculum.* It consists of a plate composed in most cases of horny, but sometimes of calcareous matter, and it is attached to the foot of the animal by a strong muscle. It is usually spiral, but in a few instances it is concentric.

The following woodcuts are intended to show the position of those parts of bivalve and univalve shells to which frequent allusion will be made in the descriptions given of the several species.

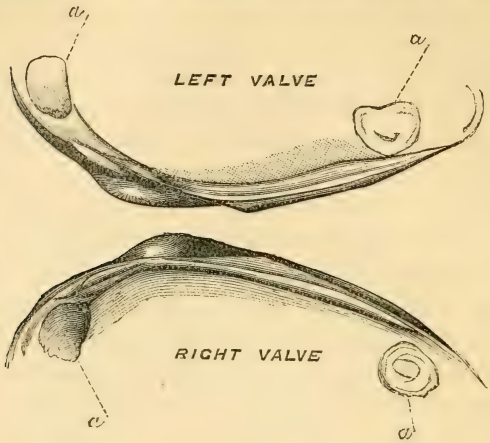
In order to ascertain which is the right and which the left valve of a bivalve shell, we have only to hold it in the position it would occupy if the animal were crawling straight away from us, viz. with the *anterior* or front side furthest from, and the *posterior* or hinder side nearest to us, the beaks being uppermost; the valve on our right hand will be the right, that on our left the left valve.



The first figure represents the left valve of *Unio tumidus*, and shows the position of the *anterior* and *posterior sides*, the *lower margin*, *ligament*, and *umbo.*

In the second figure the interior of both valves is

seen; the marks *a* indicate the position of the muscular scars or impressions made on the shell by the attachment of the *adductor muscles* which serve to



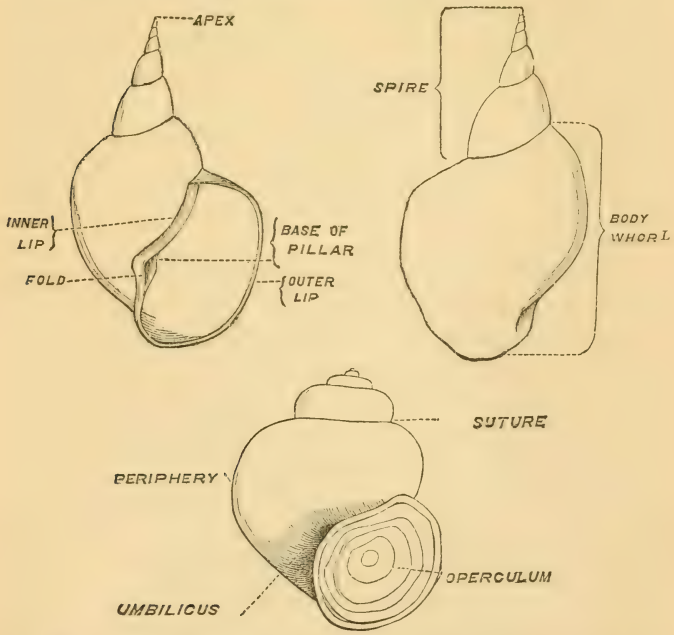
draw the valves together. The number of the muscles is not in all cases the same: *Conchifera* or Bivalves have therefore been divided into two groups, named respectively *Monomyaria* and *Dimyaria.* In the former and smaller group the animals have only one adductor muscle, which is placed in, or near, the centre of the body. In the latter and much larger group there are two distinct adductor muscles on the right and left sides of the body.

In addition to the impressions made in the interior of the valves by these muscles, there is a groove called the *pallial scar*, which is caused by the muscular attachment of the mantle to the shell; it is not shown in the woodcut, but if a specimen of *Unio tumidus* be examined, it will be seen that it extends from one

adductor scar to the other, following, at a short distance from the edge, the curve of the lower margin.

The exact position of the *umbones* is more clearly indicated in the second figure than it is in the first, by the small white patch seen on the apex of each valve. The figure also shows the hinge and teeth, which in the *Unionidæ* are lateral only; they are described in the body of the work (see pp. 11–12).

Cardinal teeth are those placed close to the umbones (see *Sphærium corneum*, p. 3).



The above three figures show the several parts of a univalve shell.

Collecting.—The requisites for collecting our land and fresh-water shells are as simple in construction as they are few in number. A net of coarse canvas, or better still, a scoop made of copper-wire gauze, and having a zinc rim fitted with a socket by which it can be attached to a pole or a walking-stick; a plentiful supply of pill-boxes of various sizes; a wide-mouthed bottle or two, with tightly fitting corks; and a pocket lens for examining minute species, will complete the collector's kit. Aquatic species may be taken by sweeping with the net or scoop among the water-plants which float on the surface or grow on the sides of ponds, rivers, and ditches. Those which bury themselves in the mud can be obtained by scraping along the bottom with the scoop, which should then be moved to and fro on the surface of the water till the mud has escaped through the gauze, leaving the shells behind.

Very little need be said here respecting the hunting-ground of the Conchologist, as the habitat or place of abode of each species will be given when the animal and shell have been described. I can give no better advice to the young collector than bid him search *everywhere*, and, literally, "leave no stone unturned." Dry gravelly soils, pine woods, and bogs, are, however, as a rule, to be avoided, though in them, even, some species may be found. The best time to look for land snails is during, or immediately after, rainy weather. It is not necessary that the Conchologist, when on a collecting excursion, should waste his time in attempting to name the specimens he finds; this can be better and more conveniently done at home;

but, too much stress cannot be laid upon the importance—the absolute necessity, in fact—of carefully recording the *locality* where each species is found; this should be done *on the spot*, and not left to memory, in *legible* writing on the lid of the boxes, or on a label placed with the specimens, and it is advisable to add the date.

On his return home the collector should kill the animals as speedily as possible, and not keep them huddled together, alive, in close boxes for one moment longer than he can help; this, the only unpleasant part of the Conchologist's task, is usually effected by plunging them into boiling water, and he should take care that it *is boiling*, so that the poor creatures may be instantly deprived of life. The animals, when dead, may easily be removed from bivalve shells by inserting a thin knife between the valves and cutting the adductor muscles; those of univalves, by means of a pin used after the manner so adroitly practised by the vendors of whelks and "winkles." It frequently happens that the most painstaking efforts to remove the whole of the animal, especially in the case of the smaller species, prove ineffectual, a portion of it being left behind, to the disfigurement of the shell (if it be transparent), near the apex; sometimes the fragment may be removed with a bent pin, but in most cases it cannot be reached, and as it is worth while to take a little trouble to extract it from a valuable specimen, the following method may be tried, and will usually prove successful. A teacup or wine-glass is filled with damp sand, into which the shell is plunged (apex downwards) till it is firmly imbedded,

the aperture being left exposed; a glass syringe, with a fine point, is now filled with a solution of caustic potash and a small quantity of the liquid squirted *very gently* into the interior, care being taken *not to fill* the shell or allow any of the solution to come in contact with the epidermis; the cup is then to be carefully placed in an upright position, in some place where it will not be disturbed, and left for a few days, when the shell may be rendered thoroughly clean by injecting either cold or warm water into the interior with the syringe. The *operculum* should, in all cases where it exists, be removed from the foot of the animal and placed in its proper position in the aperture of the shell, a little cotton wool having been previously put there to prevent it slipping into the interior; a touch of gum on its inner surface and edges will keep it from falling outwards.

Arrangement of Collection.—A series of drawers enclosed in a cabinet with folding doors is certainly the most suitable receptacle for a collection of shells; but as cabinets are more or less costly, those who cannot afford to purchase one, may, for a trifling sum, procure boxes which will answer the purpose.

There are several ways of mounting shells; some collectors attach them with gum to strips of cardboard, or to pieces of thick glass cut into different lengths. In the latter case, the under side of the glass should be covered with paper of a tint which will form a suitable background—a shade of stone-colour, perhaps, shows the shells to the best advantage; the paper should be attached to the glass, with gum, at one end only, so that it can be folded or opened backwards, like the

leaf of a book, in order that both sides of the shell may be seen. Sometimes collections are placed on cotton wool in a series of cardboard trays. Perhaps the most satisfactory method is to affix the shells to cedar or mahogany tablets (covered with stone-coloured paper), $\frac{1}{4}$ of an inch in thickness and $3\frac{1}{2}$ inches in width; in the first instance the tablets should be cut into lengths to fit the drawers or boxes, and afterwards sawn across into various sizes to suit the specimens. It is advisable, when space will admit of it, to have a series of examples; at all events there should, if possible, never be less than two specimens of each species, one of them being fixed to the tablet with the mouth upwards and the other the contrary way. I advise the reader, in arranging his collection, to follow the method and nomenclature adopted in this volume; it is that of Dr. Gwyn Jeffreys, our highest authority upon British Conchology. Lists, printed on one side only, of all the species and varieties of the British land and fresh-water shells, can be obtained at a trifling cost; those published by Messrs. Taylor Brothers, at the office of the 'Journal of Conchology,' 9, Wade Street, Leeds, will answer the purpose; they are sent post free at the rate of $1\frac{1}{2}$*d.* each, or 9*d.* per dozen. The name of each species and variety should be firmly fastened with gum (at the end of the series) to the lower edge of the tablet, on the left, and the *locality*, neatly written on a strip of cardboard or paper, on the right. It is advisable to mount minute shells, especially those which are of a white or pale colour, upon a neatly cut strip of black paper which is to be attached, in its proper place, to the tablet.

In conclusion, I would once more urge upon my readers the duty incumbent upon them of never needlessly depriving any animal of its life, or inflicting upon it unnecessary pain. If it be true that to man it has been given to have "dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth," it is also true that the gift entails upon him a very grave responsibility, and he who wittingly and ruthlessly inflicts torture upon any creature, however humble it may be, is thereby degraded to a level lower than that of the victim of his tyranny.

The moral stamped on every page of Nature's book, if rightly read, will teach humility of mind and tenderness of heart; and though ,as Cowper wrote—

> "An inadvertent step may crush the snail
> That crawls at evening in the public path;
> Yet he that has humanity, forewarned,
> Will tread aside, and let the reptile live.
> For they are all, the meanest things that are,
> As free to live and to enjoy that life,
> As God was free to form them at the first,
> Who in His sovereign wisdom made them all."

THE

LAND AND FRESHWATER SHELLS

OF

THE BRITISH ISLES.

AQUATIC.

CLASS I.—CONCHIFERA, OR BIVALVES.*

Body oval, sides usually compressed ; there is no distinct head ; the mouth is situated within the folds of the mantle ; *mantle* with two lobes ; in some species it is open, and its edges are then usually fringed, in others it is furnished with tubes, or *siphons*, in which case the latter are frequently fringed with thread-like filaments or feelers ; *foot* tongue-shaped, often capable of great extension ; in some species it is provided with a tuft of threads, called the *byssus*, by which the animal attaches itself to stones or other bodies ; both sexes are united in the same individual, which has the power of fertilizing itself. The whole or greater part of the body is enclosed in a shell composed of two pieces or *valves*, which are united by a *ligament* or hinge along their dorsal margin. *Respiratory organs* consisting of gills.

ORDER LAMELLIBRANCHIATA.†

Gills four, leaf-shaped, two on each side of the body.

All the British freshwater bivalves belong to this order, and are divided into three families, viz. :—

I. SPHÆRIIDÆ.
II. UNIONIDÆ.
III. DREISSENIDÆ.

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* Having two valves. † With leaf-like gills.

FAMILY I.—SPHÆRIIDÆ.

Body somewhat globular; *mantle* produced (lengthened) in front into either one or two *siphons* or tubes, which the animal has the power of extending or contracting. In those species which are furnished with two siphons, the longer one serves for breathing and nutrition, the other for excretion; the edges of the mantle and tubes are simple, that is, they are not provided with filaments; *foot* wedge-shaped, exceedingly extensile.

Shell with two valves, which are of equal size, but more or less inequilateral, and of an oval or subtriangular form; *hinge* furnished with cardinal and lateral teeth; *ligament* placed at the posterior (hinder) side of the hinge, external, but sometimes nearly hidden.

The *Sphæriidæ* differ from most of the Conchifera in having their siphons placed in front instead of at the posterior end. They are active in their habits and frequently float on the under surface of the water with their foot spread out upon it, the shell at the same time being inverted; in addition to this, many if not all of the species have the power of spinning gelatinous threads by means of which they raise and lower themselves, or remain suspended in the water.

They feed on animalcula, and in winter bury themselves in the mud, where they remain in a torpid state until the return of spring.

They are ovoviviparous, that is, the eggs are hatched and the living fry retained for a time within the body of the parent before they are born.

GENUS I.—SPHÆ'RIUM, SCOPOLI.*

Body, sides nearly equal; *mantle* with two siphons (or tubes), which are placed in front.

Shell nearly equilateral; *beaks* almost central.

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* A sphere or globe.

1. Sphærium cor'neum,* Linné. Pl. I.

Body greyish, or occasionally of a reddish or brownish tint; *foot* rather longer than the shell, somewhat pointed, of a milky hue, slightly tinged with rose-colour towards the extremity; *mantle* grey at the edges; *siphons* longish, truncate, of a pale grey faintly tinged with flesh-colour.

Shell rather globular, compressed in front, thin, shining, of a pale horn-colour, marked in the line of growth with lighter-coloured bands, and often with brownish rays which proceed from the beaks towards the front margin; with very fine close-set striæ in the line of growth, which are intersected by still finer lines; *epidermis* thin; *beaks* nearly central; *ligament* short, almost invisible externally; *inside* of a faint bluish tint; *hinge* thick, with a small double cardinal tooth in each valve, and two double lateral or side teeth in the right valve, and two prominent single teeth in the left valve; *muscular impressions* (or scars) faint.

Inhabits rivers, ponds, canals, &c., in every part of Great Britain.

Var. 1. *flavescens.*—Shell of a pale straw-colour, smaller and more globular. Cumberland, Westmoreland, Grand Canal, Dublin, Aberdeenshire, in a lake near Lerwick, *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.* Inverness-shire and Kirkcudbrightshire (F. Buchanan White), *S.N.* Near Colchester (Laver), Stapleton near Bristol, Hampstead, Watford, Hendon (Rich).

Var. 2. *nucleus.* — Smaller and more globular. Crymlyn, bog near Swansea, Barton Run, Norfolk, Richmond, *B.C.* Stapleton near Bristol, Bath, Hampstead, Watford, Hendon (Rich).

Var. 3. *Scaldiana.*—Shell more oval, and of a paler colour. Oxwich marsh near Swansea, Thames at Clifden, and in many places, *B.C.* Canal, Acock's Green near Birmingham (G. S. Tye), *J.C.* Stapleton near Bristol, Bath, Hampstead, Watford, Hendon (Rich).

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* Horn-coloured.

Var. 4. *Pisidioides.*—"Shell subtriangular, and rather more produced at its posterior slope; transverse (or concentric) striæ coarser; ligament slightly perceptible on the outside. Grand Junction Canal at Paddington. A form approaching this variety has been taken by Mr. Jordan near Bath, and by Mr. Nelson near Birmingham."—*B.C.* Regent's Park, and Brentford, Essex (Rich). The Rev. J. M'Murtrie informs me that "this variety or one resembling it is abundant in the canal at Edinburgh, where the ordinary form does not occur. The ordinary form is the only one found in other pieces of water in the neighbourhood of Edinburgh."

2. S. RIVI'COLA,* LEACH. PL. I.

Body grey, tinged with yellow or brown; *foot* broad, somewhat swollen towards the extremity, greyish-white; *mantle* dark grey at the edges; *gills* brownish or reddish-grey; *siphons* of nearly equal length, short, whitish.

Shell oval, swollen, sides nearly equal, solid, glossy, yellowish-brown, occasionally with a greenish tinge, frequently encircled with bands of a darker colour; with strong concentric ridges which are crossed by fine striæ; *epidermis* thick; *anterior side* rounded; *posterior side* somewhat produced and truncated; *beaks* obtuse, central; *ligament* short, conspicuous; *inside* pearly; *hinge* and teeth as in *S. corneum*, but stronger; *scars* distinct.

Inhabits sluggish streams and canals in the home, midland, and some of the northern counties of England. In Ireland it has been found near Dublin, but it is a local species. It differs from *S. corneum* in being much larger and more solid, as well as in its oval form and strong ridges. Near Bath (Daniel), *B.C.*, vol. v. p. 150. River Cherwell, Banbury, Oxon (D. Pidgeon), near Blue Bridge, York (Hey), *J.C.*

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* Inhabiting brooks.

3. S. OVA'LE,* FÉRUSSAC. PL. I.

"Body milk-white; *tubes* long, united nearly all the way; *foot* tongue-shaped, very extensile and flexible; *gills* of a faint blush-colour."—*B.C.*, vol. i. p. 8.

Shell oblong, compressed, sides somewhat unequal, thin, semitransparent, but not very glossy, of an ashy-grey colour, sometimes marked with faint rays which extend towards the lower margin, finely striate concentrically; *epidermis* thin; *anterior side* roundish; *posterior* side truncate; *lower margin* sharp, curved; *beaks* almost central, small; *ligament* long, narrow, visible outside; *inside* greyish; *hinge* straight on the posterior, incurved on the anterior side; *teeth* as in *S. corneum*, but very small; *scars* indistinct.

Inhabits ponds and canals, but it is a very local species. It has been found at Exmouth (Clark), in the Paddington Canal (J. G. J.), canals and ponds in Lancashire, and near Wakefield, *B.C.* Canal, Acock's Green, &c., near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), near Blue Bridge, York (Hey), *J.C.* In 'British Conchology' it is stated that "a living specimen, which had been taken early in February, and kept in a vessel by itself, gave birth about three weeks afterwards to some young ones, at intervals of two or three days. Immediately on being excluded they were very active, and used their long foot as an organ of progression, by extending it to its full length; and, after attaching its point to the bottom of the vessel, like a leech, they drew up their shell to it, and by repeating this several times they contrived to travel along for some distance. They seemed to be fond of nestling under their mother for the sake of shelter or shade."

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* Oval.

4. S. LACUS'TRE,* MÜLLER. PL. I.

Body whitish, or of a faint rose-colour; *foot* about twice the length of the shell; *mantle* greyish at the edges; *siphons* long, the *respiratory* one cylindrical and truncate at its orifice, which is large; *anal siphon* slightly conical, orifice small.

Shell roundish, equilateral, somewhat compressed, very thin, shining, semitransparent, pale greyish horn-colour, occasionally marked with bands of a darker colour, slightly striate concentrically; *epidermis* thin; *anterior* and *posterior sides* truncate and sloping from the upper side; *front margin* sharp and somewhat curved; *beaks* central, very prominent, tipped with the nucleus or first growth of the shell; *ligament* narrow, faintly visible outside; *inside* bluish-white; *hinge* strong, teeth as in *S. corneum*, but smaller in proportion; *scars indistinct.*

Inhabits canals, lakes, and ponds in most parts of England, Wales, and Ireland; in Scotland it has been found near Glasgow.

Gwyn Jeffreys says he has "found it alive in the hardened mud of a pond which had been drained, and its bed so completely dried up by the sun as scarcely to show the marks of any footsteps on it."—*B.C.*, vol. i. p. 11.

This species may be distinguished from the other members of the genus by the rounder form and extreme slenderness of its shell, as well as by the presence of the nucleus on the beaks.

Var. 1. *Brochoniana.*—Shell much larger and flatter; *beaks* smaller and less prominent. Clumber Lake, Notts, *B.C.* Near Hornsey (Rich).

Var. 2. *rotunda.*—Shell rounder and flatter; *epidermis* yellowish-green. Singleton, near Swansea, *B.C.*

Var. 3. *Ryckholtii.*—Shell small, triangular and globular; *beaks* very prominent. Marsh between Exmouth and Budleigh Salterton, *B.C.*

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* Living in lakes.

GENUS II.—PISIDIUM, C. PFEIFFER.*

Body, sides unequal; *mantle* with only one *siphon.*
Shell, sides unequal; *beaks* near the *anterior* end.

The members of this genus differ from those of the preceding one (*Sphærium*), in having only one siphon, and in their shells being less equilateral and very much smaller; in other respects, however, they resemble them, their habits and homes being almost identical; they possess, too, in common with them the power of creeping in an inverted position on the under surface of the water. They occur in vast numbers in rivers, lakes, ponds, and stagnant water, and are a favourite food of fish and ducks. The shell is very often thickly coated with a deposit from the water in which they live.

Five species only, of this genus, are as yet known to occur in Great Britain, and as they are not very easily identified, I cannot do better than follow the lead of the gifted author of 'British Conchology,' and "divide them according to their shape, as follows:—

"A. *Triangular.* 1. P. amnicum. 2. P. fontinale.
"B. *Oval.* 3. P. pusillum.
"C. *Round.* 4. P. nitidum.
"D. *Oblong.* 5. P. roseum." *B.C.*, vol. i. p. 19.

A. *Triangular.*

1. PISIDIUM AM'NICUM,† MÜLLER. PL. I.

Body whitish or greyish, slightly transparent; *foot* rather long, broadish at the base, abruptly pointed, capable of great extension; *mantle* bordered with grey; *siphon* short, somewhat conical, obliquely truncated at its extremity.

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* Pea-shaped. † Inhabiting rivers.

Shell somewhat triangular, rather swollen, solid, glossy, with deep concentric grooves, greyish horn-colour ; *epidermis* thickish ; *anterior side* abruptly truncate ; *posterior side* considerably produced (lengthened) and sloping downwards towards the lower margin ; *lower margin* obliquely curved ; *ligament* short, visible outside ; *inside* bluish-grey, pearly ; *teeth* same as in *Sphærium*, the lateral ones strong ; *scars* deepish.

Inhabits slow running rivers, lakes, ponds, and canals throughout Great Britain.

2. P. FONTINA'LE,* DRAPARNAUD. PL. I.

Body whitish or greyish, slightly transparent ; *foot* rather long, somewhat pointed ; *mantle* bordered with grey ; *siphon* somewhat conical, obliquely truncate at its extremity, orifice large and flexible.

Shell somewhat triangular, swollen, thin, shining, greyish, with fine, irregular concentric striæ ; *epidermis* very thin ; *anterior side* abruptly truncate ; *posterior side* rounded and gradually sloping downwards ; *beaks* prominent and somewhat pointed ; *ligament* short, indistinct ; inside whitish, pearly ; *hinge* short, thick ; *teeth* as in last species ; *scars* deepish.

Inhabits sluggish rivers, canals, ponds, &c., throughout Great Britain. It is considerably smaller than the last species, and also differs from it in being thinner, and in having the posterior margin somewhat less produced, the beaks more prominent, and the ligament less distinct.

Var. 1. *Henslowana.*—Each valve with a plate-like appendage near the beaks. Occurs in many of the northern, eastern, home, and south-western counties of England, as well as in South Wales and Cork, *B.C.* Barnsley Canal near Wakefield (J. Hebden), near Birmingham (G. Sherriff Tye), *J.C.*

Var. 2. *pulchella.*—Shell more glossy, strongly and regularly grooved ; *beaks* less acute. More common than the last variety, *B.C.*

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* Inhabiting fountains.

Var. 3. *pallida.*—Shell more ventricose, irregularly striate, and of a paler colour, with occasionally a few darker rays which diverge from the direction of the beaks to the lower margin. Marshes and pools near Swansea, *B.C.*

Var. 4. *cinerea.*—Shell larger and flatter, with fainter striæ. Widely diffused in this country, *B.C.*

B. *Oval.*

3. P. PUSIL'LUM,* GMELIN. PL. I.

Body whitish, faintly tinged with rose-colour; *foot* a little longer than the shell, slender; *mantle* bordered with reddish-grey; *siphon* short, somewhat conical, truncate, orifice small, edges entire.

Shell nearly oval, somewhat compressed, but swollen, thin, not very glossy, irregularly and finely striate concentrically, greyish horn-colour; *epidermis* extremely thin; *anterior* side rounded; *posterior side* rounded and sloping gradually downwards; *lower margin* rounded; *beaks* nearly central, short, blunt; *ligament* short, inconspicuous; *inside* greyish, not very pearly; *hinge*, *teeth*, and *scars* as in *P. fontinale.*

Inhabits weedy pools, ditches, swamps, &c., in most parts of Great Britain. It may be distinguished from *P. fontinale* by its *oval* form, and by its beaks being blunter and more central. It is usually covered with a reddish-brown incrustation.

Var. "*obtusalis.*—Shell smaller and much more ventricose; beaks prominent, very obtuse. In similar situations with the typical form, but more local and less abundant."—*B.C.*

C. *Round.*

4. P. NI'TIDUM,† JENYNS. PL. I.

Body whitish; *foot* moderately long, finely pointed; *mantle* edged with grey; *siphon* funnel-shaped, short, orifice wide, with notched edges.

Shell roundish, somewhat swollen above, compressed below,

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* Small. † Shining.

thin, very glossy, with fine, regular, concentric striæ, and 3–5 broadish ribs near the beaks, yellowish white or pale horn-colour; *epidermis* extremely thin; *anterior* side rounded, slightly truncate; *posterior side* somewhat produced, sloping abruptly downwards; *lower margin* rounded; *beaks* prominent, almost central, blunt; *ligament* short, almost invisible; *inside* whitish; *hinge* and *teeth* as in *P. fontinale*; *scars* distinct.

Inhabits lakes, and ponds throughout Great Britain. This species differs from the rest of the *Pisidia* in its more glossy and iridescent appearance, and stronger striæ, as well as in its siphon being *funnel-shaped* and having the margin notched or puckered.

Var. *splendens*.—Shell lemon-coloured, much larger, not so glossy; *striæ* fainter; *beaks* more swollen; *ligament* stronger, more apparent. Lakes near Lerwick, and at Balmacarra in West Ross, *B.C.*

D. *Oblong.*

5. P. RO'SEUM,* SCHOLTZ. PL. I.

Body "opaline-white, orange-yellow, red, or rose-colour in the upper part; *tube* long, slender, subconical, and truncate at its orifice; *foot* long, semitransparent."—*B.C.*, vol. i. p. 26.

Shell somewhat oblong, swollen, thin, extremely glossy, with strong, regular, concentric striæ, yellowish-white or pale horn-colour; *epidermis* very thin; *anterior side* truncate, sloping downwards; *posterior side* elongated and rounded; *lower margin* almost straight; *beaks* prominent, blunt, placed away from the centre; *ligament* almost invisible; *inside* whitish, pearly; *cardinal teeth* very small; *lateral teeth* small, outer edges strong, sharp; *scars* very slight.

Inhabits ponds, ditches, &c., throughout the British Isles. This species bears some resemblance to *P. nitidum* in its sculpture and glossy surface, but may

* Rose-coloured.

readily be distinguished from it and the other members of the genus by its *oblong* shape, by its beaks being placed away from the centre, by the *straight* outline of the lower margin, and finally by the absence of striæ near the beaks, or of any appearance of notching round the margin of the siphonal orifice.

FAMILY II.—UNIONIDÆ.

Body oblong, compressed; *mantle* open, except behind, where it forms two orifices. Through the upper and smaller of these orifices, the edges of which are *simple* (not fringed), the excretions of the animal are voided, and it is separated from the lower and larger one by a plait or fold of the mantle; the lower and larger orifice, by means of which the animal breathes, is not *simple* like the other, but is furnished at its margin with several rows of threadlike filaments, which serve as tentacles or feelers; *mouth* as in the first Family, consisting of a slit with two small triangular lips, and placed between the anterior (*front*) adductor muscle and the base of the foot; *foot* large, broad, tongue-shaped.

Shell "equivalve, oblong, inequilateral, compressed; *epidermis* thick; *beaks* (which form the nucleus, or young shell) plaited or wrinkled; *ligament* external, strong, and always conspicuous; *hinge* furnished with lateral teeth only; those on the *anterior side* being sometimes so much developed as to resemble cardinal teeth."—*B.C.*, vol. i. p. 28.

The *Unionidæ*, popularly known as "freshwater mussels," unite the two sexes in the same individual, in other words, each animal is both male and female. Like most of the molluscs, some of them are oviparous, while others, as is the case with the *Sphæriidæ*, are ovoviviparous. They live in rivers, lakes, and ponds, and feed upon small aquatic animals, especially the minute freshwater crustacea, which in some

respects resemble their marine allies the lobster, crab, shrimp, &c.

They are active in their habits during the summer months, but in winter bury themselves in the mud.

GENUS I.—U'NIO, PHILIPPSSON.*

Body long, somewhat swollen; *gills* (lower orifice) almost straight.

Shell long, solid; *lateral teeth* strong; *lunule* distinct.

In Great Britain three species only, belong to this genus; they are all oviparous, and produce pearls.

The portion of the shell which surrounds the beaks (or *umbones*) is frequently eroded, or worn away. Gwyn Jeffreys believes that this is "caused by the chemical action of gases which are evolved from the mud in which this portion of the shell is usually imbedded."—*B.C.*, vol. i. p. 32.

1. UNIO TU'MIDUS,† PHILIPPSSON. PL. I.

Body greyish; *foot* milky-grey; *mantle* edged with brown; *upper orifice* elongated, brownish; *lower orifice* pale grey, sometimes tinged with orange-brown.

Shell oval, convex above, swollen, solid, glossy, of a brown colour, often tinged with green in the line of growth; *epidermis* strong; *beaks* somewhat incurved, not central, surrounded by wavy folds which are often pitted; *lunule* narrow, lance-shaped; *ligament* strong, short, prominent; *anterior side* rounded, sloping downwards; *posterior side* sloping to a point; *lower margin* curved; *inside* bluish-white, pearly; *hinge* strong; on the anterior side of the right valve there is a strong tooth forming with the margin of the shell a groove into which a corresponding notched tooth on the other valve fits; on the posterior side

* A pearl. † Swollen.

there is a long plate-like tooth which locks into a deeply grooved plate on the left valve; *muscular* and *pallial scars* strongly defined.

Inhabits rivers, ponds, and canals in the southern, midland, and some of the northern counties of England, as well as in some parts of Wales.

According to Moquin-Tandon, this species breeds during the months of July and August; the eggs are deposited in masses containing about 100, and a single individual has been known to lay 1500 eggs in two or three days.

Var. 1. *radiata.*—Shell thinner; *epidermis* greenish with yellow rays; *posterior side* more compressed above; *hinge line* almost straight. River Avon near Bath, Railway lake near Oxford, *B.C.* Near Birmingham (G. Sherriff Tye), River Went, Yorkshire (Chas. Ashford), near Wakefield (J. Hebden), *J.C.*

Var. 2. *ovalis.*—Shell triangular-oval, or wedge-shaped, compressed and incurved in the middle, rather inequivalve, dark olive-brown; *anterior side* broader, abruptly truncate; *lunule* broad, deep, oblique. River Avon, Wilts, River Brent, Bath, *B.C.*

2. U. PICTO'RUM,* LINNÉ. PL. I.

Body light red, more or less tinged with grey; *foot* reddish or yellowish; *mantle* edged with brown; *upper orifice* elongated, dark brown; *lower orifice* grey.

Shell oblong, compressed, scarcely so solid as *U. tumidus*, yellowish girdled with brown in the lines of growth, and green towards the posterior margin, wrinkled transversely; *epidermis* thin; *beaks* very slightly incurved, not central; *umbonal region* less prominent and not so strongly wrinkled as in the last species; *lunule* long, narrow; *ligament* somewhat longer than in *U. tumidus*; *hinge line* straightish; *anterior side* rounded; *posterior side* sloping gently, rounded at the end; *lower margin* nearly straight; *inside* cream-colour, or pinkish, pearly; *hinge*

* Painters'.

moderately strong; *teeth* as in last species, but sharper and not so strong; *muscular scars* well defined; *pallial scars* indistinct.

Inhabits rivers, canals, and ponds in England as far north as Yorkshire. It may be distinguished from *U. tumidus* by its oblong shape and thinner shell, by the straightness of the upper and lower margins, as well as by its beaks being less tumid, and its hinge and teeth more slender. The eggs of this species are laid during the months of May, June, and July; Bouchard-Chantereaux says that a single individual will, during that time, produce the enormous number of 220,000. The name of *pictorum* (belonging to painters) was given to this species because in former times the Dutch painters made use of the shells for holding their colours, and in this country at the present day they are sold containing gold and silver leaf for illuminating.

The pearls produced by this and the last species are small and valueless.

Var. 1. *radiata.*—Shell having faint and narrow rays of green, which diverge from the beak. River Avon, Bath, *B.C.*

Var. 2. *curvirostris.*—Shell smaller, shorter, and flatter; *epidermis* yellowish-green with brown zones; *posterior side* curved and wedge-shaped. In a brook near Harpsden Wood, Henley-on-Thames (Rich).

Var. 3. *latior.*—Shell broader and shorter, yellowish-brown. Canal near Oxford, *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.* In a brook near Harpsden Wood, Henley-on-Thames (Rich).

Var. 4. *compressa.*—Shell very broad and flat, upper margin raised and curved; *posterior side* greatly compressed and attenuated, assuming a beak-like form, and having a double ridge and furrow which runs from the beak in the younger

state of growth ; *lower margin* straight ; *lunule* broad, and extending between the beaks, so as to separate them from each other. Norwich (Bridgman), *B.C.*

3. U. MARGARI'TIFER,* LINNÉ. PL. II.

Body dirty grey with more or less of a reddish tinge, sometimes of a livid flesh-colour ; *foot* large, tongue-shaped, somewhat obtuse, yellowish-grey or dirty red ; *mantle* bordered with grey in front ; orifices brownish-grey with whitish rays.

Shell oblong, compressed, solid, not glossy, blackish-brown, strongly and roughly striate in the line of growth ; *epidermis* thick ; *beaks* placed away from the centre, incurved ; *umbonal region* eroded so deeply that the under layers of the shell are exposed ; *lunule* indistinct ; *ligament* very long, produced to the anterior side ; *hinge line* curved ; *anterior side* rounded ; *posterior side* sloping gently, rounded at the end and bluntly keeled above ; *lower margin* straight or slightly concave ; *inside* tinted with flesh-colour, pearly, stained with dirty green about the adductor muscles, and pitted in the middle ; *hinge* strong, the anterior side of the left valve is furnished with a broad, strong double tooth tubercled at its tip, the posterior side has an indistinct ridge ; on the anterior side of the right valve there is a strong cone-shaped single tooth which fits into the double tooth just described ; on the posterior side there is a ridge-like plate similar to that in the left valve ; *muscular* and *pallial scars* very strong and deep.

Inhabits rivers, chiefly in the mountainous districts of Great Britain. Gwyn Jeffreys says it occurs "in several parts of the Swansea Canal, where the bottom is gravelly, having been carried in by the water-courses which supply it." This species is longer from the beaks to the lower margin than the two preceding ones, and is more compressed, of a darker colour, and less glossy surface ; it is also subject to much greater

* Pearl-bearing.

erosion about the beaks, and the posterior teeth are much less fully developed. The interior of the shell is very thickly coated with mother-of-pearl.

Pearls occur much more frequently in this species than in *U. tumidus* or *U. pictorum*, and are usually of a larger size and of greater value than those produced by them; their prevailing colour is white, but green, brown, black, and flesh-coloured or pink ones are occasionally found, those of the latter hue, when large and well shapen, being of considerable value. At one time the pearl fisheries in this country were a sourc of considerable revenue to their owners; it is stated in Brown's 'Recent Conchology' that the pearls sent from the River Tay, in Perthshire, to London, from the year 1761 to 1764, were worth 10,000*l.*

Var. 1. *sinuata.*—Shell broader than the typical form, yellowish-brown; *lower margin* concave in the middle. It occurs in some of the streams in the West of Scotland. I have met with it in the River Clouden, near Dumfries; it is also found in the West of Ireland. Perthshire (F. B. White), *S.N.*

Var. 2. *Roissyi*, Michaud.—Shell proportionably longer, *lower margin* convex or rounded. Yorkshire (Sowerby), *B.C.* Perthshire (F. B. White), *S.N.*

GENUS II.—ANODON'TA, LAMARCK.*

Body somewhat oval; *mantle* with thickish and fringed edges; *gills* flexuous.

Shell oblong, thin, somewhat compressed anteriorly, *beaks* not very prominent; hinge almost toothless; *scars* indistinct.

The *Anodontæ* are ovoviviparous, in which respect they differ from the *Uniones*, but their habits are very similar.

* Toothless.

1. Anodonta cyg'nea,* Linné. Pl. III.

Body longish oval, compressed, grey, with sometimes a yellowish or reddish tint; *foot* dirty yellow, more or less tinged with orange or red; *mantle* brownish at the edges; *gills* (lower orifice) grey, or reddish-grey, somewhat resembling gauze.

Shell oblong, somewhat swollen, thin, rather glossy, greenish-yellow, sometimes brown, with irregular grooves formed by the lines of growth, strongly wrinkled on the posterior and lower sides; *epidermis* thin; *beaks* straight, placed away from the centre; *umbonal region* strongly plaited, compressed; *ligament* long; *hinge line* straight; *anterior side* rounded, sloping abruptly downwards, not gaping; *posterior side* somewhat compressed above, sloping gently, ending in a rounded wedge-shaped point, gaping; *lower margin* straightish; *inside* white, pearly, iridescent; *hinge* small, sharply ridged in both valves on the posterior side; *scars* very indistinct.

Inhabits sluggish rivers, canals, ponds, &c., in most parts of Great Britain, as far north as the counties of Banff and Perth.

Var. 1. *radiata.*—Shell larger, yellowish-green, beautifully-marked with longitudinal rays or streaks of the same colour; *beaks* placed at a distance of only one-third from the anterior side. Bog of Allen, Ireland, Clumber Lake, Notts, *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.*

Var. 2. *incrassata.*—Shell more swollen and solid, olive-brown; *upper margin* or hinge line rather curved on the posterior side. Scarborough, Otterspool, Lancaster, Oxwich Marsh, Swansea, *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.* River Earn, Perthshire (F. Buchanan White), *S.N.* River Irvine, Ayrshire (McMurtrie).

Var. 3. *Zellensis.*—Shell broader, yellowish-brown, having the upper and lower sides nearly parallel; *posterior side* much produced. Bog of Allen, Ireland, Clumber Lake, Notts, *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

Var. 4. *pallida.*—Shell light yellow or fawn-colour; *hinge*

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* Of or belonging to swans, as those birds feed upon it.

line rather curved, and raised on the posterior side, which is produced to a long wedge-like point; *lower margin* rounded. West of Ireland, *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

Var. 5. *rostrata.*—Shell oblong-oval; *upper margin* forming a dorsal crest, which is slightly raised and curved; *anterior side* rounded; *posterior side* attenuated, and ending in a long, curved, wedge-like point; *lower margin* nearly straight. River Corfe, Dorset, ponds at Wistow, Leicestershire, Wynyard Park, Co. Durham, and Oxford, *B.C.*

2. A. ANATI'NA,* LINNÉ. PL. II.

Body nearly oval, somewhat compressed, grey of various depths of colour; *foot* yellowish or reddish-grey; *mantle* brown at its edges; *gills* dirty grey.

Shell oval, somewhat compressed, rather thicker than the last species, olive-green or brown, banded in the line of growth with a darker colour, usually rayed with green and irregularly wrinkled; *epidermis* thin but slightly stronger than in *A. cygnea; beaks* straight, not central; *umbonal region* compressed, plaited; *ligament* short, prominent; *hinge line* curved, and considerably raised; *anterior side* rounded, sloping obliquely below, gaping; *posterior side* curved, sloping obliquely downwards to a wedge-shaped point; *lower margin* slightly curved; *inside* white, pearly, iridescent; *hinge* as in last species; *scars* deeper than in *A. cygnea.*

Inhabits situations similar to those where *A. cygnea* occurs. Considerable difference of opinion exists among conchologists as to whether *A. anatina* should be regarded as a distinct species, or merely a variety of *A. cygnea.* In the 'Annals and Magazine of Nat. Hist.,' 4th series, vol. v. p. 66, Mr. R. M. Lloyd makes the following remarks:—

"It has been maintained that these animals are *varieties,* because no difference is to be found in their

* Belonging to (i. e. food for) ducks.

soft parts excepting as regards the general shape, which corresponds to that of the shell; but I have observed in *A. anatina*, that the *branchial opening* is not only comparatively but actually much larger, and fringed with much more delicate and numerous tentacles than in *Anodonta cygnea*." In any case, whether a separate species or a variety only, it may be distinguished from *A. cygnea* by its shell being smaller, and longer in proportion; by the hinge line being *raised* instead of straight, and by the *abrupt* instead of gradual slope of the *posterior side*.

Var. 1. *radiata*.—Shell marked with green and yellow rays. "The rayed markings form scarcely a varietal character, being common to half-grown individuals of the last, as well as of this species."—*B.C.*, vol. i. p. 44.

Var. 2. *ventricosa*.—Shell larger, more solid, exceedingly tumid, especially in the middle and towards the umbonal region, also marked with green and yellow rays. River Exe, *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.* Near Colchester (Laver).

Var. 3. *complanata*.—Shell oval, greatly compressed, brown; *beaks* placed close to the anterior margin; *upper margin* raised and curved; *anterior side* abruptly truncate. Gumfrieston, near Tenby, *B.C.* Brook near Harpsden Wood, Henley-on-Thames (Rich).

FAMILY III.—DREISSENIDÆ.

Body rhomboidal, compressed; *mantle* closed, with the exception of three orifices, two of which are placed on the posterior side; the upper one is short and serves as the excretal passage, the lower one which is produced (lengthened) is the respiratory opening, and its margin is reflected, and fringed with spine-shaped tentacles: the third orifice is placed on the front margin and serves for the passage of the foot; *foot* tongue-shaped, with a byssal groove.

Shell triangular, equivalve, inequilateral; *epidermis* strong, horny; *beaks* situated at the anterior end; *ligament* internal;

inside whitish ; *hinge* with small teeth, or toothless ; each valve has a triangular depression below the beak for the reception of the anterior muscle.

The *Dreissenidæ* bear a strong resemblance to the marine *Mytilidæ* (mussels), but differ from them in the mantle being almost closed and in having a transverse plate on the hinge inside the shell.

GENUS DREISSE'NA, VAN BENEDEN.*

The *Dreissenæ* have the power of living for a considerable time out of water ; they are gregarious, and attach themselves to surrounding objects by a *byssus*, as the marine mussels do. A single species only, belonging to this genus, occurs in Great Britain, or indeed in Europe ; it was discovered in 1754 by Pallas, a Russian naturalist, in the River Wolga, as well as in the Black Sea. In this country it was first noticed in 1824, in the neighbourhood of London, and was supposed to have been imported in timber ships from the Baltic. Gwyn Jeffreys, however, inclines to the belief that it is indigenous.

DREISSENA POLYMOR'PHA,† PALLAS. PL. III.

Body usually blackish : *foot* oblong, cylindrical, narrow, slightly transparent, grey faintly tinged with rose-colour ; *mantle* bordered with grey in front, marked behind with dark brown stripes ; *gills* grey ; *byssus* strong.

Shell triangular, sharply keeled in the centre of both valves, somewhat compressed below, gradually expanding obliquely downwards, somewhat solid, of a dullish aspect, yellowish-brown, usually marked above with wavy lines of a purplish or brownish hue, strongly wrinkled in the line of growth, faintly and irregularly puckered ; *epidermis* silky ; *beaks* small, terminal, incurved ;

* Named after M. Dreissens. † Many-shaped.

ligament long, narrow; *upper margin* angular; *anterior side* straightish; *posterior side* curved; *lower margin* incurved; *inside* rather pearly; *hinge* toothless, strong, with a hollow, triangular plate in both valves under the beaks; *scars* faint.

Inhabits sluggish streams, lakes, and canals, in various parts of this country, as far north as Edinburgh. It is most abundant in the New River, which supplies a portion of the metropolis with water. Gwyn Jeffreys was informed by Mr. Norman "that he saw immense numbers of the *Dreissenæ*, in a living state, lining some of the iron water-pipes which had been taken up in Oxford Street, and that the colouring of the shells was as vivid as if the animal had lived in the light of day."—*B.C.*, vol. i. p. 48.

CLASS II.—GASTEROPODA,* OR UNIVALVES.

Body covered in front by a one-lobed *mantle; head* usually distinct; *tentacles* four or two; *eyes* situated either at the extremity or at the base of the tentacles, or sometimes on separate foot-stalks; *foot* a muscular disc adapted for crawling and, in some instances, for floating; *reproductive system* variable; in some cases each animal is both male and female, but requires fecundation by another individual; in others the sexes are distinct, each animal being either male or female; *respiratory system* consisting either of gills or of organs resembling lungs. Among the aquatic kinds both of these systems occur, but those which are terrestrial are provided with the lung-like organ only.

Shell usually but not always present, consisting of a single

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* Belly-footed.

valve or piece, which is more or less conical and spiral, and usually covers the whole, but sometimes only the most vulnerable part of the body; it is either operculate or inoperculate.

The land and freshwater univalves of this country belong to one or other of the two following orders:—

I. PECTINIBRANCHIATA.
II. PULMONOBRANCHIATA.

ORDER I.—PECTINIBRANCHIATA.*

Body spiral; *respiratory organ* a single comb-like gill, situated inside the mantle on the upper side of the head.

Shell spiral, external.

The freshwater univalves of Great Britain are comprised in three of the families which belong to this order, viz.:—

I. NERITIDÆ.
II. PALUDINIDÆ.
III. VALVATIDÆ.

The animals are provided with a pair of tentacles, and two eyes placed at their base.

The shell is operculate and covered by an epidermis.

FAMILY I.—NERITIDÆ.

Body short; *eyes* placed on short foot-stalks at the base of the tentacles; *gill* seated within the mantle; *sexes* separate.

Shell semi-globose; *spire* excentric, few-whorled; *mouth* transversely semi-lunar; *operculum* provided on the under side with a curved and deeply-grooved projection or plate-like appendage.

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* Having comb-like gills.

In Great Britain this family is represented by a single genus, which contains only one species :—

NERITI'NA, LAMARCK.*

Head provided with a strong proboscis or snout ; *tentacles* long ; *eyes* situated on short, slender foot-stalks ; *foot* broad ; *central lingual tooth* minute ; *first lateral tooth* large, sub-triangular, the two next minute ; *uncini* about sixty, the first large, the rest slender, hooked and denticulated.

Shell obliquely ovate ; *operculum* calcareous, solid.

NERITINA FLUVIA'TILIS,† LINNÉ. PL. IV.

Body yellowish-grey, spotted with black ; *head* and *snout* black ; *tentacles* rather transparent, of a light slaty-grey colour, with transverse streaks of black on the sides ; slightly thickened and widely diverging at their base, slender, and tapering to a fine point ; *eyes* very large, black ; *foot* broadly dilated and rounded in front, sole whitish, tail covered by the operculum.

Shell obliquely ovate, solid, glossy, of a brownish or yellowish colour, chequered with white, brown, purple, or pink, marked with a few strongly-defined lines of growth, and more numerous and finer intermediate striæ ; *epidermis* thin ; *whorls* three, convex, rapidly and abruptly increasing, body whorl occupying more than two-thirds of the shell ; *spire* very short ; *suture* rather deep ; *mouth* transversely semi-lunar ; *outer lip* sharp ; *inner lip* flat, glossy, exceedingly broad, continuous with the outer lip ; *operculum* semi-lunar, glossy, bright yellow or orange-colour, with a few spiral grooves and numerous finer and flexuous striæ in the line of growth ; outer edge thin, membranous, margined with orange or yellow of a deeper colour, or sometimes with red ; inner edge thick ; spire with from one and a half to two whorls ; the under side is fitted with a small, grooved, sickle-shaped projection, which serves as a lock or fastening by which the operculum is kept in position.

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* Diminutive of *Nerita*, a genus of marine molluscs.

† Inhabiting rivers.

Inhabits rivers, and lakes which are supplied with running water, especially where the bottom is gravelly, in many parts of Great Britain, but not everywhere. Gwyn Jeffreys remarks that *Neritina* "is very closely allied to *Nerita*," a genus of marine molluscs, of which it "probably only forms a section," and that "there are marine as well as freshwater species of *Neritina*." He found *Neritina fluviatilis* in Loch Stennis, Orkney, with the marine *Mya arenaria*. The Rev. J. McMurtrie has very kindly furnished me with the following particulars respecting the above-named locality:—"Loch Stennis communicates with the sea, and the lower reach is salt, becoming only slightly brackish at the constriction where the loch is divided into two reaches. I found a few specimens in comparatively salt water, but at and above the constriction, where the water is only very slightly brackish, *Neritina* becomes abundant. The shells are clean and beautifully marked." Claparède states that the female deposits her capsules upon the shell of her neighbour, not upon her own, or more rarely upon stones or the shells of other molluscs. Each capsule contains from forty-five to sixty eggs, but only a single embryo is developed, the rest of the eggs being devoured by the young Neritina before it emerges from the capsule. The capsules, which are often mistaken for the eggs, are globular, slightly flattened on one side, and enclosed in a tough covering, consisting of two segments, which are firmly united together at first, but split asunder when the embryo is excluded, the upper half falling off, while the lower one is left adhering to the object to which it was attached.

FAMILY II.—PALUDINIDÆ.

Body oval, elongated, spiral, capable of being entirely contained within its shell, provided with a prominent snout; *eyes* placed either on a short stalk at the base of the tentacles, or sessile; *foot* oval, much dilated; *gill* placed within the mantle; *sexes* separate; *lingual ribbon* usually with a few rows, each having seven teeth, one *median* or central tooth, and three on each side of it.

Shell dextral, conical, ventricose; *spire* long, symmetrical; *mouth* oval; *operculum* oval, either horny or testaceous, irregularly concentric.

The members of this family are vegetable feeders; some of them are oviparous, and others ovoviviparous; in the latter case the fry, to the number of from twenty to thirty, remain in the ovary of the parent for about two months, their opercula being formed before they are born, and they are excluded three or four at a time at intervals of several days.

GENUS I.—PALUDI'NA, LAMARCK.*

Animal ovoviviparous; *eyes* placed on short footstalks; *operculum* horny, irregularly concentric; *nucleus* placed towards the inner side.

When the fry of the *Paludinæ* are excluded the epidermis of the last formed whorl is furnished with three rows of recurved bristles, which are shed after a time, and replaced by the brown bands with which the full-grown shell is marked.

1. PALUDINA CONTEC'TA,† MILLET. PL. IV. AND IX.

Body black, dark-grey, or brownish, spotted with yellow; *head* small, very globular; *snout* large, bilobed; *tentacles* blackish with yellowish tips, long, thick at their base, diverging consider-

* Living in marshes. † Covered (by the operculum).

ably ; in the male the right tentacle is rather shorter, and thicker at the tip, than the left ; *eyes* moderately large, round, black ; *foot* with a yellowish margin, broadly rounded in front, tail nearly covered by the operculum.

Shell conical, not very solid, moderately glossy, greenish, sometimes tinged with brown ; with fine, close-set but irregular striæ in the line of growth, which are intersected by numerous faint spiral lines ; body whorl with 3 and the two preceding whorls with 2 broadish, brown, spiral bands ; *epidermis* not very thick ; *whorls*, 6–7, very much swollen, body whorl occupying about half of the length of the shell ; *suture* exceedingly deep ; *mouth* oval inclining to circular ; *outer lip* sharp, slightly reflected ; *inner lip* forming with the other a complete peristome ; *umbilicus* oblique, narrow but deep ; *operculum* rather thin, distinctly marked with the lines of growth as well as with fine, close-set, intermediate striæ, nucleus depressed.

Inhabits sluggish streams, lakes, ponds, and canals as far north as Yorkshire, but it is a local species. It is sluggish and irritable, and falls the instant it is touched, from stones or other hard substances to which it frequently attaches itself. The shell is carried almost horizontally when the animal is crawling.

Var. *virescens*.—Shell "bandless and of a pale greenish colour. Brigg, Lincolnshire (Mr. Thos. Ball). The fry are easily distinguishable from those of *P. vivipara*."—*B.C.*, Supplement, vol. v. p. 151.

2. P. VIVI'PARA.* PL. IV. AND IX.

Body dark slate-colour or nearly black, with fine yellow spots, somewhat paler in colour and more distinctly spotted underneath ; *tentacles* bluish-black with golden-coloured spots, somewhat conical, rather slender ; in the male the right tentacle is considerably shorter and thicker than the left ; *eyes* rather prominent, round, black ; *foot* very broad, slightly truncate in front, tail broad but ending in a fine point.

Shell conical, but longer and more oval than that of the last

* Producing its offspring alive and perfect.

species, rather solid, not very glossy, yellowish-green, banded and striated as *P. contecta; epidermis* thickish; *whorls* $6\frac{1}{2}$, rather swollen, body whorl occupying fully one-half of the length of the shell; *apex* rather blunt; *suture* deepish; *mouth* more oval than in the last species; *outer lip* somewhat thick, slightly reflected; *inner lip* forming with the other a complete peristome; *umbilicus* a mere chink; *operculum* rather thick, depressed lengthwise, striated as in the preceding species.

Inhabits sluggish rivers, lakes, and canals in many parts of England; in Scotland it seems to be of rare occurrence, but it has been "found at Findhorn, in the Moray Frith district." Brown, in his 'Recent Conchology,' says it occurs in Ireland in a stream at Newtownards, Co. Down.

The shell of this species differs from that of the last in being more elongated and thicker, in the whorls being very much less tumid, the suture much shallower, and the apex blunter; the mouth too is less circular. It is more active than *P. contecta*, and is exceedingly prolific. Millet counted in the ovary of a female no less than eighty-two fry of different stages of growth.

Var. 1. *unicolor.*—Shell bandless. Hertfordshire, Thames at Richmond, *B.C.*

Var. 2. *atro-purpurea.*—Shell same shape as the normal form, but of a black colour, which when viewed by transmitted light is dark purple. In the canal at Pontypool (R. M. Lloyd), *J.C.*, Feb. 1874, p. 6.

GENUS II.—BYTHINIA, GRAY.*

Eyes sessile, placed at the base of the tentacles; *operculum* testaceous, irregularly concentric, nucleus nearly central.

The animals belonging to this genus differ from those of the last in the following particulars:—They

* Living in deep water.

are oviparous, instead of ovoviviparous; their eyes are not placed on pedicles, or foot-stalks, but are sessile; the operculum is testaceous, instead of horny, and its nucleus is nearly central; the right tentacle of the male is of the same size as the left. Gwyn Jeffreys very justly remarks that "although the derivation of the word *Bythinia* would imply that these molluscs inhabit deeper water than others of the same family, such is not the case; they generally frequent small streams, canals, shallow ponds, and ditches."—*B.C.*, vol. i. p. 59.

They breed from May till August, and the eggs, which vary in number from ten to seventy, are deposited on stones or aquatic plants, in three, or more rarely in two rows, which form a transparent band. The fry are excluded at the end of from twenty to twenty-five days, and attain their full growth in about two years.

1. Bythinia tentacula'ta,* Linné. Pl. IV.

Body black or dark brown above, dirty grey beneath; *head* small, semi-oval; *tentacles* filiform, considerably diverging; *eyes* prominent, somewhat oval, black; *mouth* with a reddish margin; *foot* much broader than the snout, rounded in front, nearly opaque, edges greyish; tail bluntly rounded at its extremity, half hidden by the operculum.

Shell conical, moderately solid, rather glossy, semi-transparent, yellowish or brownish horn-colour; closely and finely striate in the line of growth and microscopically so in a spiral direction; *epidermis* thin; *whorls* 5-6, convex, body whorl occupying rather more than one-half of the length of the shell, apex somewhat sharply pointed; *suture* oblique, rather deep; *mouth* oval, angulated above; *outer lip* thick, and frequently furnished in-

* Provided with tentacles.

ternally with a strongish white rib; *inner lip* joined to the base of the penultimate whorl and forming with the outer lip a complete peristome; *umbilical chink* very narrow; *operculum* thick, oval, angulated above, centre depressed, finely striated concentrically, and made up of a series of plates rising one above another, which have been formed by the animal at different stages of its growth.

Inhabits slow-running streams, ponds, and ditches in most parts of England, Wales, and Ireland; in Scotland, where it seems to be very local, it has been observed in Aberdeenshire; the Rev. J. McMurtrie informs me that it occurs abundantly in the canal at Edinburgh, and I have found it in Dumfriesshire.

It is an inactive and irritable mollusc; when touched it instantly retreats into its shell. It frequently floats on the under surface of the water, and when crawling carries its snout turned upwards. In winter the animal is said to assume "a yellowish chestnut-colour" (Daniel), *B.C.*, Supplement, vol. v. p. 151.

Var. 1. *ventricosa* (Menke).—Shell white, whorls more tumid. Devonshire, Bristol, Wandsworth, Richmond, Surrey, *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

Var. 2. *excavata.*—Whorls rounder; suture deeper. Woolwich, Cardiff, Co. Armagh, *B.C.* Kirkthorpe, near Wakefield (J. Hebden), near Birmingham (G. Sherriff Tye), *J.C.*

Var. 3. *albida.*—Shell white. Near Birmingham (G. Sherriff Tye), *J.C.* Near Colchester (Laver).

Monst. *decollata.*—Upper whorls wanting in half-grown and adult specimens, their place being supplied by a nearly flat semispiral plate, as in *Bulimus decollatus.* Woolwich, Cardiff, Co. Armagh, *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.*

2. B. Leachii,* Sheppard. Pl. IV.

Body whitish, marked with black spots, and golden dots which are visible through the shell; *tentacles* rather transparent, nearly colourless; *eyes* black; *snout* bilobed, spotted with black, often reddish at the extremity; *foot* slender.

Shell subconical, moderately thin and transparent, yellowish horn-colour, glossy, with faint spiral striæ and stronger lines of growth; *epidermis* very thin; *whorls* 4–5, very tumid, rounded, body whorl occupying nearly one-half of the length of the shell; *spire* with a somewhat obtuse apex; *suture* very deep, straightish; *mouth* nearly circular, much less angulated above than in *B. tentaculata; outer lip* thickish, slightly ribbed internally, very little reflected; *inner lip* forming with the other a complete peristome; *umbilicus* small, but distinct; *operculum* nearly circular, flattish, striated as in *B. tentaculata.*

Inhabits situations similar to those in which the last species is found, but it is much less common. It differs from it in being very much smaller, as well as in having a more circular mouth and operculum, a deeper suture, and a more distinct umbilicus.

Var. 1. *elongata.*—Shell smaller; spire longer. Woolwich Marshes, Northampton, *B.C.*

Var. 2. *albida.*—Shell white.

FAMILY III.—VALVATIDÆ.

Body spiral; *tentacles* 2, contractile; *eyes* placed on the inner side of the tentacles at their base; *foot* separated from the snout; *gill* extending beyond the margin of the mantle, provided with a contractile feather-like apparatus; *reproductive system* androgynous, each individual being both male and female.

Shell spiral, ventricose, more or less depressed; *peristome* complete; *operculum* regularly many-spiral.

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* Named after Dr. Leach.

The respiratory organs of the Valvatidæ are very singular. When the animal whilst crawling is extended, the gill is protruded beyond the edge of the mantle in the form of an elongated, conical process called the *branchial plume,* which is provided on each side with a number of slender, spirally-twisted filaments, causing the organ to appear like a feather; the mantle itself, also, is furnished on the right side with a filament which somewhat resembles a tentacle and is, as well as the other organ, used for respiration. This is the *branchial appendage.*

The animals belonging to this family are gregarious. They frequent sluggish waters, and feed upon aquatic plants. Both sexes are united in the same individual when it has arrived at maturity, but in the early stages of its growth it is male or female only. The *Valvatidæ* very frequently attach their shells to the cases of the larvæ of *Phrygania,* popularly known as Caddice-worms. One genus only belongs to this family, viz :—

VALVA'TA, MÜLLER.*

Body spiral, capable of being entirely contained within the shell; *eyes* almost sessile, placed on the inner side of the tentacles at their base.

Shell dextral; *umbilicus* deep; *operculum* horny.

1. VALVATA PISCINA'LIS,† MÜLLER. PL. IV.

Body transparent, of a light yellowish-grey; *tentacles* thickish, placed rather near to each other; *eyes* large, round, black; *snout* narrow, yellowish-grey, with a tinge of brown underneath, finely wrinkled; *branchial plume* with 14 filaments on each side

* Valved (i. e. having an operculum).

† Living in fish-ponds.

placed at right angles to the stalk; *branchial appendage* as long as the tentacles; *foot* six times as broad as the snout, from which it is entirely separated, deeply bilobed in front and rounded behind, tail long, nearly covered by the operculum; *lingual ribbon* long, central tooth subquadrate, its base produced, hooked and denticulated; *uncini* three on each side, lanceolate, toothed on both sides.

Shell globose, depressed, rather thick, semitransparent, horn-colour with a yellowish or brownish tinge, with fine, regular close-set striæ in the line of growth, and more or less ridged spirally; whorls 5–6, tumid, rounded, the body whorl occupying more than one-half of the length of the shell; *spire* depressed and obtuse; *suture* deep, straightish; *mouth* round; *outer lip* thickish, reflected; *inner lip* forming with the outer lip a complete peristome; *umbilicus* round, not very large but exceedingly deep; *operculum* round, its centre somewhat depressed, with a spire of from 10–12 volutions whose outer edges slightly overlap one another.

Inhabits ponds, canals, and sluggish streams throughout the British Isles. It is inactive and irritable. Moquin-Tandon says it breeds during the months of May, June, July, and August, and that the eggs, to the number of about seventeen, are enclosed in a capsule, which is fixed to some solid substance. The fry are hatched after an interval of from fifteen to sixteen days, and on emerging from the egg are provided with a shell consisting of a whorl and a half; it is delicately striated, and so transparent that the little animal, one half of which is yellowish and the other greenish, is distinctly visible within.

Var. 1. *depressa.*—*Spire* more depressed; *umbilicus* larger; occurs in many parts of Great Britain, but it is local.

Var. 2. *subcylindrica.*—*Spire* more produced, apex flattened; *umbilicus* small. Grassmere (J. G. J.), *B.C.* River Went (J. Hebden), *J.C.*

Var. 3. *acuminata.*—*Spire* still more produced and ending in a rather sharp point. Avon River, Bristol (J. G. J.), North of Ireland (Mrs. Puxley), *B.C.*, vol. i. p. 73.

Monst. *sinistrorsa.*—"Sunbury (Groves)," Gwyn Jeffreys, 'Annals and Magazine of Nat. Hist.,' Nov. 1878, p. 382.

2. V. CRISTA'TA,* MÜLLER. PL. IV.

Body dark brown or greyish above, slaty-grey below; *tentacles* filiform, close together, very slightly pointed, but recurved at their tips; *eyes* small, round, black; *snout* rather narrow, curved, very convex above, broad in front, wrinkles indistinct; *mouth* narrow, nearly straight; *branchial plume* transparent, with about fifteen filaments on each side of the stalk; *branchial appendage* shorter than the tentacles; *foot* entirely separated from the snout, deeply cleft in front, greyish-brown, tail broad, keeled below.

Shell discoid, flat above, concave beneath, rather solid, slightly transparent, pale horn-colour, with close-set striæ in the line of growth; *epidermis* thin; *whorls* 3–5, body whorl occupying at least two-thirds of the shell; *spire* slightly concave; *mouth* round; *outer lip* thin, slightly reflected; *inner lip* separated from the base of the penultimate whorl, continuous with the other lip; *umbilicus* large; *operculum* round, hollow, spire with about twelve volutions, their outer margins forming projecting ridges.

Inhabits the same situations as the last species, from which it may be easily distinguished by the flatness of its shell, which in this respect resembles that of *Planorbis.* It is an inactive and timid mollusc.

ORDER II. PULMONOBRANCHIATA.†

Respiratory apparatus chiefly consisting of a network of delicate vessels seated within a fold of the mantle and adapted for the respiration of atmospheric air; in those cases in which aquatic

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* Crested (in allusion to the *branchial plume*).

† Provided with a gill resembling a lung.

respiration is required, it is also provided with lamellar (leaf-like) branchiæ.

Shell usually external and spiral, occasionally internal, and sometimes altogether wanting.

Some of the members of this order are inoperculate, while others are provided with an operculum; in the former case both sexes are united in the same animal, but fertilization by another individual is necessary; in the latter case, i. e. when the animal is operculate, each individual is male or female only.

By far the greater number of the British Pulmonobranchs are terrestrial. The aquatic kinds inhabit slow rivers, ponds, ditches, &c., but they all require atmospheric air from time to time, and frequently rise to the surface to inhale it; some species leave the water altogether for a considerable period, and often travel some distance away from it.

Most of the molluscs comprised in this order are herbivorous, but some are also carnivorous, and those of one genus at least (Testacella) are entirely so.

In this country the Pulmonobranchs are represented by six families; the members of five of them are terrestrial, and those of the remaining one, with which we have first to deal, are aquatic.

FAMILY I.—LIMNÆIDÆ.

Body usually long and spiral, rarely (as in *Ancylus*) short and hood-shaped; *mantle* covering the front part; *tentacles* 2, contractile, more or less pointed at their tips; *eyes* situated on the inner side of the tentacles at their base, towards the front; *foot* distinct from the body, oval, adapted for crawling or floating; *lingual dentition* various.

Shell spiral or hood-shaped.

The Limnæidæ are comprised in the following four genera:—

I. PLANORBIS.
II. PHYSA.
III. LIMNÆA.
IV. ANCYLUS.

GENUS I.—PLANOR'BIS, GUETTARD.*

Body long, capable of being entirely contained within the shell; *tentacles* very long, slender; *respiratory orifice* on the left side; *foot* oval, narrow, short, rounded in front and behind, and attached to the body by a long, slender stalk; *jaw* usually single and slightly arched; *lingual ribbon* with straight transverse rows, central tooth usually two-pointed, lateral teeth three-pointed.

Shell quoit-shaped or flattish; *spire* dextral; *umbilicus* more or less distinct.

The *Planorbes* inhabit sluggish streams and stagnant water; they have the power of crawling and floating, and frequently remain in a reversed position on the under surface of the water. When the ditches and marshes which they inhabit are dry some species shut themselves up within their shell, by forming an epiphragm round its aperture, till the return of rain. They are vegetable feeders. When irritated they instantly retreat into their shell, at the same time often emitting a reddish coloured liquid, which is secreted by a gland at the sides of the neck.

The most remarkable characteristic of the *Planorbes* is that while their respiratory, anal, and generative orifices are placed on the left side, their shell is dextral; many authors have on this account regarded the shell as sinistral, but Linné, Müller and other

* Flat coil.

writers, as well as in the present day Gwyn Jeffreys, have upon sufficiently strong grounds maintained that it is undeniably dextral.

To aid the reader in the identification of the species I will again follow the method adopted by the author of 'British Conchology,' and divide them into sections.

"A. Shell glossy, last whorl very large in proportion to the rest, and partly covering the preceding one." *B.C.*, vol. i. p. 79.

1. PLANORBIS LINEA'TUS,* WALKER. PL. IV.

Body very slightly transparent, brown with a reddish or violet tinge above, of a paler colour underneath; *tentacles* filiform, long, slender, separated at their base, tolerably transparent, yellowish-brown; *eyes* small, not very prominent; *foot* broad, rounded in front, gradually tapering to a point behind.

Shell quoit-shaped, compressed, but somewhat more convex above than below, thin, exceedingly glossy, semitransparent, yellowish or brownish horn-colour, sometimes grey, with close-set transverse striæ which are stronger and curved near the aperture or mouth of the shell; *epidermis* very thin; *periphery* obtusely keeled; *whorls* 4, compressed, body whorl larger than the rest of the shell, and overlapping a great part of the penultimate whorl, provided internally with 2–5 rows of whitish, curved ridges or plates, which are placed at nearly equal distances from, and opposite to each other, so as to divide the interior of the whorl into separate *septa* or chambers; these plates are distinctly visible through the shell; *spire* deeply sunk; *suture* shallow but distinct; *mouth* forming about two-thirds of a compressed oval; *outer lip* thin, flexuous, bluntly angular above; *umbilicus* narrow but deepish.

Inhabits sluggish streams and ponds in the home and eastern counties of England; it occurs "in pro-

* Having lines or ridges.

fusion in Dringhouses Bog, near York" (Hey), *J.C.*, Oct. 1879; it has also been found in Nottinghamshire, and in Ireland, in Co. Tipperary, but it is not a common species.

It is rather active, and when crawling carries its shell in the same plane with its foot.

It breeds in August, laying only from three to eight eggs, which are enclosed in a roundish, transparent, amber-coloured capsule. The young are excluded in from ten to twelve days.

2. P. NITIDUS,* MÜLLER. PL. IV.

Body rather transparent, reddish-grey or ash-colour with a yellowish tinge, somewhat darker underneath, marked with numerous very fine dark grey specks; *tentacles* filiform, extremely slender, pointed at their tips, transparent, pale reddish-grey; *eyes* prominent; *foot* short, obtuse in front, narrowing slightly towards the tail which is bluntish at its extremity.

Shell quoit-shaped, much depressed, very thin and glossy, iridescent, greyish or pale yellowish horn-colour, sometimes faintly tinted with red; with fine, indistinct striæ in the line of growth, and sometimes microscopically striate spirally; *epidermis* very thin; *periphery* sharply keeled; *whorls* 4–5, the last but one about half covered by the body whorl which slopes gradually outwards; *spire* depressed, but much less so than that of *P. lineatus*; *suture* deepish; *mouth* as in the last species but more compressed; *umbilicus* small, shallow.

Inhabits lakes, ponds, and marshes in most parts of Great Britain, attaching itself to and feeding upon aquatic plants. It is a timid and inactive species; the eggs, in number from three to five (rarely six), are roundish or slightly oval, transparent, and somewhat depressed.

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* Shining.

The shell of this species is thinner and of a paler colour than that of *P. lineatus*, the spire is more raised, the keel is sharper, and the interior of the body whorl is not divided into *septa* or chambers.

B. *Whorls few.*

3. P. NAUTI'LEUS,* LINNÉ. PL. IV.

Body greyish-brown, rather paler underneath, dotted with small black specks ; *head* very thick ; *tentacles* nearly cylindrical, rather thick, transparent, light grey, considerably separated at their base ; *eyes* moderately large, round, black ; *foot* greyish-brown with a reddish tinge, rounded in front, narrow but terminating obtusely behind.

Shell discoid, depressed, flat or slightly concave above, rather convex beneath, thin, subpellucid, of a dullish aspect, brownish, or greyish, occasionally white ; *epidermis* thickish ; *periphery* slightly and obtusely keeled ; *whorls* 3, body whorl larger than the rest of the shell, furnished at regular intervals with strong curvilinear ridges, which are often armed with spinous crests ; *suture* deepish ; *mouth* oval, or somewhat circular, oblique ; *outer lip* thin, forming a complete peristome with the inner one ; *umbilicus* large.

Inhabits lakes and ponds throughout Great Britain, attaching itself to aquatic plants. This is an exceedingly beautiful little creature ; the shell, as its name implies, bears a strong resemblance to some of the *Nautili*, which inhabit tropical seas. It is usually to be found on the *under side* of the leaves of water plants, particularly those of the water lily when they are partially decayed. It is an inactive species ; when crawling, the animal carries its shell inclined to one

* Resembling a nautilus.

side. It lays from three to six eggs, and the fry are hatched in about ten or twelve days afterwards.

Var. *cristata.*—Shell smaller, ridges more distant, stronger, and more distinctly crested. Not unfrequently found with the typical form.

4. P. AL'BUS,* MÜLLER. PL. IV.

Body dirty brown, with a reddish tinge, indistinctly spotted with black; *head* large; *tentacles* slender, pointed at their tips, widely diverging at their base, rather transparent, light yellow with a reddish tint; *eyes* very small, nearly oval, black; *foot* dark reddish-brown, rounded in front, narrowing behind, and ending in an obtusely pointed tail.

Shell flattish above, with a hollow in the middle, more concave below, thin, brittle, of a dull appearance, pale grey, closely and delicately striate in the line of growth, more distinctly marked with raised striæ spirally; *epidermis* thick, often clothed with fine bristles, which are easily rubbed off; *periphery* somewhat compressed, not keeled; *whorls* 5, body whorl larger than the rest; *suture* deepish; *mouth* roundish-oval; *outer lip* somewhat reflected; *inner lip* spread on the base of the penultimate whorl, and continuous with the outer lip; *umbilicus* large.

Inhabits lakes, ponds, and stagnant water in many parts of Great Britain, as far north as Aberdeenshire. It is a sluggish and irritable species, and carries its shell on one side as it moves along. The eggs, which number from four to ten, are enclosed in transparent capsules of a roundish form, and the fry are hatched in about twelve days.

Var. *Draparnaldi.*—Shell with closer and sharper striæ in the line of growth; *periphery* distinctly keeled; *umbilicus* deeper. Holbrook, Suffolk (Sheppard), Cardiff, Bristol, Church Stretton in Shropshire (J. G. J.), *B.C.* Pond at Sandal near Wakefield (Sheppard), near Birmingham (G. Sherriff Tye), *J.C.*

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* White.

5. P. GLA'BER,* JEFFREYS. PL. IV.

"Body yellowish-grey; *tentacles* rather short, cylindrical and ending in a blunt point; *foot* rather broad, especially in front, with a yellowish edge."—*B.C.*, vol. i. p. 85.

Shell somewhat convex above with a depression in the centre, concave underneath, rather thin, glossy, greyish horn-colour, sometimes marked transversely with curved streaks of a whitish colour, with fine irregular striæ in the line of growth, and microscopically striate spirally; *epidermis* thin; *periphery* rounded, not keeled; *whorls* 5, convex but slightly angulated, body whorl occupying about one-half of the shell; *suture* strongly defined; *mouth* nearly circular; *outer lip* slightly reflected; *inner lip* joined to the base of the penultimate whorl, continuous with the outer lip; *umbilicus* large.

This species was first described by Gwyn Jeffreys, in the 'Transactions' of the Linnean Society (vol. xvi. p. 387). Though its range in this country is a wide one, extending from the Shetland Isles to Land's End, it is extremely local, but abundant where it occurs. It has been observed in the following localities, and will probably be found, from time to time, in other places. Near Norwich (Bridgman), *B.C.* Ackworth Park, Yorkshire (C. Ashford), Northumberland and Durham (W. D. Sutton), near Birmingham (G. Sherriff Tye), *J.C.* Somersetshire (Norman).

The chief points of difference between this shell and that of *P. albus* consist in its being smaller, and glossy instead of dull, in the convexity of the upper surface, and more particularly in the absence of the strong *spiral* striæ which are so characteristic of the latter.

Var. *compressa.*—Shell more concave below than in the type, and only depressed in the centre on the upper side, the whorls

* Smooth.

also are rounder, and do not increase so quickly, making the whole shell more compact. Found in the neighbourhood of Birmingham by R. M. Lloyd, *J.C.*, Feb. 1874, p. 7.

C. *Whorls many, keeled.*

6. P. SPIROR'BIS,* MÜLLER. PL. IV.

Body grey, with more or less of a purplish or reddish tinge; *tentacles* filiform, long, finely pointed, transparent, of an ash-colour very faintly tinted with pink; *eyes* small, round, intensely black; *foot* short, slightly transparent at its edges, bluntly rounded in front and ending in an obtusely angular tail.

Shell usually somewhat concave above and flattish underneath, sometimes the reverse, or slightly concave both above and below; rather thick, shining, of a brown horn-colour, with well-defined close-set striæ in the line of growth, and very indistinctly striate spirally; *epidermis* thin; *periphery* somewhat angular, often obtusely keeled below; *whorls* 5–6, rounded but somewhat angulated, body whorl rather broader than the others; *suture* deep; *mouth* nearly round, often provided internally with a rib; *outer lip* scarcely reflected; *inner lip* spread on the base of the penultimate whorl, continuous with the outer lip; *umbilicus* large but shallow.

Inhabits stagnant water and sluggish streams in every part of Great Britain. As is the case with other members of the genus, the shell of this species is often distorted, the whorls being drawn out and separated from each other, causing it to assume the appearance of a corkscrew.

Var. *ecarinata.*—"Shell smaller, light grey, having one whorl less than usual and no trace of a keel," *B.C.*, vol. i. p. 87. Gwyn Jeffreys says it appears to be very rare in this country, he only found it once and that was in Oxwich Marsh near Swansea. My friend Dr. Laver of Colchester informs me that he has met with it in Essex.

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* Having a round spire.

7. P. Vor'tex,* Linné. Pl. IV.

Body rather slender, reddish-brown tinged with violet above, of a lighter shade beneath, indistinctly speckled with black; *head* very large, much rounded in front; *tentacles* slender, pointed at the tips, somewhat thicker, and widely diverging at their base; *eyes* black; *foot* reddish-brown with a yellowish tinge, margins paler, rounded in front, and ending in a tapering and keeled tail.

Shell greatly compressed, somewhat concave above, flat beneath, thin, glossy, greyish or brownish horn-colour, regularly and closely marked with fine striæ in the line of growth, sometimes very faintly striate also spirally; *epidermis* thin; *periphery* distinctly keeled below; *whorls* 6–8, somewhat angular, gradually increasing in size; *suture* distinct but rather shallow; *mouth* nearly oval, slightly compressed, acutely angulated above, internal margin often strengthened by a slender rib; *outer lip* not reflected; *inner lip* continuous with the other, widely spread over the base of the penultimate whorl; *umbilicus* broad, not deep.

Inhabits the same situations as *P. spirorbis*, from which it may be distinguished by its thinner and flatter shell, by its distinct and sharper keel, and by the shape of the mouth, which is oval and angulated, instead of nearly circular.

It is an inactive and irritable species, and delights in floating lazily on the under surface of the water. When, during hot weather, the places of its abode are dried up, it buries itself under the mud and weeds, and after closing the aperture of its shell with a thin white epiphragm, it awaits in a torpid state the return of rain.

Var. *compressa.*—Shell thinner and flatter, *keel* more prominent and placed near the centre of the periphery. It is often found with the typical form.

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* A whirlpool.

8. P. CARINA'TUS,* MÜLLER. PL. IV.

Body dark reddish-brown, slightly greyish beneath, indistinctly spotted with black; *tentacles* slender but somewhat thickened at their base, transparent, yellowish, with a tinge of pink, tips bluntish; *eyes* very small, round, black; *foot* reddish-grey beneath, darker towards the middle, roundish in front, and ending in a broadish, blunt tail.

Shell compressed, concave above, nearly flat or slightly convex beneath, thin, somewhat glossy, slightly transparent, pale brownish horn-colour, with fine close-set striæ in the line of growth, and faintly striate spirally; *epidermis* thin; *periphery* prominently keeled in or near to the centre; *whorls* 5–6, rather rapidly increasing in size, body whorl sloping gradually towards the periphery on both sides; *suture* deep; *mouth* obliquely oval, acutely angulated above, sometimes furnished with an internal rib; *outer lip* very little reflected; *inner lip* widely spread over the base of the penultimate whorl and continuous with the other; *umbilicus* very small.

Inhabits slow rivers and stagnant water in many parts of Great Britain, but it is local and not very abundant where it does occur. It seems to be most plentiful in the home and eastern counties, but its range is somewhat wide, as it has also been found in those of Dorset, Somerset, Northampton, York, Durham (W. D. Sutton), Oxford (D. Pidgeon), as well as in some parts of Wales and Ireland.

It is an inactive species, at one time attaching itself firmly to smooth substances, at another floating idly on the under surface of the water.

Its eggs, to the number of ten to twelve, are laid during the months of May, June, and July, and are deposited in roundish capsules, the fry being hatched in about ten or twelve days.

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* Keeled.

Var. *disciformis.*—"Shell flatter and thinner, of a yellowish colour, having the last whorl larger in proportion to the others, and the *keel* more prominent and sharp, and placed exactly in the middle. It is found in Bucks, Oxford, Cambridge, Glamorgan, Cork, and Tipperary, and is somewhat rare."—*B.C.*, vol. i. p. 90. Titterford and Sutton-Coldfield near Birmingham (G. Sherriff Tye), *J.C.*

9. P. COMPLANA'TUS,* LINNÉ. PL. IV.

Body dark violet-red, very slightly transparent; *tentacles* filiform, slender, somewhat pointed at the tips, thicker at their base, yellowish faintly tinged with rose-colour; *eyes* small, round, black; *foot* violet-red, greyish at the edges, finely spotted with black, rounded in front, and ending in a blunt tail.

Shell concave above, nearly flat beneath, thickish, almost opaque, usually of a dullish appearance, brownish or greyish horn-colour, with close-set striæ in the line of growth, and indistinctly striate spirally; *epidermis* thickish; *periphery* strongly keeled below; *whorls* 5–6, rapidly enlarging, more rounded than in *P. carinatus*, body whorl in breadth about one-quarter of the shell; *suture* deepish; *mouth* rounded-oval, somewhat angulated above, often ribbed internally; *outer lip* slightly reflected; *inner lip* spread over the base of the penultimate whorl and continuous with the outer lip; *umbilicus* large but not deep.

Inhabits slow rivers, ponds, and stagnant water in most places in England, Wales, and Ireland. In Scotland it is abundant near Edinburgh, in Duddington and Lochend Lochs, as well as in marshes at Luffness Links, East Lothian (McMurtrie).

Like the preceding species, this is a sluggish and irritable creature; when touched it instantly falls from the object to which it had attached itself, retreating

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* Flattened

at the same time far within its shell, which, as is the case with the other members of the genus, is considerably larger than the body of the animal. Moquin-Tandon says that it lays its eggs during the months of April, May, and June; they vary in number from six to twenty-one, are glossy, of a roundish form, and enclosed in from eight to ten capsules which are either roundish or oblong. It is rather difficult to distinguish this from the last species, and some conchologists are consequently doubtful as to their being specifically distinct; but the shell of *P. complanatus* is rather larger and thicker than that of *P. carinatus*, the whorls are more rounded, the keel is placed on the lower side instead of near the middle of the periphery, and the mouth is more roundly oval and scarcely so angular above. Monstrosities occur in this as in most of the species of Planorbis, having their whorls more or less separated from each other.

Var. 1. *rhombea.*—Shell smaller, more solid, more convex above, deeply umbilicated below; keel blunt and almost obsolete. Near Dublin and in the South of Ireland, *B.C.* Erith, Kent (H. Leslie), *J.C.*

Var. 2. *albida.*—Shell whitish or colourless. Eltham in Kent (Choules), *B.C.*

D. *Whorls rounded, not keeled.*

10. P. COR'NEUS,* LINNÉ. PL. IV.

Body shiny black or dark red above, greyish beneath; *tentacles* filiform, slender, rather opaque, of a dirty brown colour, slightly rounded at the tips, diverging considerably at their base; *eyes* rather small, round, black; *foot* opaque, blackish, with reddish margins, covered with small, round,

* Horn-coloured.

indistinct tubercles, narrow in front, and ending in a broad, blunt tail, which is keeled; *jaw* consisting of three pieces.

Shell concave above, rather less so beneath, thick, nearly opaque, somewhat glossy, of a rufous or yellowish-brown colour, usually paler on the lower side, with close-set curved striæ in the line of growth, as well as with finer spiral striæ which are most apparent in the upper volutions; *epidermis* thinnish; *periphery* round, not keeled; *whorls* 5–6, rounded, body whorl in breadth about one-third of the shell; *suture* deep; *mouth* slightly oblique, nearly round; *outer lip* slightly reflected; *inner lip* continuous with the other and broadly spread over the base of the penultimate whorl; *umbilicus* wide but shallow.

Inhabits slow streams, ponds, and ditches, but it is local. It is very much larger than any of the other British Planorbes, and is inactive and extremely irritable, pouring forth a copious stream of red-coloured liquid when provoked. It crawls with a jerking sort of movement, and is fond of floating on the surface of the water.

The capsules, usually two or three in number, are of an oval or roundish form, and colourless, or much more rarely of a pale pink colour; in each of them from twelve to forty eggs are deposited, and the fry are hatched after a lapse of fifteen or sixteen days. The shell of this species during the early stages of its growth is covered with a downy epidermis.

Var. *albina.*—Shell white. Occurs in Surrey, *B.C.* Near Henley-on-Thames, and Clevedon, Somerset (Rich).

11. P. CONTOR'TUS,* LINNÉ. PL. IV.

Body blackish, faintly tinged with red above, pale dirty reddish-brown beneath; *tentacles* very slender, not very transparent, dirty brown, considerably diverging at their base; *foot*

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* Twisted.

broad, rounded in front, tapering gradually behind, and ending in an obtuse tail.

Shell flattish above with a depression in the middle, extremely concave beneath, thickish, brownish horn-colour, with fine, close-set striæ in the line of growth; *epidermis* thickish; *periphery* rounded; *whorls* 8, remarkably compact, considerably compressed, angulated above, less so beneath; *suture* deep; *mouth* crescent-shaped, often furnished with a rib internally; *outer lip* very slightly produced, not reflected; *inner lip* thinly spread over the base of the penultimate whorl, not continuous; *umbilicus* broad, deep.

Inhabits lakes, ponds, and ditches, on aquatic plants in most parts of Great Britain. It is, however, rather local. It is a sluggish and irritable little creature, shrinking from the slightest touch, and it frequently floats in an inverted position on the under surface of the water. The capsules of this species vary from five to nine in number, each of them contains six to eight eggs, and the fry are excluded in about ten or twelve days.

Var. *albida*.—"Shell nearly white." Found by Gwyn Jeffreys in a lake near Lerwick. "Weston-super-Mare" (Rich).

P. DILATA'TUS, GOULD (*P. lens*, Lea).

This American species was first noticed in this country by Mr. Thomas Rogers, of Manchester, in 1869. There is every reason to believe that it came across the Atlantic in cotton bales. Mr. Rogers first found it in the Bolton Canal at Pendleton, close to the refuse and warm water discharges from a cotton mill, and afterwards in a similar situation in the canal at Gorton. He sent specimens to Dr. Gwyn Jeffreys, who, in a communication to the 'Annals and Magazine

of Natural History' for November, 1869, gave the following description of it:—

"The shell is about the same size as *P. nautileus*, which may be considered its nearest ally; but it has one whorl less, the periphery is angulated, the under side is remarkably gibbous, the mouth is very large, squarish, and scarcely oblique, the outer lip is expanded ('so as to make it trumpet-shaped'—Gould), and the umbilicus is abruptly contracted, small, and deep. Some of the Manchester specimens are more or less distinctly though microscopically striated in the direction of the spire. The following is a description of the animal or soft parts:—

"Body dark grey, often with a slight orange tint, closely and minutely speckled with flake-white; *mantle* thick, lining the mouth of the shell; *head* large and tumid; *mouth* furnished with broad lobular lips; *tentacles* cylindrical and extensile, widely diverging, broad and triangular at the base; the sheath or outer part is gelatinous, and the core or inner part is of a much darker colour and apparently greater consistence; tips rounded; *eyes* sessile on the inner base of the tentacles; *foot* oblong, squarish in front and bluntly pointed behind; *verge* curved, on the left-hand or umbilical side of the shell. The spawn is arranged in an irregular mass containing about a dozen membranous capsules, each of which has a yellowish yolk or vitellus in the centre.

"It is active, and occasionally creeps, like many other aquatic Gastropods, on the under surface of the water, with its shell downwards."

In the 'Quarterly Journal of Conchology' for August 1875 there is an extract from a paper read by Mr. Rogers in 1870 before the Natural History Section of the Manchester Literary and Philosophical Society, upon the introduction of this species, in which he "said

that since the year 1869 (when the mollusc was found in small quantity) it had increased its area of distribution and multiplied so much as to be likely to become one of the commonest of our local shells."

GENUS II.—PHY'SA, LAMARCK.*

Body oblong, spiral; *tentacles* long, rather slender; *foot* elongated, roundish-oval in front, pointed behind, attached to the body by a broad, short pedicle; *jaw* single, slightly arched.

Shell oblong or oval, very thin, transparent; *spire* more or less produced, sinistral.

This genus seems to form a connecting link between *Planorbis* and *Limnæa*, partaking of some of the characters of each, but differing from both in the form of the shell, which is sinistral. The *Physæ* inhabit clear water; they are gregarious and herbivorous. Their eggs, which are oval and of a glassy texture, are incased in gelatinous capsules or coverings, which are cemented to stones and other substances under water. There are only two species in Great Britain.

A. Mantle simple, not covering the shell; *shell* covered with an epidermis; *spire* long.

1. PHYSA HYPNO'RUM,† LINNÉ. PL. IV.

Body dark grey or brown, sometimes slaty-black, of a texture resembling velvet, covered with exceedingly small blackish specks; *tentacles* long, slender, much pointed, grey more or less deep in colour; *eyes* somewhat indistinct, very small, black; *foot* oblong, lanceolate, narrow, and obtuse in front, ending behind in an oval, depressed, and somewhat pointed tail, which is of a paler colour than the rest of the body, and more distinctly spotted with grey or black.

Shell spindle-shaped, thin, semitransparent, very glossy,

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* A bladder. † Living in *Hypnum*, one of the genera of mosses.

ochreous-brown, slightly striate in the line of growth, and indistinctly so, spirally; *epidermis* extremely thin; *whorls* 5–7, rounded, and somewhat compressed laterally, body whorl larger than the rest of the shell; *spire* produced, obtuse at the tip; *suture* rather shallow; *mouth* narrowish oval, acutely angular above, rounded beneath; *outer lip* thin; *inner lip* spread on the base of the penultimate whorl; *pillar* with a broad fold.

Inhabits sluggish streams, ponds, and ditches, on aquatic plants, in most parts of the British Isles, but it is local. It is rather an active mollusc, often leaving its native element to crawl upon those leaves and stems of surrounding plants which are not submerged; at other times it floats in an inverted position on the under surface of the water. The eggs, which are oval, are deposited in gelatinous masses, each of which contains from eight to twenty. The young are hatched in about fifteen or sixteen days, and have a small obtuse shell; they arrive at maturity in two years.

B. *Mantle* lobed; *shell* not covered with an epidermis; *spire* short.

2. P. FONTINA'LIS,* LINNÉ. PL. IV.

Body rather transparent, greyish or slaty-grey, sometimes slightly tinged with either a violet or faintly greenish hue; *mantle* with two lobes, one of which is split into six and the other into nine finger-like lobes, or divisions, which, when expanded, lap over the shell; *tentacles* rather slender, slightly transparent, ash-colour; *eyes* moderately large, black; *foot* pale grey, rounded in front, ending in a narrow tail.

Shell ovate, very thin, fragile, glossy, transparent, pale greyish

* Inhabiting fountains.

horn-colour, with a faint greenish or yellowish tint, with faintish striæ in the line of growth, occasionally marked with rather stronger ridges in the same direction, and very indistinctly striate spirally; *whorls* 4–5, tumid, body whorl much larger than the rest of the shell; *spire* short, apex obtuse; *suture* deepish; *mouth* oblong, large, somewhat contracted, and acutely angular above, rounded below; *outer lip* very thin; *inner lip* widely spread over the base of the penultimate whorl; *pillar* with a slender fold.

Inhabits slow rivers, brooks, ponds, and ditches on aquatic plants, particularly watercress, all over Great Britain, and is common.

This is a more than usually active mollusc; it jerks itself from place to place along the water in a manner which it is amusing to witness. Gwyn Jeffreys says: "The jerking motion which this animal has is said to be owing to its being infested by a small kind of parasitic worm, which causes it some uneasiness. I should rather be inclined to attribute this motion to the length and narrowness of the foot, which has to support a comparatively bulky shell." —*B.C.*, vol. i. p. 99. I have before me now a glass vase, in which are several kinds of aquatic molluscs, which I have placed there for the purpose of observing their habits. They are all more or less infested by parasites, which do not appear to cause them much, if any, annoyance. Among them there are several specimens of *Planorbis corneus*, whose bodies, more especially about the head, are literally swarming with vermiform parasites, that wriggle about in a manner one would suppose to be anything but comforting to their victims, which seem, however, totally unconcerned, and slowly creep round the

vessel, devouring with evident relish the confervoid growth that adheres to the glass.

The jerking manner in which *P. fontinalis* and *P. hypnorum* are in the habit of disporting themselves is doubtless owing to the fact that they spin "molluscan threads," like those of the *Sphæriidæ*, and when suspended in mid-water by these invisible cables, twist themselves about and perform all manner of antics, sometimes in sport and sometimes in angry combat with one another. Nor is the capability of thread-spinning confined to the *Sphæriidæ* and *Physæ;* many other molluscs employ the same means of locomotion. It is well known that *Bythinia tentaculata*, many, if not all, of the *Limnæidæ*, and several of the slugs are thread-spinners; but they do not all possess this faculty to the same extent. Some species avail themselves of it more frequently than others, and some more frequently in the young than in the adult state. In the 'Quarterly Journal of Conchology' for November, 1878, there is a most interesting paper on "Molluscan Threads," by Mr. Sherriff Tye, who had read it before the Birmingham Natural History and Microscopical Society. The following is a brief extract from it:—

"*Physa hypnorum.*—As before stated, I have had the young of this species creeping up and down permanent threads for eighteen or twenty days together. In one case I saw three *Physæ* and a *Limnæa glabra* upon a thread of the former at one time. Often when two *Physæ* meet upon the same thread they fight as only molluscs of this genus can, and the manœuvres they go through upon their fairy ladders outdo the

cleverest human gymnast that ever performed. I once saw one ascending, and when it was half-way up the thread it was overtaken by another; then came the 'tug of war.' Each tried to shake the other off by repeated blows and jerks of its shell, at the same time creeping over each other's shell and body in the most excited manner. Neither being able to gain the mastery, one began to descend, followed by the other, which overtook it, reaching the bottom first. Yet they are not always bent upon war, but pass and repass each other in an amicable spirit."

The gelatinous capsules of *P. fontinalis* contain from five to twenty eggs. The fry are excluded at the end of about twenty days.

Var. 1. *inflata.*—Shell half as large again as the usual size; *whorls* angular towards the suture, the middle one rather more prominent than the penultimate whorl, causing the summit of the spire to appear abruptly terminated. Dublin (Humphreys and Warren), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

Var. 2. *curta.*—Spire extremely short. Clonoony Barracks, Ireland (Brown), Bramerton, Norfolk (J. G. J.), *B.C.* Perthshire (Buchanan White), *S. N.*, vol. ii. p. 207.

Var. 3. *oblonga.*—Spire considerably produced. Anglesea (J. de C. Sowerby), Naas, Ireland (Humphreys), *B.C.* River Went, Yorkshire (J. Hebden), near Birmingham (G. Sherriff Tye), *J.C.*

Var. 4. *albina.*—Shell of a milk-white colour. Birkenhead (Webster), *B.C.*

GENUS III.—LIMNÆ'A (LYMNEA), BRUGUIÈRE.*

Body longish, spiral; *mantle* entire; *tentacles* flattish, subtriangular, short; *foot* strongly notched in front, obtuse behind,

* Inhabiting marshy places.

attached to the body by a pedicle ; *respiratory orifice* on the right side ; *generative orifices* also on the right side, apart from each other, that which serves for the male functions being placed behind, and that for those of the female in front, at the base of the neck, near the respiratory orifice ; *jaw* with three pieces, smooth, upper one usually slighly beaked ; *lingual* ribbon usually as in *L. stagnalis.*

Shell conic-ovate, more or less elongated ; *spire* dextral.

The animals which belong to this genus are gregarious ; they inhabit sluggish waters, and are extremely prolific. The apex of their shell is frequently eroded, and sometimes the upper volutions are altogether wanting. This is mainly caused by the animal retiring downwards, as its body increases in size, into the larger portion of the shell, the upper whorls being thus left untenanted, so that after a time, like a deserted house, they crumble away. I cannot help thinking, however, that the process of demolition is often aided by the ravages of individuals of the same, or even of other species, when the water they inhabit chances to be deficient in carbonate of lime. This erosion is by no means the rule, but rather the exception, and it does not occur, to the same extent at least, in all situations, and I have frequently observed these molluscs engaged in what seemed suspiciously like the act of purloining "building materials" from the apex of their neighbours' shells. It would be interesting if conchologists in different parts of the country would take the trouble to analyze the water from those localities where the molluscs are liable to erosion. Gwyn Jeffreys, in his remarks respecting the members of this genus, says : "Their mode of propagation is very singular, three or more individuals

being united in a chain for that purpose. Leach has remarked that, in consequence of the sexual parts being distant from each other, one individual is able at the same time to perform the function of each sex with two others, as was first observed by Geoffroy about the middle of the last century. The spawn resembles that of the last genus."—*B.C.*, vol. i. p. 101.

A. Shell very thin and brittle, nearly covered by a contractile expansion of the border of the mantle; *spire* very short.

1. LIMNÆA GLUTINO'SA,* MÜLLER. PL. V.

Body large, glutinous, of a dark grey or greenish colour tinged with yellow, and covered with golden-yellow specks; *tentacles* very short, sub-triangular, light greenish-yellow veined with grey, and spotted with white; *eyes* situated at the inner base of the tentacles on small knob-like stalks; *foot* extremely large, speckled with white, broad and obtusely rounded in front, and ending in a blunt tail.

Shell globosely ovate, remarkably thin, very glossy, transparent, pale amber or greyish horn-colour, often indistinctly banded with a darker shade of the same colour, with remote, irregular striæ in the line of growth, and very faintly but closely striate spirally; *epidermis* very thin; *whorls* 3–4, globular, body whorl occupying the greater part of the shell; *spire* slightly produced; *suture* deepish; *mouth* nearly oval, slightly contracted above; *outer lip* extremely thin; *inner lip* broadly spread on the base of the penultimate whorl; *fold* (on the pillar) curved, sharp.

Inhabits ponds and ditches, chiefly in the home and eastern counties; it has also been noticed in the following localities:—Near Dunster Castle, Somersetshire (Leach), Bala Lake (Gibbs), near Windermere (Bulwer), *B.C.* Near Henley-on-Thames (Rich).

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* Glutinous.

This local species sometimes disappears mysteriously from localities in which it has been known to exist, reappearing however after a time as plentifully as before. This curious phenomenon has not been satisfactorily accounted for. It is scarcely probable that the animal actually leaves its habitat; perhaps for some reason it buries itself for a lengthened period in the mud, and thus escapes observation. Moquin-Tandon says that it is a lively animal, being usually on the move, and that it greedily devours the thread-like and tender roots of some of the aquatic plants. The capsules are colourless and transparent, and contain from thirty to forty eggs. The shell of the young is completely covered by the expansion of the mantle.

Var. *mucronata.*—Shell not quite so globular; *spire* more produced.

B. Shell not covered externally by the mantle; *spire* usually produced.

2. L. INVOLU'TA,* THOMPSON. PL. V.

"Body dark yellowish-brown, more or less speckled closely and irregularly with flake-white at the sides of the head, tentacles, and foot; *mantle* wholly enclosed within the shell, which it lines, a space being usually left between it and the mouth; no part of the mantle is outside the shell either when the animal is crawling or not, its edges are somewhat thickened; *head* very large, broad, and semicircular; *mouth* placed below the head-disc and in the middle of it, and extended sideways; it is armed with a pair of jaws which are disposed transversely; *tentacles* large and triangular, with blunt tips; *eyes* small, black, seated on the inner base of the tentacles; *foot* lanceolate (lance-head shaped), or

* Rolled inwards (in allusion to the sunken spire).

like a flint implement of that type, broader and rounded in front, and narrowing behind to a blunt point."—Gwyn Jeffreys.

Shell oval, thin, fragile, moderately glossy, almost transparent, of a pale amber or horn-colour, with numerous close-set, irregular striæ in the line of growth, which are more strongly defined near the suture; *epidermis* thin; *whorls* 3–4, convex, body whorl occupying by far the greater portion of the shell; *spire* sunken, apex slightly raised; *suture* distinct but shallow; *mouth* large, pear-shaped; *outer lip* thin, slightly reflected; *inner lip* broadly spread on the penultimate whorl; *fold* sharp, narrow.

Inhabits a small lake on the Cromaglaun Mountain near Killarney. It has not been found in any other locality.

In the meagre accounts hitherto given of the animal of this singular and beautiful species, the mantle has been erroneously described as covering the exterior of the shell, as in *L. glutinosa.*

Since the publication of his 'British Conchology,' my esteemed friend Dr. Gwyn Jeffreys has had an opportunity of examining living specimens of *L. involuta,* and has most kindly furnished me with the above accurate description of the animal, from which it will be seen that no part of the exterior of the shell is at any time covered by the mantle; I have therefore placed this species in Section B.

This mollusc may possibly prove to be a form of *L. peregra,* to which it is, in my opinion, as closely allied as are the varieties *lacustris* and *Burnetti* of that species. Its habitat is similar to that of these varieties, and the peculiar form of the three shells is probably owing to the sub-alpine position of the lakes they inhabit.

This species, according to some writers, occurs in a small stream by which the Cromaglaun Lake is fed, as

well as in the lake itself; but my friend Dr. Laver, of Colchester, who has visited the spot, informs me that "there is no stream running into the tarn, and the small overflow is lost in the boggy soil, and gradually drains over the face of the precipice."

3. L. PER'EGRA,* MÜLLER. PL. V.

Body grey or very pale brown with a greenish tinge, indistinctly but closely spotted with black, and powdered less thickly with larger specks of a yellowish-grey colour; *tentacles* flattish, widely diverging, triangular, very broad at the base, and tapering to a point in front, placed at nearly a right angle with the sides of the animal, spotted with greyish-yellow; *eyes* rather large, nearly round, black; *foot* pale greenish-brown, somewhat truncated in front, rounded behind.

Shell obliquely ovate, thin, fragile, rather glossy, somewhat transparent, yellowish horn-colour, with irregular striæ in the line of growth, and faintly striate spirally, as well as sometimes ridged in the same direction; *epidermis* thin; *whorls* 5, convex, body whorl tumid, occupying about three-quarters of the length of the shell; *spire* produced, apex sharply pointed; *mouth* oval, large, very slightly contracted above; *outer lip* thin, somewhat reflected; *inner lip* broadly reflected and thickened on the pillar, and forming a very small umbilical chink; *fold* large, curved.

Inhabits sluggish streams, ponds, and ditches in every part of Great Britain. It is an exceedingly abundant species; the size, form, and colour of the shell are very variable, being materially affected by the properties, temperature, and situation of the water it inhabits. It is tolerably active, often leaving the water to climb upon the stems and leaves of surrounding plants, and it frequently wanders away to a

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* Wanderer.

considerable distance from its usual place of abode. Gwyn Jeffreys says: "A writer in the 'Zoologist' lately stated (p. 7400) that it ate minnows when they were confined together in an aquarium. I have seen these pond-snails attack and devour their own brothers and sisters under the same circumstances when they had no other supply of food; and this was done by piercing the spire of the shell near its point, which was thinner and somewhat eroded by the action of the water."—*B.C.*, vol. i. p. 107. This species is exceedingly prolific; a single individual has been known to lay 1300 eggs during the breeding season.

Var. 1. *Burnetti.*—Body a little broader than that of the typical form, dark olive, spotted with opaque yellow; *mantle* nearly black with a few paler spots. Shell rather globular and solid, of a dull aspect, yellowish-brown; closely and strongly striate in the line of growth; *epidermis* rather thick; the last *whorl* nearly covering all the others; *spire* exceedingly short, nearly truncate, and almost intorted. Loch Skene, Dumfriesshire (Burnett), Breconshire (Moggridge). In the stomach of a gillaroo trout caught in a lake in Co. Tipperary (Walker), *B.C.*

Var. 2. *lacustris.*—Body of a darker colour than usual. Shell resembling that of the last variety, but it is much smaller and more glossy, and has strong and regular transverse grooves, and the spire is not quite so short nor inclined to be intorted. The shell is often eroded. Mountain lakes in Zetland, Scotland, Ireland, and the North of England, *B.C.* I found a smaller form of this variety in the River Clouden, near Dumfries.

Var. 3. *lutea.*—Shell remarkably solid, having a very short spire of from 3 to 4 whorls. South Devon (Montague), South Wales (J. G. J.), thrown up by the tide at the mouths of rivers, *B.C.*

Var. 4. *ovata.*—Body of a paler colour. Shell ampullaceous and rather thinner than usual; *whorls* exceedingly convex, the last being larger in proportion to the rest; *spire* very short;

suture deep; *mouth* very large. Lakes, ponds, and canals, attaining sometimes a considerable size, *B.C.*

Var. 5. *acuminata.*—Shell resembling the last variety in all respects, except in having a more produced spire and a smaller mouth. With the last, *B.C.*

Var. 6. *intermedia.*—Shell rather compressed towards the front margin, and thinner than usual; *spire* more produced; *mouth* expanded. Ponds, *B.C.*

Var. 7. *oblonga.*—Shell oblong and compressed in front. Lewes, Suffolk, Church Stretton, Salop, Bearhaven, Co. Cork (J. G. J.), *B.C.* Marsh at Hamstead, near Birmingham (G. Sherriff Tye), *J.C.*

Var. 8. *labiosa.*—Shell smaller, having the outer lip remarkably expanded and reflected. Appin, Argyleshire (Bedford), *B.C.* Sutton Park, near Birmingham (G. Sherriff Tye), *J.C.*

Var. 9. *picta.*—Shell rather smaller than the last, and beautifully marked by alternate bands of brown and white, which are sometimes confluent. Ulva, I. Hebrides (Bedford), *B.C.*

Var. 10. *maritima.*—Shell dwarfed, rather solid; *spire* produced; *suture* deep. Marshes on the sea-coasts of Glamorganshire and North Devon (J. G. J.), *B.C.*

Var. 11. *succineæformis.*—Shell shaped like a Succinea, and very thin; *whorls* 4; *spire* small and oblique. Kensal Green (J. G. J.), *B.C.*

Var. 12. *albida.*—Shell of a very clear white colour. Near Askern, Yorkshire (Lister Peace), *J.C.*

The following monstrosities also occur :—

Monst. 1.—*decollata.*—Shell more or less eroded; *spire* truncate. Church Stretton, Oxwich, near Swansea (J. G. J.), *B.C.* Several localities near Birmingham (G. Sherriff Tye), *J.C.* Warwickshire (McMurtrie).

Monst. 2.—*sinistrorsa.*—Shell *spire* reversed, rather solid, spiral ridges distinct. Scarborough (Bean), pond near Balta, a single specimen (Waller), *B.C.*

Monst. 3.—*scalariformis.*—Shell oblong, with deep and regular striæ; *whorls* more or less disjointed, *suture* consequently deep. Warminster (J. G. J.), *B.C.* Sutton-Coldfield near Birmingham (G. Sherriff Tye), *J.C.* Warwickshire (McMurtrie).

4. L. AURICULA'RIA,* LINNÉ. PL. V.

Body of a pale brownish-grey, with a faint tinge of green, thickly covered with minute black and milk-white specks, the latter being rather larger and less numerous; *tentacles* triangular, flattish, placed widely apart, and at nearly a right angle with the sides of the animal, very broad at their base, gradually narrowing towards, and pointed at the tip, rather transparent, pale greenish-grey, and finely powdered with a line of yellowish-grey specks along the margins; *eyes* moderately large, roundish, black; *foot* obtusely rounded in front and behind, keeled, and margined with a narrow yellow band.

Shell globosely ovate, thin, glossy, transparent, of a pale amber-colour, with strongish irregular striæ in the line of growth, as well as with intermediate rows of very fine, close-set lines, and somewhat indistinctly ridged spirally; *epidermis* thin; *whorls* 4-5, very tumid, body whorl occupying by far the greater portion of the shell; *spire* very small, apex sharply pointed; *suture* strongly defined; *mouth* very large, roundish, oval, inner side slightly contracted and somewhat truncated; *outer lip* very thin, reflected; *inner lip* somewhat thickened, and forming a rather small umbilical chink or hollow; *fold* considerably curved, sharp.

Inhabits slow rivers, lakes, ponds, and canals in many parts of England, but it is not a common species. It has been found "in a ditch at Clonooney, King's County, Ireland," Brown's 'Illustrations of Recent Conchology,' p. 29. In Scotland it has been observed "in Abercorn Park," Forbes and Hanley, vol. iv. p. 171; and "in Monkland Canal (Dougall)," 'Trans. Glasgow Natural History Society,' vol. i. p. 192. This is a sluggish mollusc; it usually remains at or near the bottom of the water, but sometimes it floats idly on the surface; when crawling it carries

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* Ear-shaped.

its shell in a horizontal position. It breeds during the months of July and August; the capsules are of a tubular form, somewhat compressed, and more or less curved or bent like a bow. Each of them contains from fifty to sixty eggs, and the fry are excluded in about fifteen days.

Var 1. *acuta.*—Body of a greyish colour and closely covered with black spots. Shell smaller than the typical form, more oblong, and having the last whorl and mouth proportionably narrower. Marshes on the sea-coast of Glamorganshire, Church Stretton, Salop, Kent, Co. Tyrone (J. G. J.), Yoxford, Suffolk (Barlee), *B.C.*

Var. 2. *albida.*—Shell smaller and thinner, white, with a shorter spire and less distinct striæ. Bath (Clark), Blenheim Lake (Mrs. Richard Smith), *B.C.*

5. L. STAGNA'LIS,* LINNÉ. PL. V.

Body yellowish-grey, with a faint tinge of green, mottled with minute brown and milk-white specks; *tentacles* flattish, in form of an elongated triangle, pointed at their tips, rather transparent, greenish-grey, powdered with distinct milk-white spots; *foot* broad, faintly dotted with brown, margined with a narrow line of yellow, convex and keeled behind; *lingual ribbon* with 110 rows of 111 teeth = 12,210, central tooth minute, laterals large, with two points, the outer one being the smaller.

Shell ovate-oblong, moderately thick, semitransparent, greyish or yellowish horn-colour, with strong irregular striæ in the line of growth, as well as with numerous intermediate rows of slender but sharply defined curved striæ which are more apparent on the upper volutions, and indistinctly ridged spirally; *epidermis* rather thin; *whorls* 6–8, convex, but somewhat angulated by the ridges, body whorl much larger, and more tumid than the others; *spire* elongated, tapering to an acute point; *suture* deepish, with a narrow white line on its margin; *mouth* nearly oval; *outer lip* rather thin, somewhat reflected in

* Living in stagnant pools.

full-grown specimens; *inner lip* broadly and thickly spread on the base of the penultimate whorl; *fold* strong and very much curved.

Inhabits sluggish streams and stagnant water throughout Great Britain. In form this is one of the most elegant of our freshwater shells. It is an indolent species, and adheres very firmly to the objects to which it has attached itself. It frequently floats on the surface of the water. Owing to the sluggish nature of this species its shell is very frequently incrusted with a mineral or vegetable deposit. The eggs, which vary in number from forty to one hundred and twenty, are deposited in oblong or roundish capsules, and the fry are excluded in from twenty to thirty days. The young shell is extremely slender and fragile, and strongly resembles the variety *fragilis*. In the 'Quarterly Journal of Conchology,' May, 1877, p. 216, Mr. W. Nelson remarks, "This species has the power (occasionally at any rate), when irritated, of discharging a pale violet-coloured liquid. Having observed many times that in scalding the animal of this species, previous to cleaning out the shells, the water was tinged with violet, I was led to pay particular attention to them in the living state, and found that they discharged this coloured liquid sometimes at once upon being lifted out of the pond, but more often if irritated."

Var. 1. *fragilis*.—Shell smaller, more fragile, slender, and tapering. Kennet and Avon Junction Canal, Wilts, Surrey and Croydon Canal, River Cam at Cambridge, Grand Canal, Dublin, *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.* Near Colchester (Laver).

Var. 2. *albida*.—Shell white. Grand Canal, Dublin, *B.C.*

Var. 3. *labiata.*—Shell dwarfed and more solid, with the outer lip much reflected and thickened. Lough Neagh, Ireland (Moggridge), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

Monst. *sinistrorsa.*—Spire reversed. Kenn Moor, Somerset (Norman), *B.C.*

C. Shell elongated; *spire* considerably produced.

6. L. PALUS'TRIS,* MÜLLER. PL. V.

Body rather opaque, of a dark slaty-grey or deep violet-colour above, greenish-grey beneath, closely mottled with indistinct blackish and yellowish spots; *tentacles* conical, slightly curved, somewhat pointed at the tips, of a brownish colour which is paler at the extremities; *eyes* oval, black, seated on small round tubercles; *foot* oblong, slightly notched, and truncate in front, rounded and faintly keeled behind.

Shell oblong-conic, thick, opaque, of a dull brownish horn-colour, with occasionally a violet tinge; with strong irregular striæ in the line of growth, the spaces between them filled in with rows of close-set finer lines, rather strongly ridged spirally, especially on the last two volutions; *epidermis* thin; *whorls* 6–7, rather convex, but angulated by the ridges, body whorl occupying about two-thirds of the length of the shell; *spire* considerably produced, and ending in an acute apex; *suture* deepish, usually encircled by a slender white line; *mouth* nearly oval; *outer lip* thickish, very little reflected; *inner lip* spread on the base of the penultimate whorl; *fold* strong and sharp.

Inhabits marshy places, slow streams, and stagnant water throughout Great Britain. It is a sluggish and irritable creature, and very voracious; it frequently leaves the water. The eggs vary from fifty to ninety in number, and are deposited in capsules which in form resemble a depressed or flattened cylinder.

Var. 1. *Corvus.*—Shell larger, more tumid, purplish-brown. Suffolk (Barlee), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

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* Living in marshes.

Var. 2. *elongata.*—Spire elongated. Falmouth (J. G. J.), *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.*

Var. 3. *tincta.*—Shell shorter and broader, light brown, with a purplish mouth. It resembles a *Bulimus* in form. Swansea and Dorsetshire (J. G. J.), Anglesea (Gibbs), *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.*

Var. 4. *conica.*—Shell conic, greyish-white, with a deep suture and an umbilical cleft. Banks of the Thames from Hammersmith to Woolwich (J. G. J.), Cork (Humphreys), *B.C.* Yatton, Somerset (McMurtrie).

Var. 5. *roseo-labiata.*—Mouth of the shell furnished inside with a rose-coloured or white rib. Belfast (Thompson), Cork (Humphreys), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.* Duddingston, Edinburgh, Luffness Links, E. Lothian, and near Moffat (McMurtrie).

Var. 6. *albida.*—Shell white. Near Leeds, a single specimen (J. W. Taylor), *J.C.*, May, 1874. Near Southport (E. Collier).

Monst. *decollata.*—Spire truncated, not uncommon.

7. L. TRUNCA'TULA,* MÜLLER. PL. V.

Body rather opaque, blackish-brown above, pale slate-colour below, finely speckled with black; *tentacles* broadish at the base, narrower towards the tips, which are rounded, rather transparent, pale grey with very fine black specks; *eyes* almost sessile; *foot* somewhat truncate in front, narrowing very gradually behind where it is rounded.

Shell oblong-conic, turreted, moderately thick, rather glossy, yellowish horn-colour, rather strongly striate in the line of growth, and with finer, close-set, intermediate striæ, and ridged spirally as in the last species; *epidermis* thin; *whorls* 5-6, rounded, but somewhat truncate above, body whorl occupying more than one-half of the length of the shell; *spire* tapering

* Somewhat truncated.

somewhat abruptly, apex rather acute; *suture* very deep; *mouth* nearly oval; *outer lip* sharp; *inner lip* continuous with the other, spread on the base of the penultimate whorl; *umbilical cleft* distinct; *fold* moderately thick.

Inhabits marshes, muddy streams, and ditches, as well as rocks by the side of waterfalls, in every part of Great Britain. This little mollusc varies considerably in size and colour according to the nature and position of the localities in which it occurs. It not only lives in marshy and low-lying places but is equally abundant in mountainous districts, and it appears to be as much at home on land as it is in the water. It lays from twelve to twenty eggs, and the capsules which contain them are usually deposited on the mud.

Var. 1. *major.*—Shell larger; whorls more swollen, body whorl much larger than usual. Penzance (Millet and Barlee), Newton Nottage, Glamorganshire (J. G. J.), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

Var. 2. *elegans.*—Shell much larger, more solid, and slender, greyish-white, marked with coarse spiral ridges; *spire* much produced; *suture* oblique; *outer lip* thickened. Hants, *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.*

Var. 3. *minor.*—Shell much smaller, thinner, and semi-transparent, dark horn-colour, marked with stronger and closer longitudinal striæ. Mountainous tracts and sea-side marshes *B.C.*

Var. 4. *albida.*—Shell smaller, milk-white. Battersea (J. G. J.), Crymlyn Burrows, Swansea (Moggridge), *B.C.*

Var. 5. *microstoma.*—Shell smaller and narrower; *whorls* more swollen; *mouth* contracted. Southampton (J. G. J.), *B.C.*

Monst. *scalariformis.*—Shell smaller; *whorls* nearly disunited. Warminster (J. G. J.), *B.C.*

8. L. GLA'BRA,* MÜLLER. PL. V.

Body rather opaque, dark slaty-grey above, somewhat paler below, finely spotted with black; *tentacles* curved, broad at their base, somewhat pointed at the tips, rather transparent, pale grey; *eyes* situated on prominent tubercles, round, black; *foot* truncate in front, rounded behind.

Shell elongated, cylindrical, gradually tapering, thinnish, rather glossy, greyish or brownish horn-colour; sculpture similar to, but somewhat fainter than that of the last species; *whorls* 7–8, rounded, not very tumid, body whorl scarcely half the length of the shell; *spire* produced, tapering to a moderately fine point; *mouth* oblong-ovate, acutely contracted above, with a broadish, white internal rib, which is slightly removed from the margin; *outer lip* thin, very slightly reflected; *inner lip* thickish, spread on the base of the penultimate whorl; *fold* sharp; *umbilical cleft* very minute.

Inhabits ditches and ponds in many of the English counties, as well as in some parts of Ireland. In Scotland it has been found near Perth (Buchanan White), *S.N.*, vol. i. p. 26, Frankfield Loch near Glasgow (Dougall), 'Trans. Glasgow Nat. Hist. Soc.,' vol. i. p. 192; but it is a local species. This is an inactive and very timid creature, and as it rarely floats on the surface of the water, must be searched for by scraping with the spoon or net along the sides and bottom of the ponds or ditches where it lives. The eggs, in number from fifteen to thirty, are enclosed in a transparent, oblong capsule, which is attached to stones, the stems and leaves of aquatic plants, and sometimes even to the shells of other species.

Var. *elongata.*—*Spire* considerably more produced. Near Wakefield, common (J. Hebden), near Birmingham (G. Sherriff Tye), *J.C.* Near Colchester (R. R.).

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* Smooth.

GENUS IV.—AN'CYLUS,* GEOFFROY.

Body more or less oval, conical, flattened beneath ; *tentacles* subcylindrical, short ; *respiratory orifice* in the form of a short tube ; *foot* oval, rather shorter than the body, to which it is attached by a rudimentary pedicle or stalk.

Shell cowl-shaped ; *spire* rudimentary, dextral, or sinistral.

The animals which belong to this genus usually inhabit clear water, attaching themselves to stones or the leaves and stems of aquatic plants. They crawl along in a very leisurely manner, twisting their shell slowly from side to side as they advance. In Gray's edition of Turton's 'Manual' (1840, p. 248) it is stated that "these animals sometimes swim about on the surface of the water like Limnæi, with their backs downwards." Moquin-Tandon, Gwyn Jeffreys, and other writers affirm, however, that they do not float, nor have I ever observed them in a floating position. They feed upon Confervæ and other water plants, and upon decomposing vegetable substances. Their stomach is often filled, like the gizzard of a fowl, with minute particles of fine gravel or sand, which are doubtless of service to the animal during the process of digestion. The capsules in which the eggs are deposited are attached to stones and other submerged objects.

In Tate's 'British Mollusks' it is stated that the two species (by which this genus is represented in the British Isles) differ considerably from each other in their lingual dentition. In *A. fluviatilis* "the central tooth is minute, the lateral teeth, thirty-seven in

* Curved or hooked (like the eagle's beak).

number, have long recurved hooks, and are at first simple, but becoming ultimately narrowed and minutely toothed; there are 120 transverse rows." In *A. lacustris* "the central part of each row is much arched, and composed of a central tooth with twelve similar laterals on each side, next to which is a tooth of a different form, and lastly, six more on each side, which latter are in a slight curve; the number of transverse rows is seventy-five; the total number of teeth is 2925."

A. Body sinistral; *shell* dextral.

1. Ancylus fluvia'tilis,* Müller. Pl. V.

Body more or less transparent, slaty-grey, finely spotted with black; *tentacles* greyish-white, rather transparent, diverging, broad at their base, gradually narrowing to a bluntish tip; *eyes* apparent, but small, round, black; foot yellowish-brown, much expanded at the sides, rounded in front, convex and obtuse behind.

Shell hood-shaped, moderately thin, of a dullish aspect, pale horn-colour with a yellowish or greenish tinge, with rather strong, regular striæ, which radiate from the apex towards the margin of the aperture, and more finely striate in the line of growth; *epidermis* thin; *spire* recurved or bent downwards towards the posterior margin, apex rather blunt and usually more or less twisted to the right; *mouth* oval, margin membranous, scarcely reflected.

Inhabits rivers, lakes, and ponds throughout the British Isles. This little mollusc usually attaches itself, after the manner of the marine Limpets, to stones, rocks, wooden piles, or other submerged

* Living in rivers.

substances, to which it adheres very firmly; occasionally, but rarely, it may be seen on the under side of the leaves of aquatic plants, and sometimes it leaves the water altogether for a time and crawls up moist rocks or wooden piles. It lays about eighty eggs during the breeding season; they are deposited in from seven to ten amber-coloured capsules, and the fry are excluded after the lapse of twenty-four to twenty-seven days.

Var. 1. *Capuloides.*—Shell larger and higher, with the beak not placed so near the posterior margin. Very rare (J. G. J.), *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.* I found a single specimen on the under side of a leaf of the water-lily in the River Colne near Colchester.

Var. 2. *gibbosa.*—Shell smaller, more swollen, with the beak reaching or overhanging the posterior margin. Sark, Osmington Mills near Ringstead, Dorset, Dunboy near Bearhaven, Co. Cork (J. G. J.), *B.C.* Near Leeds (W. Nelson), Yorkshire, two localities (H. Crowther), *J.C.*

Var. 3. *albida.*—Shell milk-white, and more finely striated. Various localities.

In the 'Annals and Magazine of Nat. Hist.' for October 1876, Mr. E. Duprey, in a paper on some of the Mollusca of Jersey, makes the following remarks respecting *A. fluviatilis:* "More than once I have found young specimens of this slow animal adhering to an active flying water-beetle, the *Acilius sulcatus.* Thus carried from one pond to another, it can be rapidly distributed throughout the country."

How truly admirable as well as endless are the means by which Nature provides for the distribution of her works!

B. Body dextral ; *shell* sinistral.

2. A. LACUS'TRIS,* LINNÉ. PL. V.

Body greenish-yellow, finely spotted with black ; *tentacles* widely separated, thick, rather transparent, whitish-grey, tips pointed ; *eyes* distinct, but not prominent, round, black ; *foot* greenish-yellow, truncate in front, rounded, and of a somewhat darker colour behind.

Shell much more oblong in form than that of the last species, and thinner, rather glossy, horn-colour, faintly tinged with yellow or green ; *striæ* as in *A. fluviatilis*, but they are finer and much less distinct ; *epidermis* rather thick ; *spire* ridged, apex acute, distinctly twisted to the left ; *mouth* oblong, *margin* membranous, somewhat reflected.

Inhabits sluggish streams, lakes, and ponds, attached to the under side of the leaves of aquatic plants, especially those of the water-lily, in many parts of Great Britain, but it is much more local than *A. fluviatilis.* This species adheres less firmly than the last to the objects to which it attaches itself. It seldom moves from place to place, but when it does so it crawls somewhat rapidly. Moquin-Tandon says it is rather difficult to count the number of its eggs owing to their extreme transparency ; that they usually number from four to twelve, are of an oval form, and not crowded so closely together as those of the last species. The capsules in which they are enclosed are roundish, considerably compressed, transparent, and covered with numerous minute tubercles. The young are hatched in from twenty to twenty-six days.

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* Living in lakes.

Var. 1. *compressa.*—Shell rather larger and considerably broader and flatter than usual. Dunstall, Staffordshire (J. G. J.), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.* Colchester (Laver).

Var. 2. *albida.*—Shell milk-white with a light grey epidermis. Grand Canal, Dublin (Warren), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

TERRESTRIAL.

The terrestrial molluscs of Great Britain have now to be considered. Although the greater number live entirely on land, some of them are capable of remaining submerged for a considerable time.

With respect to animals of a higher organism there is a true and common saying, that it is impossible to determine the point at which instinct ends and reason begins, and in the case of these humbler creatures of the Great Artificer's hand, it is equally impossible to detect a single flaw or gap in the chain which unites them not only to one another, but to beings of a higher as well as of an inferior order, so deftly and so imperceptibly are its links graduated.

The terrestrial molluscs, like the *Limnæidæ*, belong to the second order (*Pulmonobranchiata*), and are comprised in five families which for convenience' sake may be divided into three sections. The first section contains three families, and the animals comprised in it resemble the *Limnæidæ* in most respects, but their tentacles are *retractile* instead of *contractile*. The second section contains only one family, which has a still closer affinity to the *Limnæidæ*, inasmuch as the tentacles of the animals which belong to it are *contractile*, and their eyes are placed *at the base* instead of on the tips of the tentacles. The third section consists of one

family; its members differ from the rest of the *Pulmonobranchs* in having separate sexes and in their shell being operculate, in which respect they resemble the *Pectinibranch* .

SECTION I.

Tentacles retractile, usually four; in some instances the lower pair are rudimentary, in others altogether wanting; *eyes* situated on the tips of the upper tentacles or on those of the single pair when the lower ones are absent; *shell* in most cases external, complete, spiral; in others internal and shield-like, or rudimentary, consisting only of calcareous granules.

Family I. LIMACIDÆ.
II. TESTACELLIDÆ.
III. HELICIDÆ.

SECTION II.

Tentacles 2 (with a rudimentary or imperfect lower pair), contractile; *eyes* situated slightly behind the inner base of the upper tentacles; *shell* spiral, elongated.

Family IV. CARYCHIIDÆ.

SECTION III.

Tentacles 2, contractile, *eyes* situated at their outer base; *shell* spiral, oval or cylindrical, operculate; *operculum* either testaceous or horny.

Family V. CYCLOSTOMATIDÆ.

FAMILY I.—LIMACIDÆ.

Body elongated, not spirally coiled; *mantle* shield-like, covering the upper part of the back; *tentacles* 4, cylindrical, retractile, upper tentacles longer than the lower ones; *foot* as long as the body and united to it; *jaw* arched, smooth or

ribbed; *lingual ribbon* with numerous transverse rows of spinous teeth.

Shell rudimentary, consisting of calcareous granules, or shield-like; in either case covered by the mantle.

This family comprises those molluscs popularly known as Slugs, whose bodies are unprovided with an external shell, though the vital parts are protected by a more or less rudimentary testaceous covering placed beneath the mantle. The slugs exude an abundance of slime which serves to lubricate the skin; it is very tenacious and capable of being drawn out into a thread by which the animal is enabled to suspend itself from the branches of trees, or descend in safety from a considerable height to the ground. Most of the slugs, especially when young, seem to possess the faculty of thread-spinning. In his paper on 'Molluscan Threads,' from which an extract has already been made,* Mr. Sherriff Tye writes as follows:—"Mr. Wm. Harte (in 'Proceedings Dublin N. H. Soc.,' vol. iv. part ii.) has recorded some interesting experiments he made with *Limax arborum*, causing it to spin a thread and to *reascend* by it, and he believes that from the 'perfect ease and regularity with which they do it, that they are well accustomed to it.' Mr. Harte also states that if the slug be 'gorged with food' the slime is thin and not so able to sustain it, but if kept overnight without food it performs well the next morning."

The Limacidæ are extremely voracious; their food chiefly consists of vegetable matter, but many of them devour animal matter also. A popular and very

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* Vide p. 52.

erroneous notion prevails that slugs are identical with snails, and that in summer they leave their shells and return to them for protection in winter. The body of the slug is naked and its shell internal (except in the case of *Testacella,* which has a small external shell placed near the tail), whereas the body of the true snail is entirely or very nearly covered by the shell, to which it is permanently attached by muscles.

GENUS I.—ARION, FÉRUSSAC.*

Body elongated, subcylindrical, skin coarsely wrinkled ; *mantle* shagreened ; *respiratory orifice* situated towards the front or a little beyond the middle of the right edge of the mantle ; *reproductive orifice* below the respiratory orifice ; *tail* provided at its extremity with a *slime gland; jaw* arched, strongly ribbed.

Shell consisting of loose calcareous granules, which are covered by the posterior portion of the mantle.

Unless Férussac meant to be ironical, the name he gave to this genus is singularly inappropriate; the slugs, so far as is known, are not gifted with musical or poetic genius, nor are they steed-like in their movements !

The Arions, though commonly called black slugs, vary considerably in colour, especially when immature ; they frequent moist and shady places in woods and hedgerows, as well as gardens where they are most destructive to fruit and vegetables; they also devour decomposing animal matter, and sometimes, when other food fails, their neighbours' slime. When reposing they contract their bodies into a helmet-

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* The name of an ancient Grecian musician and poet, also of a fabulous horse said to have been produced by Neptune.

shaped lump. They are very prolific, and usually deposit their eggs below the ground.

1. Arion a'ter,* Linné. Pl. VI.

Body very convex above, somewhat contracted and rounded in front, pointed behind, colour very variable, black, chocolate-brown, reddish, yellowish, greenish, or sometimes whitish, tubercles large and prominent; *mantle* finely shagreened; *tentacles* separated at their base, strongly granulated, bulbs considerably swollen; *foot* sparsely covered with large angular tubercles, and margined with a band which is usually yellow with dark transverse lines; *slime* yellowish. Length 3–5 inches.

Shell consisting of disunited calcareous granules which are unequal in size and of a roundish or oval form.

Inhabits woods, fields, hedgerows, gardens, and moist places, in all parts of the British Isles.

It breeds in May and June; the eggs, which are oval and semitransparent, vary in number from fifteen to sixty, and are deposited in holes in the ground, at the roots of plants, under stones, or among decomposing vegetable matter.

This species, in common with other members of the family, is frequently infested with small parasites, which enter and take up their abode within the respiratory cavity, sallying forth from time to time for air and exercise upon the body of the slug, which seems to be in no way disturbed by the intrusion of the self-invited guests.

2. A. fla'vus,† Müller.

Body slender, smaller, but proportionally more capable of elongation than *A. ater*, of a grey colour, the sides and mantle sometimes tinged with yellow, head and neck slate-colour or

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* Black. † Yellow.

dark grey ; *mantle* more oblong than in the last species, marked with minute white specks ; *tentacles* short, nearly smooth, lower pair very small ; *respiratory orifice* near the centre of the mantle on its right margin ; *tail* angulated ; *slime gland* prominent ; *slime* deep yellow.

Inhabits moist places among dead leaves and other decomposing vegetable matter, and has a wide range in this country. It is said to be active and to crawl under water.

3. A. HORTEN'SIS,* FÉRUSSAC. PL. VI.

Body much smaller and more slender than that of *A. ater*, varying in colour from black to brown, rufous, yellowish, grey, or greenish, usually striped or banded longitudinally, tubercles oblong, close-set, coarse ; *mantle* usually with a dark band round its margins and down the middle ; *tentacles* slightly swollen at their tips ; *foot* with a narrow border of grey, yellow, orange, or rufous-colour ; *slime* of a whitish or yellowish colour. Length, about an inch and a half.

Shell consisting of granules which are cemented together in a somewhat oval-shaped mass.

This slug is tolerably active. The breeding season extends from May till September ; the eggs which are from fifty to seventy in number, are said by Bouchard-Chantereaux to be phosphorescent for fifteen days after they are laid, and the young, which are excluded in from twenty to forty days, arrive at maturity towards the end of the first year. This species may be distinguished from *A. ater* by its much smaller size, by the longitudinal stripe with which it is usually marked, and by the testaceous granules being united instead of separate.

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* Inhabiting gardens.

GENUS II.—GEOMAL'ACUS,* ALLMAN.

Body elongated, lanceolate, not keeled; *mantle* shield-like, oval; *respiratory orifice* on the right margin of the mantle, towards the front; *reproductive orifice* behind the base of the right lower tentacle; *caudal slime-gland* large.

Shell solid, suboval.

This genus forms a connecting link between *Arion* and *Limax*, resembling the former in having a caudal slime-gland, and differing from both in the position of the reproductive orifice. There is only one known species.

GEOMALACUS MACULO'SUS,† ALLMAN. PL. VI.

Body capable of great extension, of a glossy black or brown colour of various shades, elegantly spotted with yellow on the mantle and upper part of the body, back covered with close-set longitudinal tubercles; *mantle* finely shagreened; *head* dusky-grey; *tentacles* short, finely granulated, bulbs shining, eyeless; *foot* thick, brownish-yellow with transverse stripes, squarish in front, ending in an obtusely rounded point behind; *sole* yellowish-grey, divided lengthwise by a band of a paler colour; *slime-gland* large. Length, 2 inches.

Shell oval, rather solid, with concentric lines of growth.

This singular and very beautiful mollusc was discovered in 1842, by Mr. Wm. Andrews, "on rocks around Lough Carrough, to the south of Castlemain Bay, Co. Kerry, in the west of Ireland," and described by Professor Allman in a paper read by him in 1843 before the Dublin Natural History Society.

It is active in its movements, and possesses the power of elongating its body to a remarkable extent. Dr. Gwyn Jeffreys informed me that some living

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* Earth-mollusc. † Spotted.

specimens sent to him by Mr. Waller from Valentia, were enclosed in a tin box having holes one-eighth of an inch in diameter to admit air; two of the slugs attenuated themselves to such an extent that they contrived to crawl out of the box through the holes. Professor Allman, in the paper above alluded to, states that he nearly lost the only specimen he then possessed, the animal having squeezed itself through a narrow opening of the lid of the box in which it was imprisoned.

The animal is sometimes spotted with white instead of yellow, or is whitish with black spots.

GENUS III.—LIMAX, LINNÉ.*

Body elongated, cylindrical, skin wrinkled, back more or less keeled; *mantle* either granulated or concentrically striated; *respiratory orifice* near the posterior margin of the mantle; *reproductive orifice* behind the base of the right upper tentacle; *slime-gland* wanting; *jaw* smooth, strongly arched, and beaked in front.

Shell oval or unguiform, seated beneath, and covered by the hinder part of the mantle.

The *Limaces* differ from the *Arions* in the position of the respiratory orifice, and in being destitute of a caudal slime-gland. They are more or less gregarious; sometimes a dozen or more may be seen together.

Moquin-Tandon says that during the breeding season they excavate small subterraneous galleries in moist and sheltered places, in which they bury themselves and deposit their eggs.

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* Slug.

A. *Mantle* granulated.

1. Limax gaga'tes,* Draparnaud. Pl. VI.

Body rather narrow in front, broader in the middle, and tapering to a pointed tail; *colour* variable, black, slate-colour, dark red, dark brown, or yellowish with dusky markings, paler underneath, head and neck slate-colour, tubercles oblong, close-set; *mantle* oblong when the animal is extended, distinctly bilobed, the upper lobe nearly oval and bordered by a slender black line, which, when the animal is at rest, is somewhat angulated on the right side immediately above the respiratory orifice; *tentacles* thick, short, upper pair dusky slate-colour, tips very slightly swollen, lower pair sometimes much paler in colour, tips dusky; *back* with a prominent keel which extends from the mantle to the tail; *slime* very thick and glutinous, white or faintly tinged with yellow, iridescent when dry. *Length* about $2\frac{1}{2}$ inches.

Shell oval, thick from the nucleus to the centre, nacreous, iridescent, wrinkled and pitted; *margin* thin; *nucleus* blunt, subterminal.

Inhabits many parts of Great Britain, in hedgerows and gardens, at the foot of walls, as well as at the roots of grass and other plants, and among decaying vegetable matter, but it is rather local.

2. L. margina'tus,† Müller. Pl. VI.

Body slightly swollen in front, tapering behind to a pointed tail, yellowish or rufous-brown, spotted with black or dark brown, irregularly wrinkled, head and tentacles dusky; *mantle* oblong, irregularly granulated, with a dark line on either side; *tentacles* thick, tips not very tumid; *keel* prominent, extending from the mantle to the tail, usually of an amber colour, always lighter than the rest of the body; *foot* with pale margins; *slime* colourless, thick, and glutinous. *Length* about $2\frac{1}{2}$ inches; *lingual ribbon* with 80 rows of 101 teeth = 8080.

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* Jet. † Margined.

Shell oval, thick, with well-defined lines of growth ; *nucleus* somewhat prominent, nearly terminal.

Inhabits all parts of the British Isles, commonly, among decaying vegetable matter, and at the foot of walls in gardens, and under stones. It is a voracious slug, very destructive to garden produce, and it often devours earthworms as well as the young of its own species. It differs from *L. gagates* in colour, its mantle is not so large, and the respiratory orifice is placed nearer the hinder edge of the mantle.

B. *Mantle* concentrically striate.

3. L. FLA'VUS,* LINNÉ. PL. VI. *bis.*

Body rather narrow in front, broader in the middle, tapering behind and keeled towards the tail, which is pointed ; of a yellowish colour, tesselated with white and black or dark brown, coarsely tuberculated ; *head* and *neck* slate-colour ; *mantle* oblong, broadly rounded behind, with concentric and slightly undulating wrinkles ; *tentacles* short, slate-colour ; *foot* bordered with pale yellow, sole milk-white ; *slime* yellow. *Length* about 4 inches ; *lingual ribbon* with 166 rows of 123 teeth = 20,418.

Shell oblong, or quadrangular, somewhat concave underneath, thin, with a membranous margin, lines of growth distinct ; *nucleus* slightly prominent.

Inhabits all parts of the British Islands, in cellars and damp places in houses, as well as in moist woods, under stones and at the roots of plants. It is an active and very voracious slug. At night it leaves its hiding-place and greedily devours all sorts of vegetable and animal refuse.

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* Yellow.

4. L. AGRES'TIS,* LINNÉ. PL. VI. *bis.*

Body slender, usually ash-grey with more or less of a rufous-brown or yellowish tint, sometimes cream-colour or whitish, and often mottled, covered, when at rest, with distinct oblong tubercles, nearly smooth when extended; *mantle* large, rounded in front, more broadly so behind; *concentric striæ* moderately apparent when the animal is at rest, but indistinct when it is crawling; *tentacles* dusky-grey; *back* provided with a short oblique keel near the tail; *foot* rather narrow, sole pale grey or cream-colour; *slime* copious, milk-white, leaving a thick white film when dry. *Length* 1½ inch; *lingual ribbon* with 100 rows of 65 teeth = 6500.

Shell nearly oval, concave underneath, nearly flat above, rather thin, with a membranous margin, marked with a few indistinct lines of growth, which extend from the nucleus for a short distance on the convex or upper side of the shell, which is also covered with a network of exceedingly fine microscopic lines; *nucleus* small, placed slightly on one side.

Inhabits gardens, fields, and hedgerows everywhere in this country. It is most destructive to fruit and vegetables in gardens, as well as to oats, clover, peas, and other crops in fields, and it is said to devour earthworms. According to Müller it is shy, and when touched withdraws its tentacles and lies for a whole day as though it were dead; a specimen I now have, however, is exceedingly lively; when touched it instantly protrudes its tentacles, extends its body, and crawls along rather rapidly. These slugs are very prolific, and breed several times between April and November; the eggs are said to be uninjured by exposure to considerable heat. Gwyn Jeffreys states that they "have retained their vitality and the young

* Inhabiting fields.

have been developed from them after having been dried eight times successively in a furnace," *B.C.*

5. L. LÆ'VIS,* MÜLLER. PL. VI. *bis.*

Body slender, nearly smooth, exceedingly glossy, as if coated with moist varnish, dark brown with a violet tinge; *mantle* large, obtusely rounded in front and behind, wrinkled, hinder part very tumid and of a pale yellowish-brown colour, with an approach to transparency; *tentacles* short, thick, bulbs rather tumid; *foot* narrow, sole ash-colour; *tail* ending in a slightly obtuse point; *slime* thin, almost colourless; *respiratory orifice* placed towards the centre of the right margin of the mantle. *Length* from $\frac{1}{2}$ to $\frac{3}{4}$ inch.

Shell unguiform, very convex above, nearly flat underneath, solid, slightly glossy, with a few rather indistinct lines of growth, and numerous fine, irregular microscopic lines which intersect one another in some places, and in others are forked like a herring-bone; *nucleus* terminal; margin sharp and slightly incurved, not membranous.

Inhabits moist places, among moss and dead leaves and under stones and logs of wood, in many parts of this country. It is an active little creature; if touched when it is crawling, it arches its body like the *Geometridæ* or "Looper" caterpillars, and when in this position the mantle, owing to the great convexity of the shell, becomes exceedingly tumid, resembling the hump of the dromedary. When at rest the animal is somewhat like a small leech.

6. L. TENEL'LUS,† MÜLLER. PL. VI. *bis.*

Body smooth, glossy, and almost transparent; *colour* greenish-white, the shield yellowish, and the tentacles and head black; occasionally marked on each side with an obscure whitish

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* Smooth. † Tender.

band ; *shield* concentrically wrinkled ; *slime* viscid, yellowish. *Length*, 0·75 inch.

Shell irregularly oval or oblong, of a moderate consistence, somewhat arched, partially tuberculous or beaded, microscopically and closely striated lengthwise ; *boss* indistinct, nearly terminal ; *margin* rather broad, thin, and membranous.

Habitat : North Mavine, Shetland, on stones in a watercourse of a mountain mill.—*B.C.*, vol. v. p. 156.

This slug was first noticed in this country by Mr. Blacklock, who found a single specimen in a wood at Allansford, near Shortly Bridge, Northumberland.

7. L. AR'BORUM,* BOUCHARD-CHANTEREAUX. PL. VI. *bis*.

Body slaty-grey or greenish, spotted with yellowish-white, with a dusky band on each side ; *mantle* rounded in front, bluntly pointed behind, with rather fine concentric and longitudinal wrinkles ; *tentacles* short ; *back* keeled near the tail ; *foot* margined with white ; *slime* colourless, abundant, and very tenacious. *Length* about 3 inches.

Shell nearly oval, flattish, glossy, thin, with a membranous margin, indistinctly marked by the lines of growth, and microscopically striate as in *L. agrestis ; nucleus* small, subterminal.

Inhabits many parts of Great Britain, in woods, on trees, especially the beech and walnut, it has also been observed in exposed situations, and on rocks at an elevation of 1500 feet. This species, especially when young, is pre-eminently a thread-spinner ; it descends and sometimes even ascends from one branch of a tree to another by means of its mucous thread, which is no thicker than that of a common spider. It may be distinguished from the young of the next species

* Frequenting trees.

(*L. maximus*) for which it might be mistaken, by its tentacles being much shorter, and its shell smaller, flatter, and thinner; its habitat is also different.

8. L. MAX'IMUS,* LINNÉ. PL. VI. *bis.*

Body long, rather slender; *colour* varying from ash to yellowish-grey, or sometimes black, often streaked or spotted with white or black, with close-set, coarse, oblong wrinkles; *mantle* considerably swollen, oblong, produced and pointed behind, *striæ* regular, well-defined; *tentacles* long; *back* slightly keeled near the tail; *foot* bordered with white; *slime* thick, whitish. *Length* from 4 to 6 inches; *lingual ribbon* with 160 rows of 181 teeth = 28,960.

Shell oblong, somewhat convex above, flattish or very slightly concave beneath, solid, moderately glossy, distinctly marked with lines of growth, and microscopically striate as in *L. agrestis; margin* membranous; *nucleus* small, nearly terminal.

Inhabits all parts of the British Isles, in damp cellars and outhouses, as well as in gardens, hedge-rows, and woods, in crevices of trees, under fallen timber, stones, &c.

As its name implies, this is the largest of the British slugs. It usually feeds during the night, and is very partial to all kinds of kitchen refuse.

These slugs are said to suspend themselves in pairs during the breeding season by a slimy thread.

FAMILY III.—TESTACELLIDÆ.

Body cylindrical, considerably elongated, tapering in front; *mantle* small, usually covered by the shell; *respiratory orifice* on the right side, below the mantle.

Shell external, ear-shaped, placed towards the hinder part of the animal; *spire* small, terminal.

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* Largest.

The *Testacellidæ* form the connecting link between the *Limacidæ* and the *Helicidæ*; their bodies, though not entirely naked like those of the former, are nearly so, and they resemble the latter in their shell being external. The family is represented by a single genus.

TESTACEL'LA, CUVIER.*

Body slightly granulated, sides or corners of the lips capable of being protruded, causing the animal to appear as if it had three pairs of tentacles; *tentacles* 4, cylindrical; *eyes* placed a little above the centre of the tips; *foot* provided with a prominent margin.

Shell thick; *spire* minute, forming one half of a whorl.

The snail-slugs differ from all the other land molluscs (with the exception, perhaps, of *Achatina*) in being exclusively carnivorous; their food chiefly consists of earthworms, which they attack with relentless ferocity, following them through their subterranean burrows, and, if need be, cutting off their retreat by countermining; the unfortunate victim is devoured alive, being drawn into the mouth of the slug by the formidable array of curved and barbed teeth with which it is furnished.

This savage creature feeds at night, and if its usual food is not forthcoming it will devour other slugs, as well as snails, and even its own species. When its ravenous appetite has been appeased it remains for a considerable time in a lethargic state. Though it is exceedingly hardy, and suffers but little from the cold, in very severe weather it forms a cocoon of particles of earth which are cemented together by its

* Little shell.

slime. It is by no means timorous; when placed on the hand it will soon extend itself and crawl along, and if an attempt be made to arrest its progress it will bite savagely. I once made the experiment, and have no intention of repeating it.

The eggs of *Testacella* are very large, of an oval form, and covered with a thick skin; they are deposited separately underground, and the young are excluded in from twenty-five to thirty days.

1. Testacella halioti'dea,* Draparnaud. Pl. VI. *bis.*

Body capable of great extension, tapering in front, slender in the middle and broader behind, skin thick, with transverse wrinkles when the animal is resting, but nearly smooth when its body is extended, of a dirty yellowish-brown colour, occasionally more or less spotted with red, white, or black; *lips* flexible and capable of being extended; *mantle* small, nearly covered by the shell; *tentacles* short, brown, tips very slightly swollen; *back* rounded, with two longitudinal furrows which extend downwards from the head to the front of the mantle, and are provided with a series of ramifications or slender branch-like offsets; *foot* with a prominent border. *Length* about 3 inches; *lingual ribbon* large, with about fifty rows of 51 teeth which are curved and barbed like a fish-hook.

Shell oblong, compressed, solid, of a dull aspect, with regular close-set lines of growth; *epidermis* moderately thick; *spire* very short, pointed, terminal; *front margin* rounded; *hinder margin* obliquely truncated; *mouth* very large; *lip* thickened and slightly reflected towards the pillar where it has a fold.

Inhabits gardens in a few places in England and Ireland, and is common in Guernsey. Though this remarkable mollusc has no doubt been, from time to time, unintentionally imported from France and else-

* Resembling *Haliotis* (the marine *ear-shell*).

where into this country in soil at the roots of shrubs and other plants, there are, I think, some grounds for believing it to be indigenous in Great Britain. A few years ago, when on a visit at Woolverstone Park, in Suffolk, the seat of my kind and hospitable friend Mr. Berners, the head gardener informed me that he had recently observed several curious slugs in a bed in one of the vineries, and that they usually came to the surface after the soil had been watered. They proved to be *T. haliotidea.* I ascertained that the bed had been emptied a short time previously, and replenished with loamy soil brought from a field in a remote part of the estate, and far distant from gardens, shrubberies, or plantations of any kind. Until the introduction of this soil the molluscs had never been seen by the gardener or his assistants, who naturally wage incessant war against slugs of all sorts, so that it is more than probable that they had been brought to the vinery from the field, where, owing to its position, it is not at all likely they could have been introduced.

This species varies considerably in colour, as well as in the shape of the shell.

Var. *scutulum*, Sowerby.—Body yellowish speckled with brown. Shell narrower, *spire* more produced and pointed, *B.C.*

2. T. Maugei, Férussac.

Body dark brown, head smaller than that of *T. haliotidea.* Shell larger and more cylindrical.

Inhabits nursery gardens near Bristol and other places; it occurs in fields near Devizes (Cunningham fide Woodward).

FAMILY III.—HELICIDÆ.

Body elongated, spirally coiled; *mantle* covering the neck, sometimes, though rarely, in the form of a demi-shield which is provided with a lobe; *tentacles* usually 4, rarely 2, retractile; *foot* oblong, distinct from the body.

Shell spiral, usually large enough to contain the whole body.

The British members of this extensive family are divided into eleven genera.

GENUS I.—SUCCI'NEA, DRAPARNAUD.*

Body glutinous, thickish, usually incapable of being entirely covered by the shell; *mantle* thin, entire; *tentacles* 4, upper pair conical, thickish at their base, lower pair very slender and short; *jaw* smooth; *lateral teeth* serrated; *respiratory orifice* placed on the right side; *foot* oblong, large.

Shell dextral, oblong-ovate, fragile, of an amber-colour; *spire* short; *mouth* large.

It has already been stated that the *Limnæidæ*, though essentially aquatic animals, are capable of living for a considerable period out of water, some of them, indeed, at times voluntarily leaving it. With respect to the molluscs now under consideration the case is exactly reversed. The *Succineæ*, though essentially terrestrial, can, and do occasionally, remain submerged; and hence they form a connecting link between the truly aquatic and the truly terrestrial molluscs.

The *Succineæ* frequent marshy places, climbing up and resting on the stalks of flags, rushes, and other aquatic plants. During the time of drought they

* Amber-coloured.

retreat within their shell, and close its aperture with a membranous epiphragm. They are herbivorous. The eggs, which are united together in masses by a glutinous substance, are attached to the stems and leaves of plants, or to stones near the water, and Moquin-Tandon says he has even seen them under water.

1. Succinea pu'tris,* Linné. Pl. V.

Body somewhat thick, reddish-yellow above, of a lighter colour below, with minute, close-set, flattish tubercles ; *tentacles* short, diverging, upper pair very thick ; *snout* large ; *foot* broad, somewhat truncated in front, slightly pointed behind ; *lingual ribbon* with 50 rows of 65 teeth = 3250.

Shell ovate, thin, nearly transparent, glossy, amber-coloured, frequently with a tinge of pink especially at the apex, with numerous fine and somewhat irregular striæ in the line of growth ; *epidermis* thickish ; *whorls* 3–4, convex, body whorl occupying quite four-fifths of the shell ; *spire* short, apex obtuse ; *suture* deep and rather oblique ; *mouth* oval ; *outer lip* slightly thickened, contracted above, sharp towards the pillar.

Inhabits most parts of Great Britain, in marshy places and on the banks of ditches, among sedges and other plants. It is sluggish and rather irritable, and its slime is abundant. The eggs are laid from May to September ; they are round and hyaline, and united in clusters by an albuminous covering of an oblong form. The young are excluded in about fifteen days, and arrive at maturity at the end of the first year.

Var. 1. *subglobosa.*—Shell shorter and broader in proportion to its length, usually much smaller and more solid. Marshes, and by the side of lakes on the sea-coast, and in mountainous districts, *B.C.*

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* Frequenting putridity.

Var. 2. *vitrea.* — Shell extremely thin. Carmarthenshire (J. G. J.), Cork (Humphreys), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

Var. 3. *solidula.*—Shell much thicker, reddish-yellow. Deptford, Wilts (J. G. J.), *B.C.*

Dr. Gwyn Jeffreys now considers the variety *vitrea* to be a distinct species, viz. the *S. virescens* of Morelet. In his "Notes on some British Land and Fresh-water Shells," which appeared in the 'Annals and Magazine of Natural History' for November, 1878, he makes the following remarks:—"With respect, however to *S. virescens* of Morelet, . . . I believe it is distinct from any of the three species which I have acknowledged as British, viz. *putris*, *elegans*, and *oblonga*. It should therefore be added to our native fauna. This is my variety *vitrea* of *S. putris*. . . . . I lately found a specimen at St. Albans with *S. putris*, but unfortunately I had no time to examine the animal further than by noticing that it seemed to be of a darker hue than that of *S. putris* or *elegans*. Mr. Henry Groves has obligingly sent me a specimen of the shell which he had collected at Mitcham, in Surrey. . . . The shell is extremely thin, and finely striated lengthwise; the spire is very small; the last whorl disproportionately large, and the mouth more open and expanded than in any other European species. I regard it as the *S. virescens* of Morelet, and not as his *S. debilis* which Baudon names it. . . . . Baudon's description of the animal of his *S. debilis* differs from Morelet's description of the animal of *S. virescens* chiefly in colour, the former being 'gris jaunâtre' (yellowish-

grey) and the latter 'brun roussâtre' (reddish-brown), although I do not attach much importance to that character. Not merely does the intensity of colour vary in many specimens of the same species of land shell, but also the arrangement of the colours."

Our brother conchologists on the other side of the "silver streak" are most zealous and painstaking in their researches, but some of them are confirmed species-makers. Perhaps it might be well to leave this form in the place originally assigned to it, and regard it as *S. putris* var. *vitrea*, for if the points in which it differs from the type are held to be of sufficient importance to warrant its being regarded as a distinct species, there are numberless varieties of other molluscs which are equally entitled to be raised to a similar rank.

2. S. EL'EGANS,* RISSO. PL. V.

Body yellowish-brown, sometimes blackish, paler in colour beneath, with very small round tubercles; *tentacles* very short, diverging at their base, transparent, yellowish-white, with a longitudinal row of black specks, upper pair with rounded tips; *foot* broad, margined with white, rounded in front and somewhat pointed behind.

Shell more slender in form than the last, not quite so thin, glossy, semitransparent, of a dark amber colour frequently tinged (especially at the apex) with pink; *striation* as in *S. putris*; *whorls* 3–4, scarcely so convex as in the last species; *spire* rather more produced, apex less obtuse; *suture* exceedingly oblique, moderately deep; *mouth* as in *S. putris*, but narrower; *outer lip* slightly thickened, much inflected above.

Inhabits situations similar to those frequented by *S. putris*, with which it is often found in company.

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* Elegant.

The characters which distinguish *S. elegans* from *S. putris* are perhaps scarcely decided enough satisfactorily to admit of the two forms being regarded as specifically distinct. On one occasion I observed a matrimonial alliance between them.

Var. 1. *minor*.—Shell smaller and thinner, of a reddish-brown colour, with a shorter spire and more expanded mouth. Falmouth, Hammersmith (J. G. J.), *B.C.*

Var. 2. *ochracea*.—Shell smaller and thinner, of a reddish-brown, with a larger spire and smaller mouth. Scarborough (Bean), Newcastle (Alder), Tenby, Tingwall Lake, Zetland, (J. G. J.) ; often mistaken for *S. oblonga*, *B.C.* Southend, Kent, R. R.

Monst. *sinistrorsa*.—Shell thicker, ochraceous, spire reversed. I found a single specimen near Eastbourne. M. Baudon states in his 'Monographie des Succinées Françaises,' that a specimen of this monstrosity had been sent him by M. Fagot from the department Aveiron.

3. S. OBLON'GA,* DRAPARNAUD. PL. V.

Body short, shagreened, greyish, or sometimes whitish ; *tentacles*, upper pair rather short, tips scarcely swollen, lower pair very short and obtuse at the tips ; *foot* rather broad, obtusely pointed behind.

Shell oblong-conic, moderately thin, somewhat glossy, semi-transparent, yellowish or brownish horn-colour, with sometimes a faint tinge of green, with strongish irregular striæ in the line of growth ; *epidermis* thick ; *whorls* 3–4, convex ; *spire* produced, apex obtuse ; *suture* deep, oblique ; *mouth* roundish-oval ; *outer lip* thickish, incurved above.

Inhabits dry ditches, under stones and at the roots of grass. In this country it is a rare species, and it usually occurs near the sea-coast. It has been

* Oblong.

found in the following localities:—Sandhills on Crymlyn Burrows near Swansea, and in a similar situation on Braunton Burrows, near Bideford, in North Devon (Gwyn Jeffreys), near Glasgow (Kenyon), Baltimore (Mr. Andrew), Cork (Wright and Carroll), *B.C.*, and more recently in the last-named locality by Mr. C. P. Gloyne.

It may be at once distinguished from the other species by its much smaller shell, which in proportion to its size has a much larger spire; the suture too is deeper and the mouth rounder. The shell is often thinly coated with particles of sand or mud which are caused to adhere to its surface by the slimy secretion of the animal.

GENUS II.—VIT'RINA, DRAPARNAUD.*

Body rather slender, usually, but not always, slightly too large to be entirely contained within the shell; *mantle* demi-shield-like, provided with a lobe on the right side; *tentacles* 4, cylindrical, upper pair of medium size, lower pair very short; *respiratory orifice* on the right side near the lobe of the mantle; *foot* somewhat narrow.

Shell subglobular, very thin and fragile, transparent; *spire* short; *mouth* semilunar, somewhat oblique; *umbilicus* wanting.

These molluscs form a connecting link between the slugs and the true snails, "leading to the former through *Succinea* and to the latter through *Zonites*," *B.C.*, vol. i. p. 156. Their lingual dentition and shield-like mantle resemble those of *Limax*, and their shell that of *Helix*. They are both herbivorous and carnivorous; their food consists for the most part of decomposing vegetable matter, but they also devour

* So named on account of its glassy appearance.

worms, and even small snails. They frequent damp and shady situations. Their eggs are laid in small clusters, and protected by a membranous envelope. In this country the genus is represented by a single species only.

VITRINA PELLU'CIDA,* MÜLLER. PL. VII.

Body rather slender, capable of being entirely contained within the shell, slightly transparent, of a pinkish-grey colour; *mantle* finely spotted with black, especially behind; *tentacles* ashy-grey; *foot* yellowish beneath and terminating in a point behind. The lingual teeth consist of 100 rows, each of which contains 75; the edge teeth are hooked; the jaw is arched backwards, nearly smooth and produced in front.

Shell convex above, somewhat compressed beneath, very thin and fragile, transparent, extremely lustrous, of a very pale greenish colour, faintly striate both in the line of growth and spirally; *epidermis* thin; *whorls* 3–4, body whorl occupying about two-thirds of the shell; *spire* very short, apex obtuse; *suture* grooved, but very shallow, with faint striæ; *mouth* forming nearly four-fifths of a circle; *outer lip* moderately thin; *umbilicus* wanting.

Inhabits woods, hedgerows, and shady places, under moss, stones, fallen trees, and decayed leaves in all parts of Great Britain and Ireland. This pretty mollusc is exceedingly hardy. I have frequently observed it in Scotland crawling among moss and dead leaves during the winter when snow was on the ground. It is a restless, busy little creature, constantly on the move, and it seems to be very particular about its personal appearance, for with untiring diligence it polishes its shell with the mantle, producing thereby a gloss which does infinite credit to its industry. It is possessed of some amount of cunning. Müller

* Transparent.

relates that when he placed it under water (where it is capable of remaining for a considerable time without injury) it drew in its tentacles, at the same time extending its body and making it rigid in order that it might appear to be dead. Having remained for a few hours in this position it crawled slowly out of the water, and cautiously protruding its tentacles to make sure that the way was clear, it hastened to a safe hiding-place and retreated within its shell.

The expedient of feigning death, or sometimes lameness, during moments of alarm, is frequently resorted to by animals. Some beetles when molested will roll over and remain quite motionless, as if they were dead. The lapwing, when the approach of a stranger imperils the safety of her eggs or young, wheels in circles round the intruder's head, uttering the while her plaintive cry, then suddenly darting off to a distance she lights upon the ground, and feigning lameness, runs limping along, inviting his pursuit in the hope of decoying him far away from her nest.

Var. 1. *depressiuscula*, Jeffr.—Shell rather oval and flatter on both sides; *spire* scarcely raised above the level of the last whorl. Near Swansea and Plymouth (J. G. J.), *B.C.*

Var. 2. *Dillwynii*, Jeffr.—Shell nearly globular, with the last whorl very convex; *spire* more prominent. Sandhills near Swansea, at the roots of *Rosa spinosissima* (J. G. J.), *B.C.*

GENUS III.—ZONI'TES, DE MONTFORT.*

Body elongated, capable of being entirely contained within the shell; *mantle* thick, slightly reflected; *tentacles* 4, cylindrical, swollen at their tips; *foot* long, slender; *jaw* smooth, more or less beaked; edge teeth of *lingual ribbon* hooked.

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* From the Latin word *zona*, a girdle.

Shell dextral, usually depressed, thin, glossy, more or less transparent; *mouth* semilunar or roundish; *outer lip* thin; *umbilicus* usually distinct.

The *Zonites* live in moist and shady places, and feed upon animal as well as vegetable matter. Their jaw resembles that of *Limax*, *Vitrina*, and *Succinea*, being smooth, arched, and provided with a more or less prominent beak in the centre of the lower edge.

Some species, especially when irritated, emit a strong smell of garlic. Their eggs are united together in masses and deposited in the ground.

A. *Spire* depressed; *umbilicus* open.

1. ZONITES CELLA'RIUS,* MÜLLER. PL. VII.

Body bluntly rounded in front, gradually tapering behind, not very transparent, of a dusky slate-colour above, pale slaty-grey on the sides, covered, except on the neck, with small, round, close-set, flattened tubercles; *tentacles* rather long and slender, bulbs large, upper tentacles somewhat separated at their base, of a dark slate-colour granulated with black specks, lower pair closer together, yellowish-grey with black spots; *foot* very narrow, yellowish-grey, pointed and slightly keeled behind; *lingual* ribbon with 38 rows of 35 teeth = 1330.

Shell compressed, almost equally convex above and below, rather thin and fragile, glossy, somewhat transparent, pale brownish or yellowish horn-colour above, opaque white sometimes faintly tinged with green beneath, with irregular curved striæ (which are more strongly defined near the suture) in the line of growth, and faintly striated spirally; *epidermis* thickish; *whorls* 5–6, gradually enlarging, body whorl about half the size of the shell; *spire* short, apex very blunt; *suture* shallow, grooved; *mouth* semilunar, oblique; *outer lip* slightly reflected; *umbilicus* broad and deep.

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* Frequenting cellars.

Inhabits damp cellars, outhouses, yards, and similar places, under stones, bricks, or tiles, as well as woods and hedgerows, among moss and below fallen trees, throughout Great Britain. This common species is timid and inactive. It secretes a large quantity of thin slime. It lays from thirty to forty eggs, and the young are hatched in from fifteen to sixteen days.

Var. 1. *complanata.*—Shell smaller, *spire* flatter.

Var. 2. *albida.*—Shell colourless, or white.

Var. 3. *compacta.*—Shell more compact, and convex; body whorl less swollen, not so white beneath.

These varieties are of tolerably frequent occurrence.

2. Z. ALLIA'RIUS,* MÜLLER. PL. VII.

Body blackish; *tentacles* short; in other respects resembling the last species.

Shell less depressed above, rather more compressed below than in *Z. cellarius*, somewhat thicker, more glossy, of a darker horn-colour above, and with less of the opaque white colour below; *striæ* faint; *whorls* 4–5, somewhat convex, body whorl smaller in proportion than that of the last species; *spire* slightly produced; *suture* well defined, but not grooved; *mouth* narrow; *outer lip* slightly reflected; *umbilicus* wide and deep; *lingual ribbon* with 35 rows of 25 teeth = 875.

Inhabits woods, hedgerows, and mossy banks, as well as more exposed situations, under stones, &c., all over Great Britain, but it is rather local. The shell is much smaller than that of *Z. cellarius*, its spire is more produced, the mouth narrower, and the umbilicus proportionably wider. Gwyn Jeffreys says: "If the two shells are held sideways, with the mouth towards the observer, the last whorl of *Z. cellarius* will appear

* Smelling of garlic.

deeper than in the other shell." The strong smell of garlic which this mollusc occasionally emits should not be relied upon as a test whereby to distinguish it from its allies, for other species of the genus are endowed with the same faculty.

Var. *viridula*.—Shell greenish-white. This variety has been observed in several localities in England, Scotland, and Ireland.

3. Z. GLA'BER,* STUDER. PL. VII.

"Body dark bluish-grey, striped like a zebra on each side in front, and irregularly mottled behind; two narrow and slight parallel grooves run along the neck from the head to the upper lip of the shell; the surface is more or less wrinkled, and has a few large but indistinct lozenge-shaped markings; *mantle* very thick and dark at the mouth of the shell, over which its edges are folded; *tentacles*, upper pair rather long, and finely granulated; lower pair very short; *eyes* small, placed on the upper part, but not at the tips, of the tentacular bulbs; *respiratory orifice* round, occupying the centre of the pallial fold; *foot* very long and slender; the sole appears as if separated from the upper part of the foot, being defined by a darker line; *slime* thin and nearly transparent."—Gwyn Jeffreys in 'Annals and Magazine of Nat. Hist.' for May, 1870.

Shell compressed, somewhat convex above, less so beneath, thin, exceedingly glossy, moderately transparent, darkish horn-colour, somewhat clouded with opaque white in the umbilical region; *sculpture* consisting of numerous but rather indistinctly defined transverse striæ which are stronger and slightly puckered at the suture; *epidermis* very thin; *whorls* 5–5½, gradually increasing, convex, body whorl occupying about half of the shell, flattish beneath and sloping abruptly from above and below towards the periphery, which consequently has a slightly angulated appearance; *spire* slightly produced, apex obtuse; *suture* well defined, but not deep; *mouth* large, forming about three-fourths of a circle; *outer lip* slightly reflected near the pillar; *umbilicus* narrow but deep.

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* Smooth.

Z. glaber was first noticed in this country in 1870 by Mr. Rogers of Manchester, and his discovery was recorded in the 'Annals and Magazine of Natural History' for May in that year by Mr. Gwyn Jeffreys as follows:—"My correspondent, Mr. Thomas Rogers of Manchester, has added another species to this well-worked department of our fauna. Specimens of a *Zonites* which he has now sent me, collected by him under stones at Marple Wood in Cheshire, prove to be the *Helix glabra* of Studer, 'Fér. Prodr.,' No. 215. *Z. glaber* has a wide range on the Continent, from Normandy (where I have taken it), through France, Savoy, Switzerland, Germany, and Dalmatia, to Epirus in Greece. I also found the same species in 1846 at Grassmere and in 1857 at Barmouth, but had overlooked it. Mr. Rogers' specimens being alive, I subjoin a description of the animal." The description has been transcribed above.

It is remarkable that this species should have been so long overlooked, for it seems to have a wide range in this country. I have found it in Devonshire and in Dumfriesshire, and many other localities have from time to time been given for it since its discovery by Mr. Rogers. Mr. Henry Groves informs me that it emits a very strong smell of garlic when plunged into boiling water.

4. Z. NITI'DULUS,* DRAPARNAUD. PL. VII.

"Body dark grey, or slate-colour with a brownish tinge, covered with flat and irregularly shaped tubercles of a darker hue, which give a speckled appearance; *tentacles* rather short

* Slightly shining.

and conical; *bulbs* small; *foot* rather narrow in front, swollen and keeled behind" (*B.C.*, vol. i. p. 163); *lingual ribbon* with 55 rows of 65 teeth = 3575.

Shell compressed, rather more convex above than below, moderately thin and glossy, nearly semitransparent, yellowish or brownish horn-colour, rather more polished below than above, except in the umbilical region, which is clouded with opaque white; marked in the line of growth with tolerably well-defined striæ, which are stronger and puckered near the suture, and regularly but faintly striate spirally; *epidermis* moderately thick; *whorls* 4–5, convex, body whorl about half the size of the shell; *spire* slightly produced, apex obtuse; *suture* deepish; *mouth* roundish, slightly oblique; *outer lip* not reflected; *umbilicus* wide and very deep.

Inhabits woods and hedgerows, under stones and among damp moss and decayed leaves, all over Great Britain. It is a timid species, and often buries itself in the earth. The shell, which resembles that of *Z. cellarius*, differs from it in the following respects:—It is smaller, rather more convex above and less so beneath, the spire is more produced, the umbilicus is considerably larger and deeper, the mouth less oblique, the outer lip not reflected, and the surface, especially above, is of a dullish aspect instead of being brilliantly polished.

Var. 1. *nitens.*—"Shell rather smaller and of a lighter colour, with a dull and waxy appearance; last whorl somewhat larger in proportion to the others, and laterally expanded." *H. nitens*, Michaud. Very common, *B.C.*

Var. 2. *Helmii Gilbertson.*—"Shell pearl-white." Preston (Gilbertson), Sevenoaks, Kent (Smith), *B.C.* Teignmouth, Devon (R. R.).

The Rev. J. McMurtrie informs me that in Perthshire he has found specimens of *Z. nitidulus* which emitted a strong smell of garlic.

5. Z. PU'RUS,* ALDER: PL. VII.

Body slightly transparent, yellowish-grey very faintly tinged with slate-colour, mottled with minute black specks, closely tuberculate; *tentacles* very long, rather slender, somewhat diverging at their base, of a slaty-grey finely spotted with black, yellowish towards the tips, bulbs small; *foot* narrow, slightly pointed in front, rounded behind, finely speckled with dark grey.

"Shell compressed, rather more convex above than below, very thin, not very glossy but semitransparent, light horn-colour, with a yellow or reddish tinge on the upper side, exquisitely sculptured transversely by numerous curved striæ, and spirally by still finer and almost microscopic lines, the intersection of which gives the surface a reticulated appearance; *epidermis* thin; *whorls* 4, convex, but dilated laterally, the last occupying scarcely one-half of the shell; *spire* slightly raised; *suture* moderately deep, puckered by the lines of growth; *mouth* nearly round, and not much interrupted by the penultimate whorl; *outer lip* not very oblique; *umbilicus* narrow, but deep, disclosing all the internal spire."—*B.C.*, vol. i. p. 165.

Inhabits woods, under stones and among moss and decaying leaves throughout Great Britain, but it is a local species. The shell is very much smaller than that of *Z. nitidulus*, and the umbilicus is proportionably narrower.

Var. *margaritacea.*—Shell pearl-white, and nearly transparent, *B.C.* It is frequently found with the type.

6. Z. RADIA'TULUS,† ALDER. PL. VII.

Body dusky; *tentacles* blackish, upper pair very thin, lower pair very short; *foot* extremely narrow, ending in a rather sharp point behind, blackish above, light grey spotted with black on its sides.

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* Clear. † Slightly rayed.

Shell compressed, of equal convexity above and beneath, extremely glossy, semitransparent, darkish horn-colour, with regular, close-set, sharply-defined, curved, transverse striæ, which extend to the suture and impart to the shell a rayed appearance; the striation is similar but less distinct at the base of the shell; *epidermis* thin; *whorls* 4–4½, convex, slightly compressed near the suture, body whorl scarcely half the size of the shell; *spire* slightly produced, apex blunt; *suture* not very deep; *mouth* forming about three-fourths of a circle, occasionally provided internally with a thin white rib; *outer lip* very slightly oblique; *umbilicus* small but deepish.

Inhabits woods and hedgerows, among moss and decayed leaves, at the roots of grass, and under stones and fallen branches in most parts of Great Britain. This pretty little shell may be distinguished from *Z. purus* by its more glossy appearance, as well as by its stronger striation and smaller umbilicus.

Var. *viridescenti-alba.*— Shell greenish white. Shropshire, Co. Cork, Co. Tyrone, Aberdeen (J. G. J.), Belfast (Thompson), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

7. Z. NI'TIDUS,* MÜLLER. PL. VII.

Body rather small, strongly truncate in front, slaty-black or brown, tubercles flattish, round, large, black, placed rather widely apart; *tentacles* thick, upper pair blackish, moderately diverging at their base, bulbs globular, lower pair much shorter than the others, paler in colour, and considerably diverging; *foot* slightly truncated in front, narrow, and slightly keeled behind.

Shell subglobular, considerably more convex above than beneath, moderately thin, glossy, semitransparent, brownish horn-colour (much darker when the animal is within), with numerous close-set, curved, transverse striæ, which extend to the suture, where they are puckered and more strongly defined;

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* Shining.

epidermis rather thin; *whorls* 5, convex, body whorl about half the size of the shell; *spire* somewhat produced, apex obtuse; *suture* deep; *mouth* forming three-fourths of a circle; *outer lip* thin, somewhat oblique, reflected near the pillar; *umbilicus* narrow but deep.

Inhabits moist places at the roots of grass, among moss, and under stones throughout the British Isles. This common species not only delights in damp situations, but is capable of remaining for some time under water. On one occasion when in search of *Pisidia*, having pulled up some aquatic plants, I found among their roots several living specimens of *Z. nitidus*, which had been submerged to a depth of six or eight inches.

The chief points of difference between this and the last species will be seen in the following table of comparison:—

Radiatulus.	*Nitidus.*
Tentacles, upper pair very slender.	*Tentacles* thick.
Shell equally convex above and below, very glossy, very thin.	*Shell* larger, much more convex above than below, glossy, moderately thin.
Striæ strongly defined.	*Striæ* less strongly defined.
Spire slightly raised.	*Spire* somewhat produced.
Suture not very deep.	*Suture* deep.
Outer lip scarcely oblique.	*Outer lip* somewhat oblique.

Var. *albida.*—Shell white or colourless. Dead specimens found by Mr. Choules among the rejectamenta of the Thames at Richmond, *B.C.*

8. Z. EXCAVA'TUS,* BEAN. PL. VII.

"Body slender, greyish-white, with three or four raised lines along the neck; *mantle* closely covered with milk-white specks;

* Hollowed out (in reference to its wide and deep *umbilicus*).

tentacles divergent, upper pair rather long and cylindrical, coarsely granulated, lower pair short; *foot* thick, obtusely rounded in front, and gradually narrowing behind to an angular or keeled point; *slime* rather copious and iridescent."—*B.C.*, vol. v. p. 157.

Shell compressed, more convex above than beneath, glossy, semitransparent, brownish or yellowish horn-colour, with strongly defined striæ in the line of growth; *epidermis* rather thin; *whorls* $5\frac{1}{2}$, convex, somewhat compact, body whorl occupying a little more than a third of the shell, its base considerably rounded; *spire* slightly produced; *suture* very deep; *mouth* forming about three-fourths of a circle, slightly compressed below; *outer lip* thin, rather oblique, reflected near the pillar; *umbilicus* very wide and deep.

Inhabits woods, among moss and decayed leaves, and under fallen timber. Though local it has a wide range. It has been noticed as far north as Aberdeen (J. G. J.), and it occurs in Perthshire, Argyleshire, Bute, and Rosshire (Buchanan White), and in the south and south-west of Scotland, the north of England, near Tunbridge Wells (J. G. J.), the Isle of Wight, and Cornwall, also in North and South Wales, and the west and south of Ireland.

The shell of this species may be distinguished from that of *Z. nitidus* by its stronger striation, more compact whorls, flatter spire, deeper suture, and wider umbilicus.

Gwyn Jeffreys is of opinion that this species has been erroneously regarded as belonging exclusively to Great Britain. In 'British Conchology,' vol. i. p. 169, he remarks: "I can answer for the identity of *Z. excavatus* var. *vitrina* (or *viridula*) with the *H. petronella* of Charpentier, having found specimens of the latter on the Gorner Glacier in Switzerland at a height of

about 7000 feet above the sea-level, and afterwards compared them with the types in Charpentier's collection. . . . . Instead, therefore, of the present species being exclusively British, it likewise appears to inhabit Lapland, Finland, Germany, and Switzerland."

Var. *vitrina.* — Shell greenish-white, transparent. *Helix vitrina*, Fér., 'Tabl. Syst.,' p. 45; *H. viridula*, Menke, 'Syn. Moll.,' p. 20. South Wales, Cork, and Connemara, *B.C.* Warwickshire (W. G. Blatch), near Huddersfield (J. Whitwham), *J.C.*

9. Z. CRYSTAL'LINUS,* MÜLLER. PL. VII.

Body milk-white, almost transparent; *tentacles* shortish, upper pair inky-black, lower pair greyish; *foot* whitish, narrow, ending in a point behind.

Shell depressed above, slightly convex underneath, thin, extremely glossy, translucent and iridescent, white with a greenish tinge, with very fine, close-set, transverse striæ, which are stronger near the suture; *epidermis* exceedingly thin; *whorls* $4\frac{1}{2}$–5, gradually increasing, somewhat convex, but outwardly compressed; *spire* very slightly produced; *suture* distinct but shallow; *mouth* semilunar, sometimes furnished with a slight internal rib; *outer lip* very thin, oblique; *umbilicus* distinct but narrow and not deep.

Inhabits woods, damp meadows, and shady places, among moss and decayed leaves, as well as under stones and fallen branches of trees in most parts of Great Britain.

Var. *complanata.*—Shell nearly flat on both sides, the last whorl proportionally larger than the others. Leigh Woods, near Bristol (J. G. J.), *B.C.*, vol. i. p. 170.

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* Resembling crystal.

B. *Shell* conical, *umbilicus* indistinct.

10. Z. FUL'VUS,* MÜLLER. PL. VII.

Body long and slender, nearly opaque, of a dark slaty-grey or reddish-brown colour, finely spotted with black; *tentacles* very long, slaty-black, upper pair diverging considerably, bulbs globular; *foot* rounded in front, keeled, and ending in a point behind; *lingual ribbon* with 70 rows of 45 teeth = 3150.

Shell conical, thin, glossy, especially underneath, semitransparent, of a tawny colour, with numerous very fine, irregular, transverse striæ, which are crossed by exceedingly delicate spiral lines visible only under a powerful lens, though they are slightly stronger below the periphery; *epidermis* very thin; *whorls* $5\frac{1}{2}$–6, gradually enlarging; *periphery* bluntly but distinctly keeled; *spire* produced, apex obtuse; *suture* well defined; *mouth* semilunar, narrow; *outer lip* reflected on the pillar; *umbilicus* minute, in immature specimens a mere depression.

Inhabits woods and other shady places in damp situations, among dead leaves, under fallen branches of trees and stones, in most parts of Great Britain. Though rather inactive, this little mollusc does not often retire within its shell unless disturbed. It secretes an abundance of slime.

In adult specimens the epidermis, especially on the upper whorls, is frequently eroded. The shell varies considerably in size and colour according to the nature of its habitat.

It forms a connecting link between the genus to which it belongs and that of *Helix*.

Var. *Mortoni*.—Shell of a paler colour, with the spire more depressed and the peripheral keel sharper. *Helix Mortoni*, Jeffr. in 'Linn. Trans.,' vol. xvi. p. 332. Somerset and North Hants, *B.C.* Heaton Dean near Newcastle (W. D. Sutton), *J.C.*

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* Tawny.

GENUS IV.—HE'LIX, LINNÉ.

Body somewhat elongated, capable of being contained within the shell; *mantle* thick, not reflected; *tentacles* 4, cylindrical, bulbs more or less tumid; *foot* usually broad; *jaw* arched and ribbed, edge teeth of *lingual ribbon* serrated.

Shell conical, more or less globose; *spire* in most cases produced; *mouth* more or less circular or oval; *outer lip* usually thick, with an internal rib, and reflected, sometimes thin, occasionally provided with teeth or tubercles; *umbilicus* more or less distinct, occasionally wanting.

The food of the *Helices*, or true snails, chiefly consists of vegetable matter, but some species are carnivorous as well as herbivorous. Their habits, as well as the nature of the localities they frequent, vary considerably; most species delight in moist and shady places, but some brave the scorching rays of the summer sun, and others the cold of elevated situations. Except in wet and cloudy weather they usually lie concealed during the daytime among moss and dead leaves, at the roots of plants, or under stones; in the evening they sally forth in quest of food, and soon after sunrise retire again to their hiding places. Those species which do not require a place of shelter during the heat of the day close the aperture of their shell with a thin epiphragm, and suspend themselves by means of their slimy secretion to the stalks of grass or other plants. On the approach of winter most of them retire from active life, either burying themselves in the ground or retreating to some other hiding place, where, after closing the aperture of their shell with a much thicker epiphragm

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* A coil.

than that which serves to protect them from the heat in summer, they remain in a dormant state until the return of spring.

Many, if not all of the *Helices* are provided in the pairing season with sharp, crystalline, spear-head-shaped weapons, which are contained in a sac or pouch and vary in number as well as in form in the several species. During the period of courtship these "love darts" are plunged by the animals into each other's bodies for the purpose of creating mutual excitement.

The eggs of these molluscs are joined together in a cluster and buried in the earth in small trenches which the animal excavates with its foot.

1. Helix lamella'ta,* Jeffreys. Pl. VII.

Body yellowish-white, back slaty-grey with a yellowish-white line running down the middle; *tentacles*, upper pair clavate, rather long, of a dark bluish colour, bulbs inky-black, globular; *lower tentacles* much lighter in colour than the upper pair, tips whitish; *foot* whitish, rather narrow, tapering to a fine but slightly obtuse point behind.

Shell globosely conic, thin, semitransparent, in some lights having the appearance of satin, yellowish horn-colour; *epidermis* thickish, raised in the line of growth into numerous thin, close-set, regular, and slightly oblique laminæ or plaits, the intervening furrows being finely and microscopically striate in the same direction; *whorls* 6, rounded, very gradually increasing; *spire* somewhat depressed, apex obtuse; *suture* deep; *mouth* semilunar; *outer lip* thin, slightly reflected on the pillar; *umbilicus* small, very deep.

Inhabits woods in some of the northern counties of England, as well as in North Wales, the northern and

* Having plaits.

western parts of Scotland, and in Ireland generally. This beautiful little mollusc lives among, and feeds upon, fallen and decaying leaves, especially those of the holly and the fronds of some of the ferns.

Dr. F. Buchanan White has "found it in the wooded highland glens at an elevation of 1200 feet," and has "met with it as far north as Rosshire." He adds, "though I carefully searched I have never been able to find *lamellata* or any other shell among holly leaves."—'Scottish Naturalist,' vol. ii. It may be that the localities examined by him furnished a more tempting repast, but in the south-west of Scotland I always search among fallen holly leaves for *H. lamellata*, and find it, as well as *H. aculeata* and *Z. fulvus*, in considerable abundance upon them. When crawling its movement is unusually rapid, and it carries its shell in an upright position, swaying it from side to side as it advances, reminding one of the waddling of a duck. It is very timid, and seems to be impatient of the light. Being desirous of examining some captive specimens, I found that the readiest way of inducing them to show themselves was to allow a gleam of sunshine to fall upon their shell, from which, after a few moments, they would emerge, and crawl away in quest of shade. The spire of the shell, especially at the apex, is frequently denuded of its epidermis.

2. H. ACULEA'TA,* MÜLLER. PL. VII.

Body varying in colour from slaty to greenish grey or pale brown; *tentacles* long, thick, upper pair finely speckled with black; *foot* narrow, tapering to a point behind.

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* Prickly.

Shell conical, globose, thin, scarcely semitransparent, of a dull aspect, brownish horn-colour; *epidermis* raised in the line of growth into numerous thin plaits or ridges, which in the centre of the whorls are produced into spinous points, the intermediate furrows are microscopically striate transversely; *epidermis* thick; *whorls* 4–4½, convex, gradually increasing; *periphery* faintly keeled; *apex* obtuse; *mouth* nearly semicircular; *outer lip* with an internal white rib, somewhat reflected; *umbilicus* rather small.

Inhabits woods and hedgerows in moss and under fallen leaves in most parts of Great Britain. Gwyn Jeffreys says he has observed it feeding on *Jungermannia platyphylla* (flat-leaved Jungermannia). I do not think, however, that it feeds exclusively upon that plant, for I have found it much more frequently on the fallen leaves of trees, particularly those of the beech and holly. It is less shy than *H. lamellata*, and like that species carries its shell erect, but its movements are more graceful.

Var. *albida*.—Shell whitish. Bath (Clark), *B.C.*

3. H. POMA'TIA,* LINNÉ. PL. VII.

Body varying in colour from yellowish-grey to pale brown, thickly covered with large, oval, wart-like excrescences; *mantle* with three fleshy lobes; *tentacles* long, bulbs globular, small; *foot* broad, rounded in front, bluntly pointed behind; *lingual* ribbon with 140 rows of 151 teeth = 21,140.

Shell globose, solid, almost opaque, dull yellowish-white more or less banded and tinged with brown, with strong, coarse, irregular striæ in the line of growth, which are crossed by fine spiral lines; *epidermis* thickish; *whorls* 4–5, much rounded, body whorl occupying about two-thirds of the shell; *spire* short, apex obtuse; *suture* distinct, but shallow; *mouth* roundish,

* Operculate.

somewhat angulated above; *outer lip* thick, reflected, especially over the umbilicus; *inner lip* a mere film which is spread over the base of the penultimate whorl; *umbilicus* very narrow.

Inhabits woods and hedgerows, as well as grassy places on chalky soil, chiefly in the south of England. It does not appear to have been found either in Scotland or Ireland, and its range in England does not extend further north than the Midland counties. It was at one time supposed to have been introduced into this country by the Romans, as well as more recently by some of our own countrymen; but Gwyn Jeffreys, upon sufficiently strong grounds, believes it to be indigenous.

In France, Belgium, and elsewhere on the Continent, this species is used and esteemed as an article of food, and is exposed for sale in the markets. It is by far the largest of our land shells. "M. Gaspard says that when the period of hibernating has arrived these snails become indolent, lose their appetite, and associate together. Each snail then excavates with its large and muscular foot a hole in the ground, just large enough to contain the shell. This it roofs in and lines with earth and dead leaves, making with its slime a kind of mortar, and smoothing over the inner surface of its winter domicile. Having accomplished this, it closes the mouth of the shell with a thick calcareous lid, the substance of which, when first poured out from the edges of the mantle, resembles liquid plaster of Paris. It then withdraws its body far into the interior of the shell, covering, as it retires, the empty space with several layers in succession of a fine membrane or film, in order the more completely

to exclude the cold air. In this snug receptacle it remains in a torpid state until the return of spring, all animal functions being in the meantime suspended. It then loosens and casts aside its winter bonds and resumes its former life."—*B.C.*, vol. i. p. 179. This species derives its name from a Greek word which signifies an *operculum*, in reference to the calcareous lid above alluded to, which is not, however, like a true operculum attached to the animal, but a thick and rather convex plate which exactly fits the aperture of the shell, and is cast aside at the close of winter. The eggs of this species are round, and nearly as large as a pea. They are deposited in the earth, and the young are excluded after the lapse of from twenty to forty-five days.

Var. *albida.*—Shell whitish or colourless, near Reigate (Brewer), *B.C.* Charlbury near Banbury, Oxfordshire (D. Pidgeon), *J.C.*, vol. i. p. 56. I have never seen this variety in an immature state, and am inclined to think that age has something to do with the colour.

4. H. ASPER'SA,* MÜLLER. PL. VII.

Body oblong, dark brown, or dusky-grey, speckled with white, roughly granulated; *tentacles* long, slender, diverging at their base, brownish, bulbs small; *foot* rounded in front, and ending in a point behind, margined with yellow; *lingual ribbon* with 135 rows of 105 teeth = 14,175.

Shell globose, somewhat thick and solid, of a dullish aspect, almost opaque, yellowish with dark brown bands, of which there are usually from four to five on the body whorl, and three on the upper volutions; these bands are more or less interrupted and broken up by irregular white or yellowish markings; *epidermis* thick, closely indented, and coarsely wrinkled; *whorls*

* Besprinkled.

4–4½, convex, body whorl occupying quite two-thirds of the shell; *spire* short, apex obtuse; *suture* distinct, but shallow and somewhat oblique; *mouth* roundish-oval, oblique; *outer lip* white, moderately thick, considerably reflected; *inner lip* a mere film spread on the base of the penultimate whorl; interior of shell with bands corresponding with those on the outside; *umbilicus* hidden in adult specimens, slightly visible in the young.

Inhabits gardens, woods, and hedges. This snail, as horticulturists know to their cost, is exceedingly abundant. Gwyn Jeffreys says he has not observed it so far north as Zetland, and I have noticed that in some of the southern and western counties of Scotland it is much less common than in England. Perhaps the northern gardeners, who are celebrated for their skill and industry, have, in some places at least, partially succeeded in *stamping* it out. It is slow and lazy in its movements, and rather irritable. It secretes an abundance of thick, greenish-yellow slime, which it seldom fails to pour forth copiously when it is provoked. It is very prolific, laying sometimes upwards of one hundred eggs.

Towards the end of autumn this species is to some extent gregarious. Considerable numbers may then be seen congregated together under large stones, beneath the eaves of houses or sheds, and the coping of walls, as well as in other snug nooks and corners, where, after closing the aperture of their shell with a membranous film (*epiphragm*), by means of which they frequently cement themselves to each other, they pass through the rigours of winter in a dormant state, deriving mutual warmth and protection from the close manner in which they have packed themselves together. On the return of spring, when they have left

their winter quarters, they may frequently be seen crawling about with the discarded epiphragm of their late companions still adhering to their shell. These snails were at one time collected in great quantities in this country, and exposed for sale in the markets, being considered, when boiled in milk, an excellent remedy for diseases of the chest. In Turton's 'Manual' it is stated that "the glassmen at Newcastle once a year have a snail feast (?); they generally collect the snails themselves in the fields and hedges the Sunday before the feast day." I am informed that this practice is still continued, and although it might probably be difficult to tempt the world in general with the bill of fare, the repast has at any rate the advantage of being an inexpensive one, and besides, "there is no accounting for taste." The specific name *aspersa*, bestowed upon this species by Müller, is a Latin word, which literally rendered means besprinkled (as with water). It is not easy to comprehend in what way the appellation is an appropriate one; perhaps the celebrated German naturalist by a slip of the pen wrote *aspersa* instead of *aspera* (rough), which would have been much more descriptive of the coarsely wrinkled surface of the shell.

Var. 1. *albo-fasciata.*—Shell reddish-brown with a single white band, *B.C.* Local, but not uncommon.

Var. 2. *exalbida*, Menke.—Shell yellowish or whitish, local, Norwich (Bridgman), *B.C.* Bristol (Miss Hele), Cambridge (W. G. Blatch), a colony at Burlington (Hey), *J.C.*

Var. 3. *conoidea*, Picard.—Shell smaller, more conical and thinner; mouth smaller. Sandhills and cliffs on the sea-side, *B.C.*

Var. 4. *tenuis.*—Shell dwarfed, extremely thin, and nearly

transparent, bands reddish-brown. Guernsey, Sark, and Herm.

Monstrosities sometimes occur in which the spire is sinistral, or the whorls are disjointed causing the shell to appear like a corkscrew.

5. H. NEMORA'LIS,* LINNÉ. PL. VII.

Body oblong, dark brown bordered with a paler tint, with small, round, thickly set tubercles; *tentacles* very long, slender, of a dark brown colour, upper pair nearly cylindrical, somewhat diverging, finely but distinctly tuberculated, slightly transparent; *bulbs* globular; *foot* angulated in front, tapering to a point behind; *lingual ribbon* with 135 rows of 100 teeth = 13,500.

Shell globose, compressed beneath, thickish, almost opaque, rather glossy, very variable in colour which ranges from brown to pink and yellow of different depths of shade, occasionally white, with from one to four or five bands which also vary both in breadth and colour, their prevailing tint, however, being brown, sometimes they are altogether wanting; irregularly and closely striate in the line of growth, as well as more faintly so spirally; *epidermis* thinnish; *whorls* 5–5½, rounded; *spire* short, apex obtuse; *suture* shallow; *mouth* obliquely semilunar; *outer lip* thick, reflected, of a deep chocolate-brown inside, where it is furnished with a strong rib of the same colour; *inner lip* extremely thin, chocolate or reddish-brown; *umbilicus* hidden, except in young specimens.

Inhabits groves and shady places, as well as gardens and hedgerows, in all parts of Great Britain. It is more hardy and less timid than most members of the genus, and one of the prettiest and best known of our land shells. It affords a dainty repast to the thrush and blackbird, which are in the habit of breaking the shell by hammering it against an adjacent rock or stone, around which small heaps of

* Living in groves.

fragments may frequently be seen. Considerable difference of opinion prevails among conchologists as to whether the forms *hortensis* and *hybrida* should be regarded as distinct species, or as varieties only. Gwyn Jeffreys believes them to be "merely local or casual varieties" of the typical form *nemoralis*, and states (as one of the reasons which lead him to this conclusion) that he has "never found any two of these forms living together," *B.C.*, vol. i. p. 188. In his supplement, however, he somewhat modifies this assertion, remarking that he has since found *nemoralis* and *hortensis* "living together, but passing one into the other." That these forms very frequently associate together is a fact well known to most conchologists; but whether the characters which distinguish them from one another are specific or merely varietal is another question. It was stated in the preface to this volume that I proposed to follow the accomplished author of 'British Conchology' in the method of arrangement, as well as in the nomenclature which he has adopted, and as I am anxious to avoid the confusion which any deviation from that intention might produce, I have described and figured *hortensis* and *hybrida* as varieties of *nemoralis*, though I strongly incline to the belief that *hortensis* at least is a distinct species. The following remarks embody the chief reasons which lead me to this conclusion. The greater part of the spring and summer of last year (1878) was spent by me in Normandy, where *H. nemoralis*, *hortensis*, and *aspersa*, as well as many other species, occur in endless profusion. An unusually favourable opportunity was thus afforded me

of observing them during the pairing season, at which time they are in the habit of ascending trees, often (as nearly as I could judge) to a height of from twenty to forty feet, or even higher. The trees usually selected were those growing on the outskirts of woods, in hedgerows by the wayside, or in shady lanes. The beech, ash, and other trees with smooth bark were generally preferred, and although by far the greater number of the molluscs were located on the trunk, others crawled out upon the branches; *aspersa*, *nemoralis*, and *hortensis* were all of the party, and *hybrida*, though much less numerously represented, was also present, but I failed to detect a single instance in which it had paired. *H. aspersa* was less ambitious than its neighbours, and rarely ventured upon an ascent exceeding twenty feet in height. In one locality the trees on either side of a long avenue of beeches were decked with shells. On one of them I counted twenty "happy couples," twelve of which were *hortensis*, and the rest *nemoralis*. My object in making this investigation was to determine, if possible, whether matrimonial alliances between these two forms are usual or not, and the result was that among the many hundreds of cases which came under my observation not a single instance of such union occurred—the "black-mouths" invariably paired with "black-mouths," and "white-mouths" with "white-mouths." These observations were not confined to a single locality, but were made in many places some miles apart, and in order to determine with certainty the species of those individuals which were high up in the trees, I used a pair of powerful

field glasses, which enabled me at once to distinguish between the different forms.

Var. 1. *hortensis.*—Shell more globular, and usually smaller, mouth and rib white, common.

Var. 2. *hybrida.*—Shell smaller, mouth and rib pink or brown, more local.

Var. 3. *major.*—Shell much larger and more depressed. Sand-hills and downs, Isle of Arran, Co. Galway, *B.C.*

Var. 4. *minor.*—Shell much smaller, otherwise like *hortensis.* Zetland (Barlee), Loch Carron, Rosshire (J. G. J.), *B.C.*

Besides these varieties, monstrosities occasionally occur; in some cases the whorls are much produced, or even separated, in others the spire is reversed.

6. H. ARBUSTO'RUM,* LINNÉ. PL. VII.

Body very glossy, as if coated with moist varnish, bluish-black or dark olive-green, thickly covered with coarse tubercles which are oblong when the animal is extended and roundish when it is at rest; *tentacles* slender, upper pair considerably divided at their base, gradually tapering, bulbs globular, tumid; lower tentacles very wide apart; *foot* slaty-grey, its margins grooved, ending in a rounded or bluntly pointed tail.

Shell globose, somewhat compressed below, moderately solid, glossy, scarcely semitransparent, yellowish-brown, dappled and streaked with markings of a pale yellow or straw-colour and usually having a dark brown band which encircles the centre of the body whorl and the base of the upper volutions; with strong irregular ridges in the line of growth which are crossed by fine, close-set, spiral striæ; *epidermis* thinnish; *whorls* 5–6, convex, body whorl occupying about two-thirds of the shell; *spire* usually somewhat depressed, apex obtuse; *suture* deepish; *mouth* forming about two-thirds of an oval; *outer lip* white, thick, reflected, usually furnished with a slight internal rib of the same colour; *inner lip* thinly spread on the base of the penultimate whorl; *umbilicus* very small, oblique, nearly hidden by the reflection of the outer lip.

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* Living in copses.

Inhabits shady places in woods and hedgerows and damp spots by the side of rivers, among willows, alders, &c. Although widely distributed over Great Britain, this is a local species. It is lazy in its movements and somewhat irritable. When crawling it carries its shell in a slanting position. The epiphragm is extremely thin.

Var. 1. *flavescens.*—Shell yellowish-white, usually bandless, not uncommon.

Var. 2. *major.*—Shell larger, *spire* considerably depressed, various localities.

Var. 3. *alpestris*, Ziegler.—Shell much smaller, *spire* more produced. Hoddesden, Herts, on marshes by the side of the River Lea (Pickering), *B.C.* Near Banbury, Oxfordshire (D. Pidgeon), *J.C.*, vol. i. p. 56.

Var. 4. *fusca*, Férussac.—Shell dark brown, with or without the band, very thin and transparent. Luna, East Zetland, *B.C.*

Var. 5. *albida.*—Shell white, found by Mr. Whitwham of Huddersfield, near Settle, Yorkshire (fide J. W. Taylor, Ed. *J.C.*).

Monstrosities occasionally occur, having the spire reversed, or sometimes much produced.

7. H. Cantia'na,* Montagu. Pl. VIII.

Body oblong, of a pale yellowish colour faintly tinged with pink in front, closely covered with greyish tubercles; *tentacles* long, upper pair brownish or bluish-grey, widely diverging, thickish at their base, gradually tapering towards the bulbs which are rather small and yellowish at their tips; lower pair paler in colour; *foot* slightly truncate in front; *tail* tumid, angular, keeled, with grooved margins; *lingual ribbon* with 125 rows of 81 teeth = 10,125.

Shell subglobose, somewhat compressed above and below, rather thin and brittle, semitransparent, somewhat glossy, pale

* Kentish.

white with a faint yellowish tinge, the body whorl is usually more or less tinted with rufous or fawn-colour, and generally encircled by a faint white line placed a little above the periphery; with close-set, irregular, curved striæ in the line of growth; *epidermis* thin and somewhat wrinkled; *whorls* 6–7, convex, body whorl occupying rather more than half of the shell, much rounded, not keeled; *spire* short, apex obtuse; *suture* deepish; *mouth* oblique, forming about three-fourths of an oval, with an internal white or sometimes pinkish rib placed a little away from the margin; *outer lip* thin, slightly reflected, folding over where it joins the pillar; *umbilicus* narrow, but deep.

Inhabits grassy banks in hedgerows and copses, chiefly in the home and southern counties of England. It also occurs in Yorkshire and Northumberland, as well as in some parts of Wales; but it has not been observed in Scotland, and it is doubtful whether it has been found in Ireland.

It is sluggish and irritable, and secretes an abundance of transparent slime. The shell is inclined to one side when the animal is crawling. It lays from sixty to ninety globular eggs, which are deposited in moist places.

"It hibernates from November to February, and forms an epiphragm like a film of the finest blown glass," *B.C.*, vol. i. p. 191. In the earlier stages of its growth the epidermis is clothed with short bristles, which are deciduous.

8. H. Cartusia'na,* Müller. Pl. VIII.

Body slender, moderately transparent, yellowish, faintly tinged, especially in front, with pale rose-colour, tubercles thickly set and finely dotted with brown; *tentacles* long, yellowish, trans-

* So named because it was first discovered near a Carthusian monastery.

parent, and greyish at their base, upper pair very slender, covered with small tubercles, lower pair diverging at their base, rather thick; bulbs small; *foot* roundish in front; tapering gradually towards the tail.

Shell subconic, considerably depressed above, slightly rounded underneath, thicker, less transparent and glossy than the last species, of a greyish or yellowish white colour faintly tinged with pale brown, with a milk-white spiral band placed slightly above the periphery, irregularly striate in the line of growth and very faintly so in a spiral direction, especially near the umbilicus; body whorl closely but indistinctly pitted; *epidermis* thinnish; *whorls* 6–7, body whorl occupying about half of the shell; *periphery* faintly keeled; *spire* depressed, apex slightly acute; *suture* deepish; *mouth* forming about two-thirds of an oval, with a broadish white internal rib; *outer lip* thin, scarcely reflected, except over the umbilicus; *umbilicus* very small, nearly hidden by the reflection of the outer lip.

Inhabits the downs of Kent and Sussex, near the sea-coast abundantly, on grass and other plants. It is a sluggish and irritable creature, but rather hardy, and it does not seem to be inconvenienced by the heat of the sun; its shell is carried in a slanting position when the animal is in motion. The shell is much smaller than that of the last species, more solid, less transparent, and the umbilicus is considerably smaller.

Var. *rufilabris*, Jeffr.—Shell smaller, with inside rib of a reddish brown colour. Lewes and Littlehampton, *B.C.*

9. H. RUFES'CENS,* PENNANT. PL. VIII.

Body of a dusky ash-colour, or brown, occasionally blackish, tubercles prominent; *tentacles* greyish ash-colour, upper pair long and slender; lower pair very short; *foot* narrow, of a pale ash-colour beneath.

Shell subconic, depressed above, somewhat convex beneath,

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* Reddish.

thick, scarcely semitransparent, of a dullish aspect, varying in colour from ash-grey to rufous-brown, sometimes streaked with darker or paler markings, and usually having a white band round the centre of the body whorl; with close-set, irregular striæ in the line of growth; *periphery* bluntly keeled; *epidermis* moderately thick; *whorls* 6–7, body whorl occupying about half of the shell; *spire* short, apex obtuse; *suture* deepish; mouth oblique, semilunar, with a strong white internal rib which is situated a little away from the margin; *outer lip* thickish, somewhat reflected; *umbilicus* rather narrow, but deep.

Inhabits most parts of Great Britain, in woods, gardens, and hedgerows, on grass at the foot of walls, among nettles, and under logs of wood and stones. It is one of the most abundant of our land shells; its colour is very variable. The epidermis of young specimens is clothed with short hairs, which are shed as the animals advance towards maturity. The eggs of this species vary in number from forty to fifty and are laid during the months of August, September, and October; the young are hatched in from twenty to twenty-five days.

Var. 1. *albida.*—Shell white or colourless. Not uncommon.

Var. 2. *minor.*—Shell smaller, spire more raised. Not uncommon.

Monstrosities sometimes occur.

10. H. CONCIN'NA,* JEFFREYS. PL. VIII.

"Body lustrous, reddish-brown, minutely tubercled or granulated; *tentacles* of a lighter colour, upper pair longer and more slender than in the next species (*H. hispida*); lower ones very short; *foot* narrow, of a greyish colour on its sides and soles.

"Shell subconic, compressed on both sides, rather solid for its size, but semitransparent, somewhat glossy, light ash-grey, with

* Neat.

occasional faint streaks of reddish-brown, giving the shell a prettily mottled appearance; there is also frequently on the last whorl a white spiral band like that in *H. rufescens;* the surface also is transversely striate as in that species; *periphery* obtusely and indistinctly keeled; *epidermis* rather thick, sparsely covered with short white hairs, which are easily rubbed off; *whorls* 6–7, compact, rather depressed above and slightly convex beneath, the last scarcely occupying one-third of the shell; *spire* short and blunt; *suture* deep; *mouth* obliquely semilunar, considerably higher than broad, furnished inside with a sharp white rib, which becomes thicker towards the umbilicus, and is placed near the opening; *outer lip* not very thin in adult specimens, and somewhat reflected; *umbilicus* rather broad, open and deep.

"Habitat, under stones among nettles and the *Arum maculatum*, as well as at the roots of grass in moist places; generally distributed."—*B.C.*, vol. i. pp. 196–7.

As this shell is indebted to the author of 'British Conchology' for its name as well as its title to rank as a species, I have transcribed the above minute description which he has given of it.

Much diversity of opinion prevails among conchologists as to whether it is a distinct species, or a variety of *H. hispida*, and Gwyn Jeffreys himself confesses that at one time, after having described it in the 'Transactions' of the Linnean Society, "he had some misgivings as to its being distinct from some of the numerous varieties of *H. hispida*." I incline to the belief that his misgivings were well-founded, because I think the two forms are "so intimately blended together by intermediate links as to make the line of separation too critical" (Introduction to 'British Conchology,' p. xvii.); but whether it be regarded as a species or a variety, it differs from *H. hispida* in the following respects: the body of the animal is usually

darker in colour, the upper tentacles are more slender, and the foot narrower; the shell is more depressed and glossy, the umbilicus wider, and the hairs with which the epidermis is clothed are less numerous and more easily rubbed off. Although the shell is much smaller than that of the typical form of *H. rufescens*, it bears a close resemblance to small specimens of that species.

Var. 1. *albida.*—Shell white, with specimens of the usual colour, *B.C.*

Var. 2. *minor.*—Shell smaller, and also white; spire more depressed than usual. South of Ireland (Dillwyn), Bath (Clark), Dover (J. G. J.), *B.C.*

11. H. HIS'PIDA,* LINNÉ. PL. VIII.

Body oblong, of a darkish slaty-brown above, greyish-brown beneath, sides whitish, rather transparent, tubercles round, covered with milk-white specks; *tentacles* thick, nearly cylindrical, diverging at their base, bulbs rather transparent; *foot* finely spotted with black, rounded in front, narrowing towards the tail, which is keeled and bluntly pointed.

Shell subconic, slightly compressed beneath, thin, somewhat transparent, scarcely glossy, horn-coloured or dark yellowish-brown, sometimes with a line of paler colour round the centre of the body whorl; irregularly and finely striate transversely; *periphery* rounded, rarely, and never strongly, keeled; *epidermis* thick, clothed with close-set bristles, which are recurved and not easily rubbed off; *whorls* 6–7, rounded; *spire* somewhat produced, apex obtuse; *suture* deep; *mouth* semilunar, somewhat oblique, usually furnished with an internal rib; *outer lip* thin, not reflected, except near the *umbilicus*, which is small, but deep.

Inhabits every part of Great Britain, in woods, hedges, and other places, among moss, under stones,

* Bristly.

and fallen branches of trees. This very variable and common species is, according to the Rev. Revett Sheppard, amphibious, being "frequently found some feet below the surface of water, on stakes and piles, which it ascends and descends at pleasure." As it is an extremely irritable little creature it may perhaps resort to this expedient for the purpose of cooling its temper. Between the months of April and September it lays about forty eggs, which are white, opaque, and of a globular form; the young are excluded in from twenty to twenty-five days.

Var. 1. *subrufa.*—Shell reddish-brown, and more solid, with a strong labial rib, not uncommon in dry situations, *B.C.*

Var. 2. *albida.*—Shell thinner, white or colourless. In osier-beds, as well as on the limestone at Kendal, *B.C.* Near Birmingham (G. Sherriff Tye), near Ackworth, Yorkshire (C. Ashford), *J.C.*

Var. 3. *conica.*—Shell smaller, spire more raised. Sandhills near Swansea, *B.C.*

Var. 4. *nana.*—Shell much smaller, but with a strong labial rib; spire depressed. Freshwater, Isle of Wight (Metcalfe), *B.C.*

Var. 5. *subglobosa.*—Shell more globular, and much thinner, horn-colour or white; *umbilicus* very small. Northumberland and Durham (Alder), Hammersmith, Plymouth, Brocklesby, Lincolnshire (J. G. J.), *B.C.* Lichfield (Rev. J. McMurtrie).

12. H. SERI'CEA,* MÜLLER. PL. VIII.

Body brownish, or yellowish-grey, with close-set tubercles; *tentacles* rather long, diverging at their base, of an iron-grey colour; *upper pair* rather thick at the base, finely granulated; *bulbs* much swollen, especially below; *lower tentacles* paler and more transparent than the upper pair; *foot* somewhat raised at the sides, broad, light yellowish-grey.

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* Silky.

Shell subglobular, thin, semitransparent, slightly glossy, of a pale grey, or yellowish horn-colour, sometimes streaked with faint lines of a darker colour, faintly striate in the line of growth; *periphery* rounded, not keeled; *epidermis* thickish, closely covered with fine, white, silky hairs, which do not easily rub off; *whorls* 6, tumid; *spire* produced, apex obtuse; *suture* moderately deep; *mouth* semilunar, occasionally with a slight white internal rib; *outer lip* thin, slightly reflected; *umbilicus* deep, but very small.

Inhabits woods and hedgerows among moss, in many places from the north of Scotland to Cornwall, as well as in some parts of Wales, but it is a local species. It is a timid little animal, and when crawling carries its shell in a slanting position. It differs from *H. hispida* in being more globular and of a lighter colour, in having a more produced spire and thicker coating of hairs, and more particularly in being altogether destitute of a keel.

Var. *cornea.*—Shell horn-colour, very thin, glossy, and semitransparent; the labial rib perceptible on the outside. Lulworth (Jeffreys), *B.C.*

13. H. REVELA'TA,* MICHAUD. PL. VIII.

"Body pale yellowish-grey, sometimes having a reddish or dusky hue, closely tubercled; *mantle* yellowish-brown, minutely speckled with brown and milk-white; *tentacles* rather thick and long, of a dirty grey colour faintly tinged with violet or brown; the upper ones finely granulated, with globular bulbs; *foot* rounded in front, triangular and keeled behind; sides marked with transverse furrows."—*B.C.*, vol. i. p. 202.

Shell subglobose, depressed above, thin, semitransparent, somewhat glossy, of a pale olive-green, surface finely granulated, and irregularly wrinkled in the line of growth, especially near the suture and umbilicus; *periphery* rounded; *epidermis*

* Discovered.

thickish, sparsely clothed with short whitish hairs; *whorls* 4–4½, very tumid, body whorl occupying about two-thirds of the shell; *spire* very slightly produced, apex obtuse; *suture* very deep; *mouth* forming about three-fourths of a circle; *outer lip* thin, very little reflected, except near the *umbilicus*, which is small and shallow.

Inhabits downs near the sea-coast, among loose stones and at the roots of grass and other plants in the Channel Islands, as well as similar places in a few of the southern counties of England. The following localities are given for it in 'British Conchology':—Torquay, Plymouth, Megavissey, Pendennis, Land's End, and Scilly Isles. Mr. E. J. Lowe says he has found it in woods at Stanton-on-the-Wolds, Nottinghamshire. Captain Brown, in his 'Illustrations of the Recent Conchology of Great Britain,' laid claim to having first discovered it on the Lomond Hills in Fifeshire, and he described it in the first edition of that work under the name of *Vitrina membranacea*. Subsequent writers do not seem, however, to have credited him with the discovery. It was first observed in Guernsey by the late Professor Edward Forbes, and Dr. Gray, to whom he had given some living specimens, described it as a British species in 1840. In Guernsey the range of this interesting mollusc seems to be chiefly confined to the southern end of the island, where, though local, it occurs in some abundance. It is gregarious, and I found it more plentifully than elsewhere in hollows on slopes, where small pieces of disintegrated rock had slipped from above, and were piled together in masses. A small species of sorrel (*Rumex acetosella*, I think) grows plentifully

among the loose stones, and probably affords a favourite repast to *H. revelata*, which congregated in some numbers about its roots.

14. H. FUS'CA,* MONTAGU. PL. VIII.

Body elongate, yellowish-grey tinged with violet, finely speckled with black above, tubercles small, irregularly placed ; *tentacles* long, thick at the base, very slightly transparent, bluish-grey slightly tinged with violet ; *lower tentacles* more diverging at the base than the upper ones ; bulbs small, nearly globular ; *foot* long, narrow, its edges of a bluish tint.

Shell subconical, somewhat compressed, very thin, nearly membranous, transparent, glossy, pale yellowish-brown or light horn-colour, with strong irregular wrinkles in the line of growth ; *periphery* rounded, slightly keeled; *epidermis* somewhat thick; *whorls* 5–5½, body whorl occupying a little more than half of the shell ; *spire* somewhat produced, apex obtuse ; *suture* rather shallow; *mouth* semilunar, somewhat oblique ; *outer lip* rather thin, reflected over the *umbilicus* which is exceedingly small.

Inhabits woods and hedgerows, as well as grassy banks, among nettles, brambles, and ferns, in many parts of Great Britain, but it is a local species. I have frequently seen it feeding upon the tender leaves of young alders and poplar trees. It is exceedingly hardy. In the 'Quarterly Journal of Conchology,' vol. i. p. 180, Mr. Charles Ashford makes the following interesting remarks on the habits of this species. "On Christmas day a few winters ago I was walking through Saltram Wood, three miles from Plymouth, when I noticed two individuals of *H. fusca* upon the herbage of the bank. As the weather was cold I was rather surprised to find this species abroad while its

* Dusky brown.

more thickly clad congeners were hibernating below the surface. The temperature fell considerably during the next few days, and I visited the spot repeatedly to find, if possible, the limit to the endurance of this slender mollusc. The following notes from my memoranda at the time will best show the result. Dec. 26th, the thermometer at early morning registered 26°, and the herbage was fringed with sparkling crystals of rime, notwithstanding which the little creatures were abroad and lively, crawling up the blades of the Great Hairy Woodrush (*Luzula sylvatica*) not simply indifferent to a temperature which benumbed my own extremities, but positively agile. Dec. 27th, min. temp. 28°. Dec. 28th, min. temp. 28°: this morning *H. fusca* still about and vigorous. Dec. 29th, temp. 25°. Dec. 30th, temp. 32°: after an hour's search I found only one individual. Dec. 31st, temp. 26°: none to be seen. The frost continued without intermission throughout the first week of the new year, during which time on the occasion of two visits to the same and neighbouring spots I failed to find it about, nor could I discover any at the roots of the Luzula. Jan. 9th, milder: *H. fusca* again abroad, and more abundantly on the 10th. It appears then that a continuance of a temperature below freezing point for six successive days was necessary to drive to its retreat a mollusc protected by a shell so thin as to be almost membranous, and that, on the slightest return to warmer weather, the circulation of the animal sufficiently increased to enable it to resume activity."

Moquin-Tandon says that the members of this

species congregate in social groups, when they may be seen polishing each other's shells with their slimy foot.

15. H. Pisa'na,* Müller. Pl. VIII.

Body slightly transparent, yellowish-grey above with a reddish tint in front, brownish-yellow beneath, closely tuberculate; *tentacles* yellowish-grey, very finely shagreened, rather slender, except at the base where they are broad and somewhat diverging, bulbs globular, darkish red; *foot* somewhat truncate in front, gradually narrowing to a point behind, and not keeled; *lingual ribbon* with 120 rows of 71 teeth = 8520.

Shell subglobular, slightly depressed above, rounded beneath, solid, nearly opaque, somewhat glossy, cream-coloured, encircled with chocolate-brown bands which vary in number, and marked, especially on the upper volutions, with dots and irregular blotches of the same colour, which give to the shell an elegantly mottled appearance, with irregular striæ in the line of growth, which are crossed by finer and closer lines causing the surface of the shell to be finely reticulated; *periphery* rounded: *epidermis* scarcely visible; *whorls* 5–5½, convex, but flattened at their summits, body whorl occupying about two-thirds of the shell; *spire* somewhat produced, apex obtuse and of a brownish colour tinged with violet; *mouth* forming about three-fourths of a circle, inside usually pink or rose-colour, and furnished with a slight rib; *outer lip* thickish, somewhat reflected near to, and more so over the *umbilicus* which is very small and oblique.

Inhabits sandhills and other places near the sea, at Tenby and Manorbeer in Pembrokeshire, St. Ives and Whitsand Bay, Cornwall, Balbriggan Strand in Dublin Bay, and in Jersey. It also occurs at Vazon Bay in Guernsey where Mr. Lukis in 1860 placed some specimens which he had brought from Jersey; the colony is reported to be thriving, and if un-

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* It was first found at Pisa.

molested, *H. Pisana* will probably ere long be as abundant in Guernsey as it is in the neighbouring island. In 'British Conchology,' vol. i. p. 208, Gwyn Jeffreys remarks that "the limited range of this species in Great Britain is unaccountable;" he also says that he made two unsuccessful attempts to colonize it on the sandhills near Swansea, "by bringing a basketful of live specimens from Tenby, a distance of only about thirty miles," and spreading them over the Burrows, and that, "although they seemed at first to thrive tolerably well in the new locality, they did not multiply, and the birds soon ate up the immigrants." During the autumn of 1874, being in the neighbourhood of Swansea, I visited the Burrows and was much pleased to find that his colony, instead of being extinct, had increased immensely. The foreign distribution of this extremely beautiful shell is by no means confined to the sea-board; it occurs abundantly in the centre of France and Spain; the fact of its range in this country being limited to a few places on the sea-coast is therefore suggestive of the idea that it may have been originally brought over in ballast from the Continent, or perhaps from Jersey. This species seems to be totally regardless of the unpleasant consequences of a *coup-de-soleil*, it may frequently be seen clinging to plants which its voracity has rendered all but shelterless, unconscious, apparently, of the scorching rays of a mid-day summer sun.

Var. *alba*.—Shell pale yellowish-white, or snow-white, with or without translucent markings, *B.C.*

16. H. VIRGA'TA,* DA COSTA. PL. VIII.

Body whitish with a tinge of pink or yellow, tubercles large, round; *tentacles* dark grey, cylindro-conic, thickish, *upper pair* rather close together, *lower pair* considerably diverging; bulbs globular, reddish, spotted with brown at the base; *foot* broadly rounded in front, gradually narrowing behind, tail of a pale pinkish-white, obtuse at the tip.

Shell conical, globose, rather solid, nearly opaque, somewhat glossy, white or cream-colour, usually with a dark brown band which encircles the base of the upper volutions, and gradually widening, is continued round the body whorl immediately above the periphery, at the base of the shell there are also other bands of a similar colour, which vary from three to seven in number; rather coarsely and irregularly striate in the line of growth; *periphery* rounded; *epidermis* indistinct; *whorls* 6, convex, their summits slightly depressed, body whorl occupying more than half of the shell; *spire* produced, apex brownish, glossy; *mouth* forming three-fourths of a circle, inside with a reddish-brown rib; *outer lip* moderately thin, reflected near to and over the *umbilicus*, which is narrow but deep.

Inhabits downs, sandhills, and heaths in many places in England as far north as "Alnmouth in Northumberland" (McMurtrie), also in Wales, Ireland, and the Channel Islands, but it does not seem to have been found in Scotland.

The shell of this species is very variable in its size, colour, and markings; sometimes the bands are interrupted or broken up, giving a mottled appearance to the surface, occasionally they are altogether wanting. In young specimens the periphery is somewhat sharply keeled.

The animals of this species are gregarious, and though they are found in some of the inland counties, their favourite habitat is near the sea-coast. In loca-

* Striped.

lities such as the South Downs, Dartmoor, and Cornwall, they occur in endless profusion, so that the sheep, when feeding upon the short grass, cannot possibly avoid devouring them in vast numbers; the excellency of the South Down and Dartmoor mutton has consequently, with much show of reason, been partly attributed to the very nutritive food thus afforded to the sheep. Some of the inhabitants, the shepherds especially, of the above-named localities, implicitly believe that these snails descend in showers from the clouds, and they are indignant when a stranger smiles incredulously on hearing their wondrous tale. This notion owes its origin, no doubt, to the fact that, after a shower of rain, the herbage on tracts of country extending for miles, is suddenly, as if by magic, alive with millions of the molluscs, which had previously concealed themselves at its roots.

H. virgata is very hardy and does not seem to hibernate. Moquin-Tandon says that it lays from thirty to sixty eggs during the autumn.

Var. 1. *subaperta.*—Shell of a whiter hue; *spire* more depressed; *umbilicus* wider. Bath (Clark), *B.C.*

Var. 2. *subglobosa.*—Shell smaller with a double band above the periphery, last whorl larger in proportion to the others, *umbilicus* wider. Bantry Bay and St. Mawes near Falmouth (J. G. J.), *B.C.* Black Rock, Tenby (G. Sherriff Tye), *J.C.*

Var 3. *submaritima*, Des Moulins.—Shell much smaller and more deeply coloured, often with a violet tinge; *spire* raised. Braunton Burrows in North Devon, and Swansea Burrows (J. G. J.), Isle of Wight (Pickering), *B.C.* Tenby (G. Sherriff Tye), *J.C.* Clevedon (McMurtrie).

Var. 4. *carinata.*—Shell yellowish-white, compressed above; *periphery* strongly keeled. Wingfrith near Wareham (Daniel), *B.C.*

The Rev. J. McMurtrie has kindly sent me specimens of a pretty white variety in which the bands are translucent; it occurs at Alnmouth.

Monstrosities with the whorls more or less separated or the spire reversed occur sometimes.

17. H. CAPERA'TA,* MONTAGU. PL. VIII.

Body ash-colour with a yellowish tinge and streaked with brown, tubercles rather large, thick set, tipped with black; *tentacles* long, rather slender, dusky, bulbs nearly globular; *foot* somewhat truncate in front, terminating in an obtusely pointed tail; *lingual ribbon* with 80 rows of 51 teeth = 4080.

Shell subconical, compressed, solid, nearly opaque, very slightly glossy, whitish or cream-colour, usually with a brown band which encircles the body whorl immediately above the periphery and the base of the upper volutions, below it there are generally from two to seven narrower bands of the same colour; the sculpture consists of numerous strong, close-set, ridge-like striæ in the line of growth, which intersect the bands and impart to the surface of the shell a mottled appearance; *periphery* obtusely keeled; *epidermis* thin; *whorls* 6, gradually increasing; *spire* slightly produced, apex usually brown; *suture* deepish; *mouth* forming about three-fourths of a circle, somewhat oblique, inside with a strong white rib; *outer lip* rather thin, slightly reflected near to, and more so over, the *umbilicus* which is rather large and deep.

Inhabits most parts of Great Britain, especially in dry, sandy soils, at the roots, and on the stalks of grasses and other plants, as well as under stones. This, like the last species, varies considerably in size, colour, and markings; it is inactive and timid. According to Bouchard-Chantereaux it lays during the months of August and September from thirty-five to forty eggs of an opaque white colour; the young are

* Wrinkled.

hatched after the lapse of from fifteen to twenty days, and attain their full size at the end of the following year. This species may at once be distinguished from *H. virgata* by the strong rib-like striæ with which its surface is closely covered, as well as by its more depressed spire and larger umbilicus.

Var. 1. *major*.—Shell larger. Norwich (Bridgman); Surrey (Choules), *B. C.* Tenby occasionally, and near Birmingham (G. Sherriff Tye), *J.C.* North Berwick abundant (McMurtrie).

Var. 2. *ornata*, Picard.—Shell smaller with broader and darker bands. Sandy coasts of North and South Wales, South Devon, and Cork (J. G. J.) *B.C.* Near Birmingham, Tenby, (G. Sherriff Tye), *J.C.* Bristol, Carnforth, Lancashire, Alnmouth, Northumberland (McMurtrie).

Var. 3. *subscalaris*.—Shell conical, *whorls* more convex. Cork (Humphreys), Swansea (J. G. J.), *B.C.* Tenby (G. Sherriff Tye), *J.C.*

Var. 4. *Gigaxii*, Charpentier.—Shell rather smaller; *spire* more depressed, *umbilicus* consequently larger. Sandwich and Falmouth, *B.C.*

18. H. ERICITO'RUM,* MÜLLER. PL. VIII.

Body yellowish-grey or reddish-brown, tubercles colourless and thickly set; *tentacles* rather long, thickish, granulated, somewhat transparent, yellowish-grey, bulbs rather swollen beneath, rounded at the points; *foot* slightly angular in front, tapering to an obtuse point behind, margined with a slender grey line; *lingual ribbon* with 115 rows of 61 teeth = 7015.

Shell considerably depressed, somewhat thin, scarcely semi-transparent, rather glossy, greyish or whitish, the base of the upper volutions is usually encircled by a broadish chestnut-brown band which is continued round the body whorl a little above the periphery, and beneath it there are from two to six narrower bands of the same colour; with slight but distinct striæ in the line of growth, and frequently marked with irregular indenta-

* Inhabiting heaths.

tions ; *periphery* rounded ; *epidermis* thin ; *whorls* 6 ; *spire* very slightly produced, apex obtuse, brownish ; *suture* deep ; *mouth* forming three-fourths of a circle, somewhat oblique, sometimes furnished with a slight internal rib ; *outer lip* thickish, slightly reflected ; *umbilicus* very wide and deep.

Inhabits heaths and downs, especially when the soil is dry or sandy, in many parts of Great Britain, but it is rather local. It is a slothful, timid, and irritable creature, and retreats within its shell the instant it is touched. It feeds upon various plants, and seems to be very partial to thistles.

Var. 1. *alba*, Charpentier.—Shell milk-white, not uncommon with the type.

Var. 2. *minor*.—Shell smaller. Kendal (J. G. J.), *B.C.*

Var. 3. *instabilis*.—Shell smaller, of a darker colour and sometimes streaked or spotted ; *spire* more raised, *umbilicus* narrower. *H. instabilis*, Ziegler. Iona (Lowe), Mull (Bedford), Connemara (J. G. J.), *B.C.*

Monst. *sinistrorsa*.—*Spire* reversed. Bridlington (Strickland), *B.C.*

19. H. ROTUNDA'TA,* MÜLLER. PL. VIII.

Body slender, slaty-grey, sides paler, finely spotted with black, tubercles large but not prominent, roundish, flattened ; *tentacles* dark slaty-grey spotted with black, *upper pair* rather close together at the base, bulbs short, rounded at the tips : *lower tentacles* diverging, very short and thick and more transparent than the upper ones ; *foot* rather slender, rounded in front, narrowing behind and ending in an obtusely pointed tail.

Shell compressed, especially below, somewhat thin, scarcely semitransparent, slightly glossy, yellowish horn-colour, with broadish, regularly placed, transverse markings of a reddish-brown colour, and with close-set curved ridges in the line of growth, except on the first whorl which is nearly smooth ; *periphery* obtusely keeled ; *epidermis* moderately thick ; *whorls*,

* Rounded.

6–7, gradually increasing ; *spire* slightly produced, apex glossy ; *suture* very deep ; *mouth* semilunar, rather oblique, in full-grown specimens furnished with a white internal rib ; *outer lip* not very thick, scarcely reflected ; *umbilicus* very large and deep.

Inhabits all parts of Great Britain, under stones and fallen timber, as well as among moss and dead leaves in woods and hedgerows. It is inactive and very timid. During the breeding season, which extends from May to September, it only lays from twenty to thirty eggs, so that it is much less prolific than most of its congeners. When crawling it carries its shell in an upright position.

Var 1. *minor.*—Shell smaller. Gwyn Jeffreys says this variety "appears to be an Alpine form. I have found it not only in Zetland, and on the Jura and Swiss Alps, but also in Guernsey." —*B.C.*, vol. i. p. 219.

Var. 2. *pyramidalis.*—Shell subconical ; *spire* more raised. Swansea and other places (J. G. J.), *B.C.* Dudley Castle (G. Sherriff Tye), *J.C.* Ayr, Bristol (McMurtrie).

Var. 3. *Turtoni*, Fleming.—Shell greatly depressed above and below, *spire* nearly flat. Dublin (Turton), Bath (Clark), Bristol, and Dunboy in Bantry Bay (J. G. J.), *B.C.* Edinburgh (McMurtrie).

Var. *alba*, Moquin-Tandon.—Shell pale-yellowish white or with a greenish tinge. This beautiful variety is rare and local, but it seems to have a wide range. The following are some of the localities given for it. Cleveden, near Bristol (Norman), near Birmingham (G. Sherriff Tye), near Wakefield (fide J. Hebden), near Croydon (R. R.), Church Stretton, and near Loch Awe (McMurtrie), Leeds (Nelson), Perthshire (Buchanan White).

Gwyn Jeffreys remarks that "this species may be the long-lost *H. gothica* of Linné."

20. H. RUPES'TRIS,* STUDER. PL. VIII.

Body somewhat oblong, of a dark slaty-grey, or dusky-red colour, with very small, flat tubercles ; *upper tentacles* dark grey, somewhat diverging, nearly cylindrical, thin ; *bulbs* large, nearly oval; *lower tentacles* almost rudimentary, blackish, considerably diverging ; *foot* broadish, rounded in front, ending in an obtusely pointed tail.

Shell subconical, somewhat compressed below, rather solid, semitransparent, not very glossy, of a darkish brown colour, with strongish, close-set, curved striæ in the line of growth ; *periphery* rounded in adult, obtusely angulated in immature specimens ; *epidermis* thinnish ; *whorls* 5, gradually increasing, their summits slightly depressed ; *spire* somewhat produced, apex polished ; *suture* very deep ; *mouth* forming three-fourths of a circle, somewhat compressed above ; *outer lip* thin, scarcely reflected ; *umbilicus* large and deep.

Inhabits crevices in rocks and walls, usually in elevated situations, in most parts of Great Britain. It is an inactive and timid creature, but very hardy, and capable of enduring alike the cold of winter and the burning rays of the sun in summer. It is gregarious and ovoviviparous. The shell, owing to its exposure to the sun, as well as to "wind and weather," is often bleached ; the animal when crawling carries it in an upright position.

Var. *viridescenti-alba.*—Shell greenish-white. Clifton near Bristol (Webster), Clevedon, Somersetshire (Norman), *B.C.*

21. H. PYGMÆ'A,† DRAPARNAUD. PL. VIII.

Body oblong, rather slender, darkish brown or slaty-grey, with small black specks, tubercles round, flattened ; *tentacles* very slightly diverging, cylindrical, thickish at the base, bulbs

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* Living among rocks. † Tiny.

scarcely perceptible; *foot* pale slaty-grey, rather slender and slightly rounded in front, thick, keeled, and obtusely pointed behind.

Shell depressed, thin, moderately glossy, semitransparent, pale brownish horn-colour, with very fine, close-set, curved striæ in the line of growth; *periphery* rounded; *epidermis* thinnish; *whorls* 4, gradually increasing; *spire* slightly produced, apex glossy; *suture* deep; *mouth* forming three-fourths of a circle; *outer lip* thin, inflected above and below; *umbilicus* rather large, deep.

Inhabits moist woods and other damp situations, among decaying leaves, under stones, and at the roots and on the stalks of grass and other plants, in many parts of the country from Ross-shire to the Channel Islands. This is the smallest of our British Helices; some conchologists have considered it to be the young of *H. rupestris*, but in addition to its being easily distinguishable from that species by its thinner shell, finer sculpture, fewer whorls, and shallower suture, its habits, as well as the localities it frequents, are different. It is a shy and irritable little creature, impatient of sunlight, and it seldom ventures forth except at "dusky eve," or during dull weather after rain.

22. H. PULCHEL'LA,* MÜLLER. PL. VIII.

Body rather short, very slightly granulated, milk-white, with a faint yellowish tint above, rather darker below; *tentacles* extremely transparent, pale yellowish-white; *upper pair* thick, nearly cylindrical, bulbs nearly round, very thick, intensely black; *lower tentacles* very short; *foot* faintly margined with white, strongly truncate in front, somewhat rounded behind; *lingual ribbon* with 60 rows of 31 teeth = 1860.

Shell depressed, slightly convex above and below, rather solid,

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* Beautiful.

transparent, glossy, milk-white, with numerous fine, irregular, curved striæ in the line of growth, which are stronger towards the umbilicus ; *periphery* rounded, somewhat obtusely keeled in immature specimens ; *epidermis* moderately thick ; *whorls* $3\frac{1}{2}$, rapidly increasing, body whorl larger than the rest of the shell ; *spire* very slightly produced ; *suture* deepish ; *mouth* nearly circular ; *outer lip* exceedingly thick, greatly reflected, considerably inflected above and below, and in full grown specimens forming a complete peristome ; *umbilicus* large and deep.

Inhabits most parts of Great Britain, in damp places, among moss, at the roots of grass, and under stones, as well as in woods on fallen branches. This species is well named, for it is one of the most exquisitely beautiful of our land shells, especially when it assumes the form of the variety *costata*. Though timid, this little snail is hardy, it has been found at an elevation of upwards of two thousand feet above the sea-level. Bouchard-Chantereaux says that during the months of August and September it lays from twelve to twenty eggs of a globular form.

Var. *costata* (*H. costata*, Müller).—Shell not so glossy, with numerous transverse, curved, membranous ribs as well as intermediate striæ.

This variety is not uncommon ; in this country I have not observed it in company with the typical form, but I found them living together under stones in damp places on the banks of the River Arques in Normandy.

23. H. LAPICI'DA,* LINNÉ. PL. VIII.

Body somewhat lanceolate, yellowish-brown above with a pinkish tint in front, greyish beneath and on the tail, tubercles close-set, unequal in size and placed in lines ; *tentacles* very long,

* A stone-cutter.

dark grey tinged with yellow, upper pair nearly united at their base, bulbs globular, short ; *lower tentacles* somewhat diverging ; *foot* slender and rounded in front, broader and keeled behind, margins whitish ; *lingual ribbon* with 150 rows of 81 teeth = 12,150.

Shell compressed, somewhat solid, scarcely semitransparent (opaque when the animal is within), of a dullish aspect, greyish or yellowish horn-colour, with rufous-brown transverse markings, finely and closely shagreened, and indistinctly striate in the line of growth ; *periphery* strongly and acutely keeled ; *epidermis* thickish ; *whorls* 5, sloping abruptly towards the periphery ; *spire* very slightly produced, apex obtuse, smooth, slightly glossy ; *suture* distinct but shallow ; *mouth* nearly oval, oblique, angulated above and below, and indented at its juncture with the keel ; *outer lip* whitish, moderately thick, considerably reflected and forming with the *inner lip*, which is of the same colour, a perfect peristome ; *umbilicus* large and deep.

Inhabits many places in England, especially in calcareous districts, on moist rocks and stone walls, as well as in woods and hedgerows. It does not appear to have been noticed in Ireland. In Scotland it has been found in some abundance on "a lichen-covered, dry, stone dyke near Hawick," by Mr. Grant Guthrie ('Scottish Naturalist,' vol. ii.). It has recently been discovered in Breconshire by Mr. V. Trump, who has kindly sent me specimens ; to him, therefore, the credit for having been the first to notice it in Wales, must be accorded. Although this species is of most frequent occurrence in calcareous districts, its range, in this country at least, is not altogether confined to them ; it has been found near Worcester (Reece), and at Linton in North Devon (Captain Bruce Hutton), near to which place I have seen it in great abundance on a stone wall in a wood overhanging "the Lynn" ; the strata in these localities are not of a calcareous nature.

This mollusc is hardy, but somewhat sluggish. Linné was under the impression that it has the power of boring into calcareous rocks, and consequently gave it the specific name of *lapicida* (lapidary). He says of it, "ut larvæ lignum sic calcem rodens" (eating into chalk as caterpillars do into wood), and though the immortal Swedish naturalist was undoubtedly in error in this respect, the name *lapicida* is, after all, by no means inappropriate, as anyone who knows what a lapidary's wheel is like will readily allow, the shell with its sharp keel bears a strong resemblance to it.

Var. 1. *albina*.—Shell white. Went Vale, Yorkshire (Hebden), Reigate (Saunders).

Var. 2. *minor*.—Shell smaller and of a darker colour.

24. H. OBVOLU'TA,* MÜLLER. PL. VIII.

Body narrow, rather truncate in front, light reddish-brown above, pale greyish-brown below, very slightly transparent, tubercles oblong, placed in thick-set lines, brown finely powdered with white; *tentacles* very long, slender, but slightly thickened at the base, dusky-brown or reddish-brown, bulbs globular; *upper tentacles* near together at the base, closely granulated; *lower pair* somewhat diverging; *foot* with a narrow milk-white border, and ending in a slender and keeled tail; *lingual ribbon* with 170 rows of 91 teeth = 15,470.

Shell subdiscoidal, compressed, rather solid, nearly opaque, of a dull aspect, rufous-brown, with fine, close-set striæ in the line of growth; *periphery* rounded; *epidermis* thick, covered with numerous strongish, rufous-brown hairs; *whorls* $6\frac{1}{2}$, very gradually increasing; *spire* depressed below the level of the body whorl, apex smooth, glossy; *suture* deepish; *mouth* bluntly triangular in consequence of two protuberances, one of which is placed slightly above, and the other below the periphery; *outer lip* pinkish-white, thick, considerably reflected; *umbilicus* large and deep.

* Wrapped up.

Inhabits woods, at the roots of trees and among moss, but it is rare in this country; the only localities in which it has hitherto been noticed are Ditcham and Stoner Hill near Buriton in Hampshire, and Up Park, Sussex. Some naturalists have thought it probable that this remarkable shell has been introduced into England from the Continent, where it is in many places abundant, but it has at least an equal claim with *H. cartusiana*, and some other species, to be ranked among our British molluscs. It was first discovered in Ditcham Wood by Dr. Lindsay in 1831. It is tolerably active, but timid, and instantly retreats within its shell when touched. Its slime is clear and copious, and its epiphragm very thick and of a white colour.

25. H. VILLO'SA,* DRAPARNAUD.

In the 'Annals and Magazine of Nat. Hist.' for February, 1877, Dr. Gwyn Jeffreys writes as follows:—"Mrs. David Robertson, of Glasgow, found four living specimens of this land shell, in August, 1873, on the moors near Cardiff, Glamorganshire, while searching for *Ostracoda* in the ditches. It is an addition to our Mollusca. *H. villosa* inhabits Germany, the east of France, and Switzerland, and it often occurs at considerable heights above the level of the sea." It is possible that specimens of this foreign shell may again be found in this country; our daily increasing intercourse with the Continent renders it probable that, before long, it will be no easy task to distinguish our

* Hairy.

indigenous Fauna and Flora with any degree of certainty from those which have been introduced.

It is rumoured moreover that, of late, several foreign molluscs have been intentionally imported into this country. Whether this proceeding is desirable or not is questionable; but it is desirable that those who choose to indulge their fancy in this way, should give due notice to the world of their doings, in order that naturalists may not be misled. It would not be necessary to publish the precise position of the colony; the name of the species and the district in which it had been placed would suffice.

GENUS V.—BU'LIMUS, SCOPOLI.*

Body elongated, capable of being entirely contained within the shell; *tentacles* 4; *foot* somewhat long and narrow.

Shell conical; *spire* produced; *mouth* oval; *umbilicus* very small.

The *Bulimi* are very closely allied to the *Helices*, and resemble them in most particulars; their tentacles are, however, rather shorter and their dentition somewhat different, the rows of teeth on the lingual ribbon being slightly curved as they approach its margin.

1. BULIMUS ACU'TUS,† MÜLLER. PL. VIII.

Body thickish, semitransparent, light yellowish-grey, slightly darker in front and beneath, tubercles thickly set and considerably flattened; *tentacles* greyish, darker above, upper pair close together at their base, bulbs moderately globular, much swollen at the base; *lower tentacles* short, diverging; *foot* subtruncate

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* A very inappropriate name, said to be a corruption of *Bulin*, an African word.

† Pointed.

in front, tuberculate, ending in a keeled and obtuse tail; *lingual ribbon* with 100 rows of 37 teeth = 3700.

Shell cylindrically conic, scarcely semitransparent, whitish or yellowish-white, with irregular transverse streaks of a pale brown colour, often with a dark brown band towards the base of the body whorl, which in some cases also encircles the upper volutions, closely but irregularly striate in the line of growth, and often wrinkled on the surface; *periphery* rounded; *epidermis* thinnish; *whorls* 8–9, convex, gradually enlarging; *spire* tapering, apex obtuse; *suture* deepish; *mouth* forming three-fourths of an oval; *outer lip* rather thin, reflected over, and almost concealing the *umbilicus*, which is narrow and not very deep.

Inhabits downs and other places near the sea-coast, especially on sandy soil, in many parts of Great Britain and Ireland. No well authenticated inland locality has been given for it. The shell varies considerably in colour and markings.

These snails are gregarious; in some localities they occur in countless myriads, and like *H. virgata*, are supposed to "drop from the clouds."

Var. 1. *bizona.*—Shell smaller, with two dark bands on the body whorl. Iona (Lowe and Berkeley), Abergelly near Conway (Gibbs), Cork (Humphreys), Tenby, Portmarnock in Dublin Bay (J. G. J.), *B.C.*

Var. 1. *inflata.*—Shell rather more ventricose, streaked with brown or marked with a single band; *spire* shorter; *whorls* proportionally broader; occurs with the typical form, but merges insensibly into it through intermediate gradations, *B.C.*

2. B. MONTA'NUS,* DRAPARNAUD. PL. VIII.

Body thickish, dark red or greyish-brown, tubercles flattish, rather wide apart, with minute black specks; *tentacles* conical, thickish, reddish-brown, diverging at their base, upper pair shagreened, bulbs nearly globular, thick; *lower tentacles* nearly

* Inhabiting mountains.

smooth, of a darker colour and rather more diverging than the others ; *foot* with a narrow, pale grey margin, truncate in front, terminating in a long and obtusely pointed tail.

Shell conic-oblong, semitransparent, somewhat glossy, varying from pale brownish horn-colour to brown of different depths of shade, with irregular striæ in the line of growth, which are intersected by fine, close-set, wavy lines, causing the surface, when viewed through a lens, to appear shagreened ; *periphery* rounded (keeled in immature specimens) ; *epidermis* thickish ; *whorls* $6\frac{1}{2}$–$7\frac{1}{2}$, rather compressed, body whorl occupying somewhat less than half the length of the shell ; *spire* tapering, apex obtuse ; *suture* rather shallow and oblique ; *mouth* forming three-fourths of an oval, pinkish or brown inside ; *outer lip* whitish, rather thick, reflected, especially over the *umbilicus*, which is narrow, but moderately deep.

Inhabits woods in some of the southern and western counties of England, on the trunks and among the fallen leaves of trees, especially those of the beech, but it is a very local species. It occurs with *H. obvoluta* in woods near Buriton in Hampshire, and has also been found near Godalming by Mr. H. W. Kidd, and near Henley-on-Thames by Mr. Rich. It is rather inactive and irritable, and secretes an abundance of watery slime. In spring this snail, like some of the Clausiliæ and a few other members of the Helicidæ, ascends trees (especially the beech) to a considerable height ; it should consequently be searched for in early spring before it has made its ascent, or in autumn when it descends to seek its winter quarters.

3. B. OBSCU'RUS,* MÜLLER. PL. VIII.

Body thickish, oblong, pale brown or reddish above, darker underneath, tubercles small, rather wide apart ; *tentacles* very slightly conical, brown, upper pair finely granulated, bulbs

* Hidden.

globular, tips dilated; *lower tentacles* nearly smooth, with fine and indistinct black specks; *foot* very slightly fringed, angulated in front, broader in the middle, and narrowing towards the tail, which is somewhat slender; *lingual ribbon* with 120 rows of 55 teeth = 6600.

Shell shaped like that of the last species, but smaller and shorter in proportion, semitransparent, rather thin, glossy, varying in colour from pale to dark brown, with fine irregular striæ, as well as with fainter intermediate ones, in the line of growth; *periphery* rounded; *whorls* $6\frac{1}{2}$, convex; *spire* tapering, apex obtuse; *suture* moderately deep; *mouth* forming three-fourths of an oval; *outer lip* white, not very thick, considerably reflected; *umbilicus* narrow and not deep.

Inhabits many parts of Great Britain, in woods, on the trunks of trees, in hedgerows among moss, as well as on rocks and among heaps of stones. The shell of this species bears a strong resemblance to that of *B. montanus*, but besides being very much smaller, it differs from it in the following respects: the surface is more glossy, and (owing to the absence of spiral striæ) not shagreened, the whorls are more convex and fewer in number, the suture is rather deeper, the inside of the mouth white, and the outer lip is not so thick.

It frequents moist and shady spots, and is inactive and irritable.

A curious provision has been devised by Nature for the protection of this harmless little creature. Its shell, especially when immature, is coated with mud, which causes the animal when reposing, as it often does upon the trunk of the beech or other trees, so closely to resemble a small knot or excrescence of the bark that it is almost secure from detection by its enemies. The coating of mud is made to adhere to

the shell by the slime of the animal, or perhaps by a viscous exudation from the epidermis.

Sometimes the disguise, instead of being formed of mud, consists of minute lichens, the spores of which have fallen upon and taken root in the epidermis of the shell.

This species owes its name *obscurus* (hidden) to these facts, but it is not the only mollusc for which this safeguard has been provided; the young of the last species, *B. montanus*, as well as those of *Pupa secale*, are often similarly encrusted with mud.

Var. *alba*.—Shell white or colourless. Sevenoaks in Kent (Smith), Lulworth, Dorset (J. G. J.), near Bristol (Miss F. M. Hele), *B.C.* Near Croydon (R. R.).

GENUS VI.—PU'PA, LAMARCK.*

Body capable of being contained within the shell; *tentacles* 4, short, lower pair shorter than the upper ones; *foot* narrow.

Shell cylindrical; *whorls* compact; *spire* more or less produced; *mouth* horseshoe-shaped or semi-oval, usually toothed, sometimes provided with spiral plaits or folds; *umbilicus* minute.

These little snails are gregarious, and live among moss and dead leaves, as well as upon rocks, beneath the bark of trees, and under stones, both in low-lying and elevated situations. They are herbivorous, and some species are ovoviviparous. *Pupa* (from *pupus*) is a Latin word which signifies a child, and also a puppet or doll. It has been applied to these shells, as well as to the chrysalis of insects, because of their fancied resemblance to an infant in swaddling clothes.

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* A doll.

A. *Spire* produced; *mouth* horseshoe-shaped, with teeth and folds; *outer lip* somewhat thickened, and more or less reflected.

1. Pupa seca'le,* Draparnaud. Pl. IX.

Body oblong, grey with a reddish or brownish tint above, slaty-grey beneath, tubercles small, irregular and slightly angular; *mantle* covered with minute black specks; *tentacles* short, thick, somewhat diverging, bulbs oblong; *foot* usually fringed, widening behind, but somewhat pointed at its extremity; *lingual ribbon* with 100 rows of 41 teeth = 4100.

Shell conical, elongated, thickish, nearly opaque, rather glossy, light brown or brown, with numerous distinct oblique striæ in the line of growth; *periphery* rounded, but somewhat compressed; *epidermis* moderately thin; *whorls* 8–9, gradually increasing; *spire* produced, apex obtuse; *suture* deepish; *mouth* horseshoe-shaped, considerably contracted by the laminar folds, of which there are usually from eight to nine, two (or sometimes three) on the base of the penultimate whorl (the outer one is situated close to the upper margin of the outer lip, and its outer edge is frequently furnished with a small denticle), two on the pillar, and four on the inside of the outer lip which are produced to some distance within the interior of the aperture, and are distinctly visible on the outside, where they appear like white lines; *outer lip* thickened, slightly reflected; *umbilicus* minute, oblique.

Inhabits many places in England, chiefly, though not exclusively, in limestone districts, on rocks, in old chalk-pits, and in woods at the roots of trees and under stones, but it is a local species. It does not appear to have been observed in Scotland, but it has been found in South Wales. The Rev. J. McMurtrie informs me that it occurs abundantly, of a large size

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* A grain of corn (rye ?).

and often of a whitish colour, in Steep Holm Island in the Bristol Channel.

The shells of this species, especially when immature, are often covered with mud or lichens, as is the case with those of *Bulimus obscurus.*

Var. 1. *alba.*—Shell white or colourless. Lulworth, Dorsetshire (J. G. J.), *B.C.* Pateley Bridge, Yorkshire (Lister Peace), *J.C.*

Var. 2. *Boileausiana.*—" It is distinguished from the type by its smaller size, the larger plication on penultimate whorl being always double, and by the presence of a prominent additional fold at the angle of the columella." Found by Mr. W. Nelson at Dorridge near Knowle, Warwickshire (fide J. W. Taylor).—*J.C.*, January, 1879.

Var. 3. *edentula.* — " Shell smaller, thinner, smooth and glossy ; striation regular and fine on the upper whorls, gradually becoming fainter and more irregular on the lower ones ; apertural plications obsolete." Found " in 1877 at the foot of the rocks near Ingleton, Yorkshire," by Mr. J. W. Taylor.—*J.C.*, January, 1879.

B. *Spire* short ; *mouth* horseshoe-shaped, with one or more teeth or folds ; *outer lip* considerably thickened, more or less reflected. Immature shells with transverse plates, and spirally twisted ridge-like folds.

2. B. RIN'GENS,* JEFFREYS. PL. IX.

" Body yellowish-grey or slate colour, with several dark lines or streaks along the sides, leaving a clear space in the middle, underneath milk-white ; *mantle* thick, projecting a little beyond the mouth of the shell ; *tentacles* short, of a lighter shade than the upper part of the body, larger pair cylindrical and stumpy, rather close together, the bulbs scarcely distinguishable, lower

* Grinning.

pair more like tubercles; *foot* rounded in front and obtusely pointed behind."—*B.C.*, vol. i. p. 244.

Shell subcylindrical, somewhat oval, rather solid, scarcely semitransparent, glossy, light brown or yellowish horn-colour, with slight but close-set transverse striæ; *periphery* rounded, but somewhat compressed; *epidermis* thin; *whorls* 6–6½, convex, body whorl occupying about one-third of the shell; *spire* short and abrupt, apex obtuse; *suture* distinct, but shallow; *mouth* horseshoe-shaped, but considerably angulated and contracted by the folds, of which there are usually two on the base of the penultimate whorl, the outer one large, spirally twisted, and extending far within the aperture; two on the pillar (the outer one much more prominent than the other), and a fold, as well as from one to three rather deeply seated denticles inside the outer lip; there is also a curved fold, which extends from the base of the lip to the inner fold on the pillar, forming with it a pointed arch; *outer lip* pale reddish-brown, considerably thickened, somewhat reflected, inflected and rounded above so as to join the outer fold on the penultimate whorl; *umbilicus* oblique, distinct, but narrow.

Inhabits moist places among moss and decayed leaves, as well as at the roots of grass and under stones, in the north of England, the north and west of Scotland, in most parts of Ireland, and in Guernsey.

This species was first discovered by Mr. Bean of Scarborough, and described in the 'Linnean Transactions' by Gwyn Jeffreys, who in his 'British Conchology' says: "This is a shy little creature, although tolerably active when inclined to make its appearance. It has a singular habit of withdrawing slowly one of its eyes, which rolls backwards like a little ball until it reaches the neck, while the tentacle which supports it remains extended to its full length. This I have observed being done when there was no

obstacle in the way. It also retracts occasionally, and apparently without any reason, one of its horns and not the other. It does not appear to be ovo-viviparous like the next species (*P. umbilicata*)."

In immature specimens the mouth has, in addition to the principal folds on the base of the penultimate whorl and pillar, transverse folds (similar to the plaits in *Planorbis lineatus*), which are placed at a short distance from one another, at a right angle to the position occupied by the folds on the outer lip of full-grown specimens, and are distinctly visible outside the shell.

Var. *pallida*.—Shell of a lighter colour, sometimes whitish.

3. P. UMBILICA'TA,* DRAPARNAUD. PL. IX.

Body elongated, strongly truncate in front, greyish-brown above, of a lighter colour underneath, head and neck speckled with black; *mantle* roundish, covered with minute black and white specks; *tentacles* greyish-brown, finely spotted with black, upper pair rather thick, very close together at their base, bulbs large, lower pair very thick, widely diverging; *foot* rather broad, rounded at both extremities.

Shell subcylindrical, somewhat thin, glossy, semitransparent, brownish or yellowish horn-colour with faint, irregular, close-set, oblique striæ in the line of growth; *periphery* rounded, occasionally with an indistinct blunt keel; *epidermis* thin; *whorls* 6–7, convex; *spire* short, apex obtuse; *suture* distinct, but rather shallow and oblique; *mouth* horseshoe-shaped, with a short, slightly curved denticle on the base of the penultimate whorl close to the upper extremity of the outer lip, the pillar is also thickened by an oblique fold; *outer lip* broad, considerably reflected and thickened, white, sometimes tinged with pink or reddish brown; *inner lip* thinly spread on the base of the penultimate whorl; *umbilicus* small, oblique.

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* Having an umbilicus.

Inhabits almost every part of the British Islands, in crevices of rocks and walls, beneath the bark of trees, and under stones and fallen leaves.

This common species is ovoviviparous, but not prolific; the young, which do not exceed five in number, are excluded during the months of July and August, and often remain for a time attached to the shell of the parent.

The shell of immature specimens is conical and bluntly keeled, and its mouth is furnished with a spiral lamina or plate on the base of the penultimate whorl and on the pillar, as well as with transverse folds similar to those in *P. ringens;* it has also a rather deep umbilicus, and is consequently so unlike the adult shell that it has frequently been mistaken for a distinct species.

Var. 1. *edentula* (toothless), denticle on the base of the penultimate whorl wanting; not uncommon.

Var. 2. *alba.*—Shell white or colourless. Plymouth and Somersetshire (Norman), Grassmere, Church Stretton, Cardiff, and Tenby (J. G. J.), *B.C.* Pateley Bridge, Yorkshire (Lister Peace), *J.C.*

C. Shell cylindrical; *spire* short; *mouth* semi-oval, with or without denticles; *outer lip* with a strong external rib.

4. P. MARGINA'TA,* DRAPARNAUD. PL. IX.

Body slender, slightly rounded in front, glossy, dark grey, tinged with brown above, paler and covered with minute black specks below, tubercles small but thick-set; *tentacles* thick, nearly black, opaque, considerably rounded at the tips, upper pair

* Margined.

rather close together, lower pair somewhat diverging; *foot* rather narrow in front, broader towards the tail, which is triangular.

Shell nearly cylindrical, somewhat solid, scarcely semitransparent, slightly glossy, light brown or yellowish horn-colour, with numerous fine, close-set, irregular striæ in the line of growth; *periphery* rounded; *epidermis* thin; *whorls* 6–7, convex but slightly compressed; *spire* short, apex obtuse; *suture* deepish; *mouth* forming about two-thirds of a roundish oval, often provided with a small denticle which is placed in or near the centre of the base of the penultimate whorl; *outer lip* rather thin, slightly reflected, and furnished outside, at a short distance from the margin, with a strong white rib; *inner lip* very thinly spread on the base of the penultimate whorl; *umbilicus* narrow.

Inhabits many parts of Great Britain, in the crevices of rocks, under stones, and among moss and dead leaves. It occurs most abundantly near the sea-coast, in sandy pastures, at the roots of grass and other plants.

Like the last species it is ovoviviparous; it breeds during the months of July and August, and the eggs are from three to seven in number.

Var. 1. *bigranata* (having two *grains* or tubercles), Rossmässler.—Shell rather smaller and thicker, and having a tubercular tooth or denticle on the inside of the outer lip, in addition to that on the base of the penultimate whorl. Bath (Clark), Lulworth, Dorsetshire (J. G. J.), Oxfordshire (Whiteaves), Weston-super-Mare (Norman), *B.C.* Lewes and Beachy Head (R. R.).

Var. 2. *albina*, Menke.—Shell white. Somersetshire (Clark, Norman, and J. G. J.), Oxfordshire (Whiteaves), *B.C.*

GENUS VII.—VERTI'GO, MÜLLER.*

Body capable of being entirely contained within the shell; tentacles 2, tips very slightly swollen.

Shell ovate, or somewhat cylindrical, or spindle-shaped, thin,

* A turning round.

glossy ; *whorls* compact, gradually increasing ; *spire* short, sometimes sinistral ; *mouth* usually provided with teeth, or folds, which are placed considerably within the aperture, and its outer lip is then contracted ; *umbilicus* minute.

These tiny snails resemble the *Pupæ* in many respects, but differ from them essentially in being destitute of the lower pair of tentacles, a fact which was first noticed by Müller, who consequently instituted the present genus.

Some species are semi-aquatic.

A. Shell oval or ovate ; *spire* dextral ; *mouth* provided with teeth.

1. VERTIGO ANTIVERTI'GO,* DRAPARNAUD. PL. IX.

Body short, thick, greyish-black, faintly tinged with slate-colour, tubercles very minute, more or less black ; *tentacles* black, rather near together at their base, bulbs oval, forming about a third of the tentacles ; *foot* oblong, narrow, margins pale grey, with minute black specks ; *sole* of a uniform slaty-grey.

Shell ovate, thin, semitransparent, glossy, of a chestnut-brown colour, with exceedingly fine close-set striæ in the line of growth, and very indistinctly striate spirally ; *periphery* rounded ; *epidermis* very thin ; *whorls* $4\frac{1}{2}$, ventricose, abruptly increasing, body whorl occupying about half of the shell ; *spire* short, apex obtuse ; *suture* deep ; *mouth* approaching to semi-oval, but the centre of the outer edge is considerably contracted, causing the aperture to appear somewhat angular, usually provided with the following teeth, which in colour resemble the rest of the shell, and are irregular in shape and size ; two or three on the base of the penultimate whorl, two of them rather strong and pointing towards the outer edge ; the third or inner one, when present, much smaller, one or two on the pillar, and

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* Not reversed.

three prominent curved ones on the inside of the outer lip; there are sometimes one or two small intermediate tubercles; the number of the teeth, however, is not constant; *outer lip* flexuous, slightly reflected, strengthened outside at a short distance from its margin by a rib; *inner lip* spread on the base of the penultimate whorl, and in full-grown specimens continuous; *umbilicus* distinct, but narrow.

Inhabits many parts of Great Britain, in marshy places under stones and timber, as well as at the roots of grass, moss, and other plants; but its habitat does not seem to be restricted to such situations, for it has been found in East Lothian at a height of 1200 feet above the sea-level.

This little mollusc is rather slow in its movements; Moquin-Tandon says it carries its shell in a nearly upright position, swaying it from side to side when crawling.

The shell is not furnished with its full complement of teeth until the animal is full grown; immature specimens have only one tooth on the base of the penultimate whorl and another on the pillar.

2. V. Moulinsia'na,* Dupuy. Pl. IX.

"Body smooth, shining; *colour* above, dark grey, with darker streaks arranged lengthwise; below of a much paler hue, and interspersed with numerous irregular microscopic black specks; *mantle* thickish, greyish-white, protruded like a short collar; *snout* hood-shaped, closely wrinkled across, in front gently rounded, or very slightly indented on each side, so as to make that part trilobular; *mouth* small, triangular, placed underneath the snout in the middle; *tentacles* club-shaped, folding inwards, diverging at a right angle, having a faint tint of

* Named after M. des Moulins, a French conchologist.

purple; there is not the least trace of a lower pair of tentacles; *eyes* roundish oval, seated on the bulbs or points of the tentacles, towards the front; *foot* thick, greyish-white, three or four times as long as broad, squarish or nearly truncated in front, and gradually narrowing behind to a blunt point; it is nearly the length of the shell; *sole* very flexible, especially at the edges; *pulmonary orifice* small."—Jeffreys, 'Annals and Magazine of Nat. Hist.' for November, 1878.

Shell tumidly oval, thin, glossy, almost transparent, pale yellowish or brownish horn-colour, indistinctly striate in the line of growth; *periphery* rounded; *epidermis* very thin; *whorls* $4\frac{1}{2}$, exceedingly ventricose, abruptly increasing, body whorl exceeding in size the rest of the shell; *spire* short, apex very obtuse; *suture* very deep; *mouth* forming about two-thirds of an oval, with a slight sinuosity towards the centre of the outer edge, with four or five teeth, one on the centre of the base of the penultimate whorl, one on the pillar, and two (the lower one of which is slightly the most prominent) on the inside of the outer lip; the fifth tooth, when present, is placed a little below the one on the pillar; *outer lip* whitish, somewhat thin, reflected, and strengthened by a moderately broad rib, which is placed at a short distance from the aperture; *inner lip* very indistinctly spread on the base of the penultimate whorl; *umbilicus* rather more distinct than in *V. antivertigo.*

Inhabits marshes, on reeds, &c. This interesting species was recently discovered for the first time in England by Mr. Groves in two localities, one in Hampshire and the other in the neighbourhood of Hitchin; and a short time since, when on an excursion in company with Dr. Gwyn Jeffreys and myself, he was again fortunate in first finding it in another locality in Hertfordshire.

Dr. Gwyn Jeffreys is now of opinion that the species which he discovered some years ago in Ireland, and described in 'British Conchology' as *V. Moulinsiana*

is *V.* (*pupa*) *Lilljeborgi* of Westerlund, and he proposes to add it to the British list under that name.

In the 'Annals and Magazine of Nat. Hist.' for Nov. 1878, he says, "The shell of *V. Moulinsiana* is rather more swollen or barrel-shaped than that of *V. Lilljeborgi*, and the labial rib is much stouter." A short time ago I paid a visit to Dr. Gwyn Jeffreys at Ware Priory, when he kindly showed me specimens of the two shells, which certainly differ from each other in the manner described; but unless Dr. Westerlund noticed in these forms other and stronger distinguishing features, I think he is scarcely justified in regarding them as distinct species.

The above description of the shell of *V. Moulinsiana* is from Hampshire specimens kindly given to me by Mr. Groves, who informs me that the number of teeth in shells from that locality is usually five, although there are sometimes one or two additional denticles.

Var. *bidentata.*—"Labial or palatal teeth wanting."

This is recorded in 'British Conchology' as a variety of the shells found in Ireland by the author of that work; it must therefore be referred to *V. Lilljeborgi*, if Dr. Westerlund is correct in regarding that form as specifically distinct from *V. Moulinsiana.*

3. V. PYGMÆ'A,* DRAPARNAUD. PL. IX.

Body of a dark slaty-grey colour, with minute, round, close-set tubercles; *tentacles* very slender, almost touching each other at the base, but widely diverging above, bulbs oblong, greyish at

* Dwarf.

the tips; by the aid of a lens, two minute black specks are discernible where the lower pair of tentacles would have been placed had they existed; *foot* truncate in front, ending in a narrow tail.

Shell oval, semitransparent, glossy, of a reddish-brown colour, with faint striæ in the line of growth, and a few still more indistinct spiral lines; *periphery* rounded; *epidermis* very thin; *whorls* $4\frac{1}{2}$–5, convex, not much swollen, body whorl occupying about half of the shell; *spire* short, apex obtuse; *suture* well defined; *mouth* obliquely semi-oval, with a sharp tooth in the centre of the base of the penultimate whorl, one on the pillar and two or three on the inside of the outer lip; *outer lip* rather thin, slightly reflected, thickened by a broadish external rib; *inner lip* somewhat thick; *umbilicus* moderately deep, but narrow.

Inhabits most parts of Great Britain, in dry and elevated situations, at the roots of grass and under stones and timber; it also occurs in marshy places. It is lively and irritable, and crawls along rather rapidly in a jerking manner, carrying its shell in a nearly upright position.

The much smaller size and narrower shape of the shell of this species will serve to distinguish it from *V. Moulinsiana* and *V. antivertigo;* it differs also from the latter in having only a single tooth on the base of the penultimate whorl.

Var. *pallida.*—Shell lighter in colour and thinner. Inhabits marshy places. Wool, Dorsetshire (Daniel), North Devon and Connemara (J. G. J.), *B.C.*

4. V. ALPES'TRIS,* ALDER. PL. IX.

"Body light straw-colour; *tentacles* and *foot* longer than in *V. pygmæa.*"—*B.C.*, v. i. p. 259.

Shell shaped like that of *V. pygmæa*, but somewhat more

* Inhabiting Alpine districts.

cylindrical, thin, nearly transparent, very glossy, light yellowish horn-colour, with numerous close-set, well-defined striæ in the line of growth; *periphery* rounded; *epidermis* thin; whorls $4\frac{1}{2}$, more swollen than in *V. pygmæa*; *suture* very deep; *mouth* semi-oval, less oblique than in the last species, with a sharp tooth on the centre of the base of the penultimate whorl, another strong and thick one on the pillar, and two fold-like teeth on the inside of the outer lip; *outer lip* somewhat thick, scarcely reflected, unprovided with a rib; *inner lip* rather thick; *umbilicus* moderately deep, but narrow.

Inhabits some of the northern counties of England, under stones, at the roots of grass, and among leaves, but it is a very local species. The following localities have been given for it: Clitheroe, Lancashire (Gilbertson), Lipwood near Haydon Bridge, Northumberland (J. Thompson), near Ambleside (Miss Sarah Bolton), and Grassmere (J. G. J.), *B.C.* It is also said to have been found at "Over Gloucester, and among moss on the canal banks at Sharpness (Mr. J. Jones)," Tate's 'Land and Freshwater Molluscs of Great Britain.'

It was described by Forbes and Hanley as a variety (*alpestris*) of *V. pygmæa*, but it differs from that species in its more cylindrical form and stronger striation, as well as in the aperture being unprovided with a rib, and there is not the slightest trace of rudimentary lower tentacles.

5. V. SUBSTRIA'TA,* JEFFREYS. PL. IX.

"Body grey of different shades; *snout* short, bilobed; *tentacles* slender, cylindrical, or club-shaped and divergent, bulbs equal to about one-fourth of their length; *foot* of a lighter colour, thick, short, narrow, and keeled at the tail."—*B.C.*, vol. i. p. 261.

* Somewhat striated.

Shell oval or subcylindrical, moderately thin, semitransparent, glossy, light yellowish horn-colour, with strongly defined slanting transverse striæ, which are less distinct on the body whorl, where they are intersected by a few very fine spiral lines; *periphery* rounded; *epidermis* moderately strong; *whorls* 4½, very much swollen; *spire* short and abrupt, apex obtuse; *suture* very deep; *mouth* forming about half of an oval, but there is a sinuation in the middle of the outer margin; teeth usually six, two on the base of the penultimate whorl, one, or sometimes two, on the pillar, and two or three inside the outer lip; *outer lip* thin, slightly reflected and strongly ribbed near the aperture; *inner lip* thickened; *umbilicus* small, contracted by a basal ridge.

Inhabits many parts of Great Britain and Ireland, in damp woods and marshy places, at the roots of grass, among dead leaves, and under stones.

The minute black specks which occupy the place of lower tentacles in *V. pygmæa* are altogether wanting in this species.

B. Shell sinistral, spindle-shaped; *mouth* provided with teeth and contracted.

6. V. PUSIL'LA,* MÜLLER. PL. IX.

Body brownish, or greyish slate-colour above, grey slightly tinted with blue below, tubercles small and round; *mantle* yellowish-brown; *tentacles* nearly cylindrical, dark grey tinged with brown, thick, especially at their base, indistinctly granulated, considerably diverging, except at their base, where they nearly touch each other, bulbs long and rounded at the tips: *foot* pale greyish-brown, broad, keeled, and slightly pointed behind.

Shell somewhat spindle-shaped, thin, semitransparent, glossy, pale yellowish horn-colour, with faint and wide-apart transverse

* Small.

striæ ; *periphery* rounded ; *epidermis* thin ; *whorls* $4\frac{1}{2}$-5, gradually increasing, considerably swollen, the last two of equal breadth ; *spire* produced and tapering, apex obtuse ; *suture* very deep ; *mouth* wide, approaching to semi-oval, or somewhat triangular, with a sinuation or contraction in the middle of its outer margin, teeth six or seven, two on the base of the penultimate whorl, of which the inner one is the most prominent, two or three on the pillar, and two inside the outer lip ; or if, as is sometimes the case, there are three, the third or lowest tooth is much smaller than the others ; *outer lip* thickish, slightly reflected, and furnished inside as well as outside with a strong, yellowish-white coloured rib ; *inner lip* slightly thickened ; *umbilicus* small, and contracted by a somewhat acute basal rib.

Inhabits woods, among moss and dead leaves, and under stones, in many parts of England, as well as in the north and west of Ireland, but it has not hitherto been noticed in Scotland, and it is a very local species. It is a timid and inactive little creature, and when crawling carries its shell in an upright position. This and the next (*V. angustior*) may be distinguished from all the other species of *Vertigo* by the sinistral or reversed form of the shell.

7. V. ANGUS'TIOR,* JEFFREYS. PL. IX.

" Body short and stumpy, blackish in front, and greyish on the sides and underneath ; tubercles indistinct ; *mantle* yellowish-grey ; *tentacles* thick, somewhat cylindrical, dusky-grey, considerably diverging from each other, bulbs scarcely distinct ; *foot* thick and narrow, pale grey."—*B.C.*, vol. i. p. 265.

Shell narrower than *V. pusilla*, somewhat spindle-shaped, semitransparent, glossy, pale horn-colour, with strong, oblique, close-set transverse striæ ; *periphery* compressed, slightly angular ; *epidermis* thin ; *whorls* $4\frac{1}{4}$, somewhat convex, a little

* Narrower.

compressed, gradually increasing; *spire* somewhat produced, apex obtuse; *suture* deep; *mouth* narrow, horseshoe-shaped, with strong contractions in the middle and near the base of the outer edge; teeth usually four to five, two on the base of the penultimate whorl, one on the pillar, which is thick and fold-like, and winds far within the shell, and a thick blunt tooth (as well as sometimes a smaller one) on the inside of the outer lip; *outer lip* very slightly inflected, remarkably thick, and provided internally and externally, at a short distance from its margin, with a strong yellowish-white rib; *inner lip* very thinly spread on the base of the penultimate whorl; *umbilicus* minute, contracted by a basal ridge.

Inhabits marshy places at the roots of grass. In this country, the following are the only localities in which it has as yet been found. Singleton near Swansea, and the rejectamenta of the Avon River at Bristol (J. G. J.), Tenby (Webster), Battersea Fields (Stephens), Co. Clare (Humphreys), Milford, Yorkshire (Blackhouse), Connemara, Co. Galway (Warren), *B.C.* Bundoran, Co. Donegal, and among moss and *Jungermannia* at Ballina, Co. Mayo (Miss Amy Warren).

The shell of this species is smaller and narrower than that of *V. pusilla*, its striation is stronger and closer, and the mouth is narrower and provided with fewer teeth. It is an inactive little creature, and when crawling carries its shell perpendicularly.

C. Shell dextral, cylindrical; *mouth* destitute of teeth.

8. V. EDEN'TULA,* DRAPARNAUD. PL. IX.

Body darkish ash-colour above, paler on the sides as well as underneath and behind; tubercles very minute, blackish or greyish; *mantle* pale grey with a tinge of red; *tentacles* blackish-

* Toothless.

grey, thick, bulbs oval, very obtuse, occupying nearly half of the tentacles ; *foot* oblong, narrow, of a uniform pale ash-colour, tail slightly pointed.

Shell dextral, somewhat cylindrical, thin, semitransparent, glossy, pale brown or horn-colour, with numerous delicate, slanting and slightly curved transverse striæ ; *periphery* rounded (sharply keeled in immature specimens) ; *epidermis* thin ; *whorls* 5–6½, rounded, gradually increasing ; *spire* conical, apex obtuse ; *suture* deep ; *mouth* toothless, forming two-thirds of a circle ; *outer lip* thin, scarcely reflected, except over the umbilicus ; *umbilicus* narrow, but deepish.

Inhabits woods, under stones, among moss and decaying leaves, at the roots of grass, and on the fronds of ferns, in many parts of Great Britain, as well as in Ireland and Guernsey, but it is local.

Moquin-Tandon says that it is timid and draws in its tentacles upon the slightest touch, that when crawling it slightly uplifts its shell, carrying it in an oblique position, and that its slime is watery.

Var. *columella*.—Shell rather longer, body whorl slightly broader than the one above it. Inhabits moister places than the type. Finnoe, Co. Tipperary (Waller), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.*

9. V. MINUTIS'SIMA,* HARTMANN. PL. IX.

Body grey tinged with slate-colour, spotted with black, finely shagreened ; *mantle* greyish-brown ; *tentacles* slaty-grey spotted with black, moderately transparent, widely diverging, separated by a narrow groove, very much swollen at their base, which is broadly margined with black, bulbs very slightly globular ; *foot* pale slaty-grey, tail triangular and bluntly pointed.

Shell cylindrical, narrower, more solid, and much smaller than *V. edentula*, semitransparent, glossy, horn-colour more or less tinged with yellowish-brown, strongly, closely, and obliquely

* Exceedingly small.

striate in the line of growth; *periphery* rounded but somewhat compressed; *epidermis* thin; *whorls* $5\frac{1}{2}$, moderately rounded, the last three of nearly equal breadth; *spire* produced, apex very abrupt and obtuse; *suture* deep; *mouth* like that of the last species, but with an inward curvature or sinuosity towards the centre of the outer lip, toothless; *outer lip* white, reflected; *umbilicus* narrow, oblique.

Inhabits hill sides, under stones. The following are the only localities in Great Britain where it has hitherto been noticed, but it probably occurs in many other places, and has been overlooked in consequence of its extreme minuteness. Skye (Macaskill), Balmarino, Fifeshire (Chalmers), Arthur's Seat, Edinburgh (E. Forbes), Sunderland, South Hylton on the Wear, and Pontefract on magnesian limestone (Howse), Went Vale, Yorkshire (Ashford), Durdham Downs near Bristol, and Lulworth in Dorsetshire (J. G. J.), Undercliff, Isle of Wight (More), *B.C.*

This tiny mollusc is sluggish and irritable, and when on the move carries its shell in a perpendicular position. It secretes an abundance of slime.

Gwyn Jeffreys says that foreign specimens are often provided with a tooth on the base of the penultimate whorl, and another inside the outer lip; he found one in Switzerland which had three teeth "arranged triangularly."

GENUS VIII.—BA'LIA (BALEA), PRIDEAUX.*

Body capable of being entirely contained within the shell; *tentacles* 4; *foot* broadish.

Shell sinistral, elongated, thin; *spire* produced; *mouth* ovate, or somewhat quadrate, occasionally provided with a denticle on the base of the penultimate whorl; *umbilicus* narrow.

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* Striped.

In the British Isles this genus is represented by a single species only.

Gwyn Jeffreys considers that the word *Balia* is derived from *balius* (a corruption of the Latin word *badius* (brown), "and not, as Bourguignat supposed, from βαλιος (*maculosus*, spotted), as the shell is not spotted"; but it seems unnecessary thus to strain the derivation, because the signification of the Greek word is not restricted to *spotted;* βαλιος also means *striped,* or streaked, which terms are quite as applicable to the shell as "bay-coloured."

Balia perver'sa,* Linné. Pl. IX.

Body lanceolate, dark brown tinged with grey; tubercles black, very minute and rather wide apart; *tentacles* short, slaty-grey, upper pair finely granulated and almost united at their base, bulbs somewhat oval; *lower tentacles* slightly diverging, much smaller, lighter in colour and more transparent than the others; *foot* broad, slightly rounded in front and ending in a slightly keeled tail; *lingual ribbon* with 130 rows of 41 teeth = 5330.

Shell club-shaped, thin, semitransparent, glossy, yellowish horn-colour streaked with white, with numerous close-set, irregular striæ in the line of growth; *periphery* faintly angulated; *epidermis* moderately thin; *whorls* 7–8, gradually increasing in size, convex but very slightly compressed; *spire* produced, apex obtuse and (as is also the whorl below it) devoid of striation, and highly polished; *suture* deep; *mouth* forming about three-fourths of an oval, with occasionally (in adult specimens) a small tooth-like protuberance, which is situated near the middle of the base of the penultimate whorl; *outer lip* thin, whitish, slightly reflected; *umbilicus* consisting of a narrow chink.

Inhabits many parts of Great Britain and Ireland, on the trunks and under the bark of trees, especially

* Turned the wrong way.

those upon which moss and lichens grow, such as the apple, crab, and thorn ; also in the crevices of rocks. The shells of this species might easily be mistaken for immature or half-grown specimens of *Clausilia rugosa*, were it not that the periphery of *Balia* is rounded, and has scarcely any trace of angularity, while that of the young of *C. rugosa* is sharply angulated.

These little snails are gregarious. During the day-time, especially in dry weather, they conceal themselves under the bark of trees or in the fissures of rocks, and sally forth in the evening, or after a shower of rain. When unable to find them in any other way, I have frequently succeeded in obtaining specimens by examining the rotten branches of trees which after a gale are strewn upon the ground. According to Bouchard-Chantereaux, their eggs, which are large in proportion to the size of the animal, are laid in early autumn, and vary in number from fifteen to twenty. The young are hatched about fifteen days afterwards, and attain maturity at the end of the first year. Mr. Rich says that this species is viviparous.

Var. *viridula.*—Shell greenish-white, transparent. Near Cork (Humphreys), *B.C.*

GENUS IX.—CLAUSILIA, DRAPARNAUD.*

Body slender, elongated, capable of being entirely contained within the shell ; *tentacles* 4, upper pair long, lower pair very short ; *foot* long, slender.

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* So named because of the *clausium*, or apparatus by which the aperture of the shell is closed.

Shell sinistral, fusiform, or clavate ; *mouth* pear-shaped, or oval, deeply grooved above, furnished with plaits or folds as well as teeth, there is also within the throat or cavity, and distant about half a whorl from the aperture, a spiral shelly plate (*clausium*) which is attached by an elastic stalk to the pillar and closes the aperture of the shell when the animal retires within it ; *outer lip* continuous, body whorl furnished at its base with a ridge or *basal crest; umbilicus* very small.

The *Clausiliæ* are closely allied to the *Bulimi* and *Pupæ*. They are vegetable feeders, and it is probable that all the British species are viviparous, Mr. Rich having noticed that this is the case with three of them, viz. *C. rugosa*, *C. Rolphii*, and *C. biplicata*.

The *clausium* with which these animals are provided as a protection against the inroads of their enemies forms the most remarkable characteristic of the genus. Dr. Gray, in 'The Zoological Journal,' vol. i. p. 212, thus aptly describes it: "Of all the wonderful contrivances employed by Nature for the protection of the mollusca, there is none which is more calculated to excite the admiration of the conchologist than the *clausium*—an elastic appendage which closes the aperture of the Clausiliæ. It consists of a spirally-twisted, thin, shelly plate, enclosed in the last whorl of the shell, and attached to the columella by an elastic pedicle. When the animal is retracted within its shell, this shelly plate nearly covers the aperture at a little distance within the mouth, and coming in contact with a transverse plait on the outer lip, leaves only a small canal, formed between the outer plait and the posterior angle of the mouth, and sometimes an elongated longitudinal plait on the inner lip. When the animal wishes to protrude itself it pushes

the plate on one side into a groove situated between the inner plait and the columella, where it is detained by the pressure of the body of the animal, leaving the aperture free ; and when the animal withdraws itself the plate springs forward by the elasticity of its pedicle, and closes the aperture. This curious structure, and also the plaits of the mouth, which are intimately connected with it, are not formed until the animal has nearly reached maturity. It is best exhibited by breaking off the outer part of the aperture to the distance of about half a whorl, when it will generally be found free ; but in order to exhibit it behind the columella in its natural position, when the animal is exserted, it is necessary to kill the animal in that situation (by drowning it), and then suffer it to dry before the outer lip is broken off, and the pedicle will thus become fastened to the side by means of the dried mucus (of the body). It may, however, at any time be relaxed by a little moisture, when it will instantly resume its elasticity, and spring from its attachment."

It is probable that some of the Clausiliæ are thread-spinners. Mr. John Dixon, of the Leeds Infirmary, is said to have seen "several individuals of *C. rugosa* var. *dubia* suspended."—*J.C.*, November, 1878.

A. Margin of *clausium* entire.

1. Clausilia rugo'sa,* Draparnaud. Pl. IX.

Body dark brown, or greyish-brown above, of a lighter colour underneath, irregularly tuberculate ; *tentacles* short, thick (especially at their base), of a dirty brown with a tinge of slate-colour,

* Wrinkled.

upper pair very close together, slightly shagreened, bulbs thick; lower pair diverging considerably at their base, of a darker colour than the others; *foot* greyish-brown, paler towards the margin, ending in a swollen but pointed tail; *lingual ribbon* with 90 rows of 41 teeth = 3690. "Viviparous" (Rich).

Shell spindle-shaped, moderately thick and glossy, scarcely semitransparent, chocolate-brown, or horn-colour varying in intensity, marked transversely with irregular streaks of a whitish colour, with numerous close-set, strongish striæ in the line of growth, which when viewed through a lens are seen to be intersected in places by faint spiral lines; *periphery* angulated; *epidermis* moderately thin; *whorls* 10–13, gradually increasing, compressed, body whorl rather narrower than the two above it; *spire* tapering, apex obtusely rounded and (as is also the whorl below it) smooth and glossy; *suture* somewhat oblique, moderately well defined, and bordered with a narrow white line; *mouth* pear-shaped, considerably contracted above, slightly compressed on the outer side and dilated below, furnished with laminæ or plaits, which are arranged in the following manner: two oblique folds on the base of the penultimate whorl, the upper one prominent, the other less so and situated further within the aperture, sometimes there are from one to three smaller plaits between them; a semi-lunar fold placed at some distance within the shell upon the pillar, and another slender and indistinct spiral one near to it, but situated further within the aperture; sometimes there are also one or two denticles inside the outer lip; *outer lip* white, thick, detached, and reflected; *basal crest* sharp, angular; *umbilicus* very narrow; *clausium* "oval-oblong, regularly curved, slightly dilated above," *B.C.*

Inhabits all parts of the British Isles commonly, under stones, on walls and rocks, and on the bark of trees. The shell of this species varies considerably in size, colour, and thickness, as well as in the strength of the striation, which in some cases is partially obliterated, owing probably to the manner in which the animal when crawling drags its shell after it. I have noticed that the surface of those shells (of this

species) which occur on walls or rocks is much more frequently smooth than that of specimens found on trees, and consequently I infer that the partial absence of striæ is due to the friction created when the animal trails its shell along the hard surface of the stones. In the 'Scottish Naturalist' for July, 1872, Dr. Grant Guthrie states that this species occurs on Ben Lawers, in Perthshire, at an elevation of 2400 feet.

Var. 1. *albida.*—Shell greenish-white, with a few white transverse lines. Dinton Hall, Bucks (Goodall), *B.C.* Near Gislingham, Suffolk (Blatch), Pateley Bridge, Yorkshire (Lister Peace), near Birmingham (G. Sherriff Tye), *J.C.* Near Loch Awe (McMurtrie), Colchester (R. R.).

Var. 2. *Everetti*, Miller.—Shell smaller. Bristol (Miller), Whalsey Skerries, Zetland, Giant's Causeway and Co. Tyrone (J. G. J.), *B.C.* Near Birmingham (G. Sherriff Tye), *J.C.* Perth (Grant Guthrie).

Var. 3. *gracilior.*—Shell longer and more slender. Battersea Marshes (J. G. J.), *B.C.*

Var. 4. *tumidula.*—Shell smaller, shorter and more ventricose. Brockley Combe near Bristol, and Connemara (J. G. J.), *B.C.* Perth (Grant Guthrie).

Var. 5. *dubia*, Drap.—Shell larger and more ventricose. Northumberland and Durham (Alder), Oxfordshire (Whiteaves), Ingleborough, Yorkshire (Dixon), *B.C.*

Var. 6. *Schlechtii*, Zelebor.—Shell "generally larger, more elongated, smoother, and more transparent than var. *dubia*, of a pale brown, frequently resembling in external appearance *Clausilia laminata* both in smoothness and transparency," *J.C.*, No. III., p. 36. This variety was discovered in 1874 by Mr. W. D. Sutton in the counties of Northumberland and Durham.

Monst. *dextrorsa.*—Shell resembling a *Pupa* in shape, *spire* dextral. Sevenoaks, Kent (Smith), *B.C.*

2. C. Rolph'ii,* Gray. Pl. IX.

Body of a very dark reddish-brown above, lighter brown underneath, tubercles more or less black, placed in close-set lines; *mantle* yellowish-white, spotted with white; *tentacles* nearly opaque, greyish-brown, upper pair rather short and thick, slightly shagreened, and covered with exceedingly minute black specks, bulbs thick; lower tentacles very short, lighter in colour than the upper pair; *foot* very long and narrow, sole greyish. Viviparous (Rich).

Shell spindle-shaped, rather thin, almost semitransparent, glossy, brown, or yellowish-brown, with numerous strong, regular, close-set curved striæ in the line of growth, which are less numerous, slightly flexuous, wider apart and stronger towards the base of the shell; *periphery* angulated; *epidermis* moderately thick; *whorls* 9–10, ventricose but slightly compressed; *spire* tapering abruptly, apex obtuse and (as are the two whorls beneath it) quite smooth and glossy; *suture* rather shallow and somewhat oblique; *mouth* slightly quadrangular, contracted above, sinuous on the outer side, and considerably dilated below; *plaits* similar to those of the last species, but the lower one on the base of the penultimate whorl is less prominent and frequently cruciate; *outer lip* detached, thick, whitish, reflected; *basal crest* curved; *umbilicus* indistinct; *clausium* oblong.

Inhabits moist places in woods, under stones, among moss, dead leaves, nettles, and dog's mercury, and on the bark of trees in a few localities in England, but it is a rare species. It has been observed in the following counties:—Kent, Sussex, Hampshire, and Gloucestershire, and Mr. W. G. Blatch has found it near Newton Abbot in South Devon.

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* Named after Mr. Rolph, who was the first to notice it in England.

3. C. BIPLICA'TA,* MONTAGU. PL. IX.

Body reddish-grey, blackish above, lighter underneath, rather strongly tuberculate; *tentacles* very slightly transparent, of a dirty reddish colour, upper pair subcylindrical, shagreened, diverging, bulbs slightly swollen, lower pair considerably diverging, bulbs indistinct; *foot* long, somewhat slender, sole of a uniform ashy-grey with minute milk-white specks. Viviparous (Rich).

Shell somewhat spindle-shaped, slender, moderately thin, scarcely semitransparent, rather glossy, brown with a reddish or yellowish tinge, with strong, close-set, slightly curved striæ in the line of growth, some of which are streaked with white; *periphery* bluntly angulated; *epidermis* thickish; *whorls* 12–13, compressed; *spire* tapering, apex obtuse and (as are also the two whorls below it) smooth and glossy; *suture* rather shallow, somewhat oblique; *mouth* pear-shaped, contracted and channelled below, folds similar to those of the preceding species, except that the small teeth or ridges between the folds on the base of the penultimate whorl are usually absent; *outer lip* white, moderately thick, broad, detached; *basal crest* prominent, nearly straight; *clausium* oval, slightly curved.

The following are the only localities in which this species has as yet been observed in this country:—Easton Grey, Wilts (Montagu), Clarendon, near Salisbury (Bridgeman), and near Hammersmith. It is to be found at the roots and on the bark of willow trees, and among moss on banks. The shell is much longer and less ventricose than that of *C. Rolphii*, from which it also differs in being streaked with white, and in having its aperture channelled at the base.

Var. *Nelsoni.*—"Shell rather more slender than the usual form, almost totally devoid of striation, and translucent, the axis

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* With two folds.

being visible through the shell; the last whorls tinged with a very pale reddish-brown passing into whitish in the upper whorls," *J.C.*, May, 1877. This variety was found near Hammersmith by Mr. J. W. Taylor.

B. Margin of *clausium* notched near its base.

4. C. LAMINATA,* MONTAGU. PL. IX.

Body reddish-black or greyish-brown above, dirty grey beneath, tubercles rather large, prominent and close-set; *tentacles* rather short and thick, diverging at their base, reddish-brown, upper pair very slightly conical, and indistinctly tuberculated, bulbs somewhat swollen, lower tentacles rather more conical and of a darker colour than the upper pair; *foot* dark greyish-brown, slightly rounded in front, gradually narrowing towards the tail; *lingual ribbon* with 120 rows of 51 teeth = 6120.

Shell somewhat spindle-shaped, thin, almost transparent, glossy, of a yellowish-brown colour with sometimes a slightly reddish tint, nearly smooth, but marked in the line of growth with fine close-set striæ, which are stronger towards the suture and base of the shell and only visible under a lens; *periphery* rounded; *epidermis* thin; *whorls* 12, somewhat compressed, gradually increasing; *spire* tapering, apex obtuse; *suture* shallow, somewhat oblique; *mouth* roundish-oval, less angular above than in the foregoing species, and with much stronger folds on the base of the penultimate whorl, as well as three or four labial plaits, which in consequence of the transparency of the shell are distinctly visible from the outside; there are no ridges or denticles between the two folds on the base of the penultimate whorl; *outer lip* white, thick; *basal crest* slight; *umbilicus* minute; *clausium* deeply notched on its margin near the base.

Inhabits woods, among dead leaves, on fallen branches, and on the bark of trees, especially the beech, in many parts of England, as well as in Wales

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* Having plaits or folds.

and Ireland, but it is local. In Scotland it has been found sparingly near Perth by Dr. Buchanan White.

These snails, as well as the two preceding species, do not usually leave their hiding-places till sunset, when they ascend trees to feed during the night, returning at daybreak to the ground in quest of shelter; but after rain, or in very dull weather, *C. laminata* may frequently be seen in the daytime on the trunks of beech and other trees.

The eggs of this species, which are very large, and from ten to twelve in number, are laid in August and September. The young attain maturity at the end of the second year.

Var. 1. *pellucida.*—Shell thinner, more transparent, and very glossy. Penrice, Glamorganshire (J. G. J.), *B.C.*

Var. 2. *albida.*—Shell greenish-white. Box Wood, near Bath (Clark), Darnwood, Kent (Stephens), Clevedon, Somersetshire, and Watlington, Oxfordshire (Norman), Surrey (Choules), Newmarket (Wright), *B.C.* Cooper's Hill, near Cheltenham (E. Simpson), *J.C.*

C. PARVULA, STUDER.

The author of 'British Conchology' (vol. i. pp. 280-1) makes the following remarks respecting this species: "*C. parvula* differs from the present species (*C. rugosa*) in being smaller and quite smooth, with the exception of some very faint transverse lines, which are only observable with a lens, or of a few striæ near the mouth. It inhabits the north of France, as well as every other part of the Continent, and may be expected also to be found in Great Britain."

This prediction seems to have been fulfilled, for in the Supplement to the same work (vol. v. p. 161)

Mr. Grant Allen is said to have found several specimens at Kinver, near Stourbridge. In all likelihood they were accidentally or intentionally imported from the Continent.

C. SOLIDA, DRAPARNAUD.

A single specimen of this Continental species was found at Stapleton, near Bristol, by Mr. Rich, who informs me that there are extensive nursery gardens in the locality; the probability, therefore, is that the shell had been brought from France, or elsewhere, in the roots of plants or among the moss in which they were packed.

GENUS X.—COCHLI'COPA, FÉRUSSAC.*

Body glutinous, somewhat elongated, capable of being entirely contained within the shell; *tentacles* 4, upper pair long, nearly cylindrical, lower pair short, conical; *foot* rather long, slender.

Shell sub-cylindrical, nearly smooth, very glossy, more or less transparent; *epidermis* thin; *whorls* rapidly increasing; *spire* produced; *mouth* pear-shaped, with or without teeth and folds, base more or less notched; *outer lip* not reflected, strengthened by an internal rib, occasionally channelled above; *umbilicus* wanting.

There are only two British species.

A. *Mouth* provided with teeth; *outer lip* sinuous; *inner lip* thick.

1. COCHLICOPA TRI'DENS,† PULTENEY. PL. IX.

Body slender, coarsely wrinkled, slaty-grey with a yellowish tinge and closely speckled with black above, of a paler tint below; *mantle* thickish; *tentacles* rather transparent, upper

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* Notched shell. † Three-toothed.

pair very slender, covered with minute black specks, bulbs occupying about one-fifth of their length; lower pair rounded at the tips, more transparent than the others and not spotted; *foot* rather longer than the shell, slaty-grey with a white margin, rounded in front and ending in a finely pointed tail.

Shell spindle-shaped, almost transparent, very glossy, pale yellowish-brown, with very faint transverse wrinkles and still finer and less distinct spiral striæ, the former being almost, and the latter quite, invisible to the naked eye; *periphery* rounded (acutely keeled in immature specimens); *epidermis* very thin; *whorls* 7, rapidly increasing, somewhat swollen, the penultimate and body whorls much broader than the others; *spire* produced, apex obtuse, rounded; *suture* shallow, fringed with a narrow bead-like band; *mouth* obliquely pear-shaped, curved at the upper angle and at the base, furnished near the centre of the base of the penultimate whorl with a prominent twisted fold, which extends some distance within the shell and sometimes has its crest notched (close beside it, nearer the outer lip, there is often a small denticle), with another strong, tortuous fold on the pillar, and a triangular denticle near the centre of the inside edge of the outer lip; there are sometimes two or three additional denticles between the teeth or folds; *outer lip* sinuous, strengthened by a slight rib which is frequently tinged with flesh-colour; *inner lip* also sinuous and provided with a rib which is continued along the base of the penultimate whorl till it nearly touches the outer lip.

Inhabits damp woods, among moss and dead leaves, in many parts of England, but it is a rare species. It has been found at Llandudno in North Wales by Mr. R. R. Thomas; in Scotland near "the Bridge of Allan (Foulis), Dumfriesshire (Somerville)," 'Scottish Naturalist,' 1872, and Captain Laskey is said to have found it near Leith.

It is gregarious, from six to ten individuals being usually found associated together. According to Moquin-Tandon, it is a sluggish creature, and when crawling carries its shell in a horizontal position.

The number of the folds and teeth with which the mouth of the shell of *C. tridens* (as well as of some species of other genera) is furnished is not constant.

Var. *crystallina*, Dupuy.—Shell greenish-white, transparent, and glassy. Wheeley Castle, Worcestershire (Clark), near Stanstead, Kent (Smith), Tawstock Woods, near Barnstaple, and Brockley Combe, Somersetshire (J. G. J.), *B.C.* Petersfield, Hants (C. Ashford), near Birmingham (G. Sherriff Tye), near Wakefield (Jackson) *fide* G. Taylor, *J.C.*

Monst. *sinistrorsa*.—Shell reversed. A specimen found by Mr. J. Emmet, of Boston Spa, *J.C.*, July, 1879.

In the 'Journal of Conchology' for July, 1879, there is a note on *C. tridens* by Mr. William Taylor, who proposes to add to the British list two varieties of that species, viz. *C. Noulitiana* (Dupuy) and *C. Alzensis* (St. Simon), of which he gives the following descriptions :—

"Var. *Noulitiana*.—Shell rather larger and thinner, a single denticle only on the outer lip."

Mr. Taylor considers this to be "our common English form."

Var. *Alzensis*.—"Outer lip bearing two deeply-seated denticles in addition to those described in the typical form; found at Dorridge, &c., Warwickshire."

The inconstancy of the number of folds or teeth in the aperture of nearly every species in the genera *Pupa*, *Vertigo*, and *Clausilia* is remarkable; and if the presence or absence of a tooth or two in *C. tridens* is held to be a sufficient reason for making varieties, the same will hold good in their case also; but the needless multiplication of varieties, as well as species, ought, I think, to be avoided.

B. *Mouth* without teeth or plaits; *outer lip* entire, *inner lip* thin.

2. C. LU'BRICA,* MÜLLER. PL. IX.

Body nearly opaque, blackish or dark slaty-grey above, of a paler shade beneath, tubercles small; *mantle* grey tinged with brown, covered with small milk-white specks; *tentacles* dark slaty-grey, not very transparent, broad at their base, upper pair slender, granulated, bulbs globular, swollen; lower pair short, somewhat thick; *foot* rather angular in front, ending behind in a pointed and somewhat flattish tail; *lingual ribbon* with 80 rows of 41 teeth = 3280.

Shell sub-cylindrical, slightly turreted, transparent, very glossy, pale brownish or yellowish horn-colour, surface apparently destitute of striation, but a strong magnifying power reveals faint curved striæ in the line of growth, which are stronger towards the suture, as well as very indistinct but close-set spiral lines; *periphery* rounded (slightly angulated in immature specimens); *epidermis* very thin; *whorls* 5 to $5\frac{1}{2}$, convex, gradually increasing, body whorl usually occupying about half of the shell; *spire* produced, apex rounded; *suture* moderately deep, with a wrinkled band, which is narrower and less distinct than in *C. tridens; mouth* forming about two-thirds of a narrowish oval; *outer lip* thick, with a strong internal rib which is usually more or less tinged with a reddish colour; base of the *pillar* with an indistinct blunt protuberance; *inner lip* a mere film spread on the base of the penultimate whorl.

Inhabits all parts of the British Isles, among damp moss, decayed leaves, at the roots of grass, and under logs of wood, and stones. This species, though inactive, is very hardy, braving the cold temperature of highly elevated situations. It is capable of remaining submerged for a considerable time with impunity; a

* Slippery, smooth.

specimen which Müller placed in cold water seemed to be but little, if at all, inconvenienced, and did not leave its bath till after the expiration of three hours.

Var. 1. *hyalina.*—Shell greenish-white. Tawstock, near Barnstaple (J. G. J.), *B.C.* Oban (McMurtrie); Llandudno, North Wales (W. D. Roebuck); near Loch Rannoch, Perthshire (Ponsonby).

Var. 2. *lubricoides*, Fér.—Shell smaller and more slender. Bath (Clark); Church Stretton, Salop; Clifton-Hampden, near Oxford; Rawleigh, near Barnstaple; Minlough Castle, Co. Galway; Dunboy, Co. Cork (J. G. J.), *B.C.* Wakefield (J. Hebden), near Birmingham (G. Sherriff Tye), *J.C.*

Var. 3. *viridula.*—Shell shaped like the last variety, but greenish-white. Dunboy (J. G. J.), *B.C.*

Var. 4. *fusca.*—Shell smaller, thinner, reddish brown. Guernsey (Lukis), *B.C.*

Var. 5. *ovata.*—Shell much smaller and oval; *spire* shorter. Cardiff (J. G. J.), *B.C.* Near Birmingham (G. Sherriff Tye), near Wakefield (J. Hebden), *J.C.* Near Ayr (McMurtrie).

GENUS XI.—ACHA'TINA, LAMARCK.*

Body slender, capable of being contained within the shell; *tentacles* 4, with small bulbs, lower pair very short; *foot* slender.

Shell cylindrical, thin, glossy, smooth; *whorls* rapidly enlarging; *spire* produced; *mouth* with a notch at its base; *outer lip* thin, not reflected; *umbilicus* wanting.

Though this genus contains nearly 400 known species, one only occurs in this country.

ACHATINA ACIC'ULA,† MÜLLER. PL. IX.

Body slender, transparent, white, nearly colourless below, with very fine granulations; *mantle* thickish, with a slight longitudinal ridge; *upper tentacles* cylindrical, faintly granulated,

* Agate. † A small needle.

eyeless, lower pair consisting of minute and nearly invisible bulbs; *foot* compressed, ending in a pointed tail.

Shell cylindrical, tapering, thin, transparent, very glossy, white, with exceedingly faint, close-set spiral striæ, which are only visible under a microscope, to the naked eye the surface appears quite smooth; *periphery* rounded; *epidermis* excessively thin; *whorls* $5\frac{1}{2}$ to 6, compressed, rapidly enlarging, body whorl occupying about half of the length of the shell; *spire* with an obtuse and rounded apex; *suture* somewhat deep, oblique; *mouth* somewhat pear-shaped, acutely angulated above, deeply notched at the base; *outer lip* thin, flexuous, except towards the pillar, where it is thick and curved; *inner lip* a mere film spread on the base of the penultimate whorl; *umbilicus* wanting.

Inhabits many parts of Great Britain and Ireland, at the roots of grass and trees, and in gravel pits. This remarkable mollusc is destitute of eyes. It lives underground, usually at a depth of several inches; occasionally, however, it ascends to the surface. In Yorkshire it has been found in ancient Saxon coffins. In consequence of its subterranean habits, this little mollusc is not easily found in a living state; its food is supposed to consist of animal matter.

SECTION II.

FAMILY IV.—CARYCHIIDÆ.

Body spiral, capable of being entirely contained within the shell; *mantle* covering the front part; *snout* produced; *eyes* seated at the hinder base of the upper tentacles, which are contractile; *lower tentacles* rudimentary; *foot* oblong.

Shell spiral, elongated; *mouth* oval or somewhat ear-shaped, provided with teeth; *umbilicus* very small.

The *Carychiidæ* resemble the *Limnæidæ* in having contractile tentacles, as well as in the position of

their eyes, and their reproductive organs are similar to those of the latter family, each individual being both male and female.

GENUS.—CARY'CHIUM, MÜLLER.*

Body and shell as above.

CARYCHIUM MIN'IMUM,† MÜLLER. PL. IX.

Body strongly bilobed in front, rounded behind, transparent, white with a faint yellowish tinge; *snout* produced to the same length as the tentacles; *tentacles* closely approaching each other at the base, thick, conical, tips slightly rounded but not swollen; *eyes* somewhat prominent, jet black; *foot* powdered with minute black specks, rounded in front, ending in a thick and obtusely pointed tail; *lingual ribbon* with 7 rows of 25 teeth = 175.

Shell somewhat spindle-shaped, not very thin, transparent, glossy, of a whitish colour, with numerous fine, close-set curved striæ in the line of growth, and a few faint spiral striæ which are only visible under a strong lens; *periphery* rounded; *epidermis* moderately thick; *whorls* 5–5½ convex, body whorl occupying about one-half of the shell; *spire* with a somewhat acute apex; *suture* deep; *mouth* somewhat ear-shaped, with a narrow channel below, with two fold-like teeth, one on the centre of the penultimate whorl and one on the pillar, as well as a sharper denticle on the inside of the outer lip; *outer lip* much thickened and reflected, inflected above; *inner lip* continuous with the other and somewhat thick; *umbilicus* oblique, consisting of a mere chink.

Inhabits most parts of Great Britain and Ireland abundantly, in woods and damp situations, under

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* Of, or belonging to a herald; so named from its resemblance to the shell of *Buccinum*, or whelk, which in ancient times was used as a trumpet by heralds. † Smallest.

stones and fallen branches, as well as among moss and dead leaves.

This tiny but very beautiful mollusc is timid and inactive; when crawling its shell is carried horizontally. Its slime is abundant and watery. It delights in moist situations, and Moquin-Tandon says that it can remain submerged for a considerable time without injury.

In winter it may frequently be found in the hollow stems of aquatic and other plants.

SECTION III.

FAMILY V.—CYCLOSTOMATIDÆ.

Body spiral, capable of being entirely contained within the shell; *mantle* covering the front part, its margin separate from the neck, at the back of which the pulmonary cavity is situated; *snout* long; *tentacles* 2, contractile; *eyes* situated at the outer base of the tentacles; *foot* elongated.

Shell spiral, conical or cylindrical; *mouth* round or oval; *operculum* testaceous, or horny, paucispiral; *lingual ribbon* narrow, with large teeth, three on each side of the central one. The sexes are distinct.

In Great Britain this family is represented by two genera, each containing a single species only.

GENUS I.—CYCLOS'TOMA, DRAPARNAUD.*

Body oblong; *tentacles* cylindrical, tips slightly tumid; *foot* rather broad.

Shell conical, usually solid; *whorls* rapidly enlarging; *mouth* circular; *operculum* testaceous, strong, spire nearly central.

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* Circular mouth.

CYCLOSTOMA E'LEGANS,* MÜLLER. PL. IX.

Body very thick, obtuse, strongly bilobed in front, rounded behind, of a very dark greyish-brown above, lighter beneath, strongly wrinkled in front, and covered with fine tubercles behind; *mantle* smooth, with milk-white specks on the upper part; snout long, produced beyond the body, strongly bilobed, wrinkled; *tentacles* nearly black, with coarse transverse wrinkles, almost opaque, considerably diverging, bulbs nearly semi-circular, paler, and more transparent than the tentacles; *eyes* placed on slight prominences at the posterior base of the tentacles; *foot* nearly black, its sole divided into two equal parts by a longitudinal groove; *tail* rounded and nearly hidden by the operculum when the animal is crawling.

Shell conical, somewhat solid, slightly glossy, nearly opaque above, body whorl more pellucid, greyish or yellowish-brown, sometimes with a brick-red tinge, usually more or less streaked or blotched with irregular markings of purplish-brown, occasionally of a uniform grey or yellowish colour, with numerous strong, close-set spiral ridges, the intervening spaces or furrows intersected by finer and still more numerous ribs, the surface being consequently reticulated; *periphery* rounded; *epidermis* very thin; *whorls* 4½, rapidly enlarging, very tumid; *spire* produced, apex obtuse and (as is also the whorl beneath it) smooth, glossy, and of a purplish colour; *suture* very deep; *mouth* circular, but slightly angulated above; *outer* and *inner lips* continuous, thickish, scarcely reflected; *umbilicus* narrow, not deep; *operculum* testaceous, with strong, close-set, curved striæ, flat except at the *nucleus* which is depressed, smooth, rather darker in colour, and glossy.

Inhabits many places in England as far north as Yorkshire, among loose stones, under moss, and at the roots of ferns and other plants on shelving banks and in hedgerows, especially near the sea-coast and on calcareous soils. It also occurs in Wales, Ireland,

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* Elegant.

and Alderney, and it has been found in districts where there is no chalk.

This mollusc is inactive and very timid, retreating within its shell upon the slightest touch. It is a vegetable feeder. In winter, and often during very dry weather in summer, it buries itself in the ground, removing the earth with its strong snout, which it also uses as a hold-fast by which to draw itself upwards when climbing. Its mode of progression is very curious; the sides of its cloven foot are alternately moved forwards, each in its turn retaining its hold while the other advances.

GENUS II.—ACME, HARTMANN.*

Body elongated; *tentacles* slender, without bulbs; *foot* short, narrow.

Shell cylindrical, elongated; *mouth* oval; *operculum* horny.

ACME LINEA'TA,† DRAPARNAUD. PL. IX.

Body milk-white, with minute brown specks; *snout* narrow, indistinctly wrinkled transversely; *tentacles* diverging, tapering, faintly wrinkled, transparent, whitish, with a row of black specks round the base; *foot* rounded in front, ending in a slender tail.

Shell cylindrical, tapering, thin, semitransparent, glossy, yellowish-brown, sometimes dark brown, with strongish curved transverse striæ which are placed somewhat wide apart, and sometimes with a few very faint spiral lines, which are only visible by the aid of a lens; *periphery* rounded; *epidermis* moderately thick; *whorls* 6–7, somewhat compressed, very gradually enlarging; *spire* bluntly rounded at the apex; *suture* well defined, but shallow; *mouth* somewhat pyriform; *outer lip*

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* A point. † Marked with lines.

thin, flexuous, reflected over the umbilicus; *inner lip* thinly spread on the base of the penultimate whorl; *umbilicus* small, nearly hidden by the reflexion of the outer lip; *operculum* flat, with very slight irregular striæ.

Inhabits damp places in woods, among moss, lichens, and dead leaves, and in decayed timber, as well as under stones in dry ditches and drains, from the south-west of Scotland to Land's End, and in Wales and Ireland, but it is by no means common.

This little mollusc is rather active; when crawling it carries its shell in an almost perpendicular position, twisting it round and occasionally allowing it to drop down suddenly. It secretes an abundance of watery slime.

In some specimens the shell is nearly devoid of striation.

Var. *alba.*—Shell white or colourless, and transparent. Rejectamenta of the River Avon at Bristol; Ballinahinch, Co. Galway (J. G. J.); Killarney (Barlee), *B.C.*

Monst. *sinistrorsa*, spire reversed. A single specimen among the refuse of the Avon at Bristol (J. G. J.), *B.C.*

GLOSSARY

or Explanation and Pronunciation of some of the Terms used in Conchology, as well as of the Latin names of the Species and Varieties of the Land and Freshwater Shells of the British Isles.

NOTE.—I have been unable to obtain information respecting a few words, such as *Ryckholtii*, *Corvus*, &c.; they are for the most part derived from names of persons and places, and as they are all applied to *varieties* and not to *species*, a knowledge of their precise meaning is unimportant.*

A.

A, or AB, when they occur at the beginning of a word usually imply motion *from* something, as *a*vert, to turn *from*, *ab*rupt; broken off (or *from*); see AD.

ABERRANT, ab-errant, wandering or deviating from; applied to individuals of a species which differ from the type, or usual form.

ABNORMAL, ab-normal; deviating from the rule; irregular.

ABRADE, ab-rade, to rub off, to wear away.

ABRASION, ab-rayzhun, a wearing away, or rubbing off.

ACEPHALOUS, ass-effa-luss, headless, applied to animals which have no distinct head.

ACHATINA, ak-ate-in-ah, agate.

ACICULA, ah-sikyoul-ah, a small needle, or pin. A hair-pin used by Roman women.

ACME, ak-me, a point.

ACULEATA, ak-you-le-ate-ah, prickly, pointed.

ACULEATED, ak-you-le-ate-ed, furnished with prickles or spines; ending in a fine point.

ACUMINATA, ak-you-min-ate-ah, pointed.

ACUMINATE, ak-you-min-ate.

ACUMINATED, ak-you-min-ated, ending gradually in a sharp point.

ACUTE, ak-yewt, having a sharp edge, or point.

ACUTUS, ak-yewt-uss; ACUTA, ak-yewt-ah, acute, sharp, pointed.

AD, or AC, when they occur at the beginning of a word usually imply motion *towards* something, as *ad*duce, literally to lead to, hence to advance or bring forward by way of proof; see ADDUCTOR; or sometimes *increase* or *addition*, as *ac*cumulate, to heap together.

ADDUCTOR, ad-dukt-or, that which draws together; applied to the muscles which draw together and close the two pieces (valves) of a bivalve shell.

AGRESTIS, ag-resstiss, living in fields.

ALBIDA, albid-ah, white.

ALBINA, al-bine-ah, white.

ALBINISM, albin-izm, a changing from a darker colour to a white or pale variety.

* *Ah* at the end of a word is pronounced as the *a* in *apart*, the *h* is silent.

ALBO-FASCIATA, albo-fayshy-ate-ah, banded with white.
ALBUS, al-buss, white.
ALLIARIUS, alley-airy-uss, garlicky, smelling of garlic.
ALPESTRIS, al-pess-triss, inhabiting high land.
AMNICUM, amnykum, living in rivers. The *i* is pronounced like the *y* in shortly.
AMORPHOUS, am-or-fuss, having no regular form.
AMPULLACEOUS, am-pul-lay-shuss, in the form of a flask.
ANAL, ane-al, pertaining to the vent.
ANATINA, anna-ti-nah, belonging to ducks.
ANCYLUS, ansil-us, hooked.
ANDROGYNOUS, an-drodge-in-uss, combining both sexes in the same individual.
ANGUSTIOR, ang-gussty-or, narrower.
ANODONTA, anno-don-tah, toothless.
ANTERIOR, an-teery-or, the front; in *bivalve* shells the side opposite to that on which the *ligament* is placed; in *spiral univalves* that part of the shell which is furthest removed from the apex.
ANTIVERTIGO, anty-ver-ti-go, not reversed, or turned the wrong way.
APERTURE, appert-your, an opening, the mouth of univalve shells.
APICAL, ape-ik-al, belonging to the apex.
APEX, a-pex, the tip or *nucleus* which is the first formed portion of the shell.
AQUATIC, ak-watt-ik, pertaining to or inhabiting water.
ARBORUM, arbor-um, living in trees.
ARBUSTORUM, ar-bus-tore-um, living in copses.
ARION, ar-i-on, the name of an ancient musician.
ARTICULATED, ar-tik-you-late-ed, jointed.
ASPERSA, asp-er-sah, besprinkled (as with water).
ATER, ate-er, black.
ATRO-PURPUREA, a-tro pur-pewry-ah, dark purple.
ATTENUATED, at-ten-you-ate-ed, of a slender form; gradually tapering; disproportionately slender in part.
AURICULARIA, awe-rik-you-lairy-ah, ear-shaped.
AXIS, aks-iss, in Conchology, the pillar or column around which the whorls or volutions of a spiral shell are twisted.

B.

BALIA, baily-ah, striped (or bay-coloured?).
BASAL, bay-sal, belonging to the base.
BASE, the lower termination of any part.
BIDENTATA, bi-den-tate-ah, with two teeth.
BIGRANATA, bi-grane-ate-ah, literally, having two grains; with two denticles, or small teeth.
BILOBED, by-lobe'd, having two lobes or divisions.
BIPLICATA, by-plik-ate-ah, having two folds.
BISEXUAL, by-seks-you-al, partaking of the nature of both sexes.
BIVALVE, by-valve, a shell with two valves or pieces.
BIZONA, bi-zone-ah, with two bands or belts.
BOSS, a projecting knob.
BRACKISH, brak-ish, moderately salt.
BRANCHIÆ, branky-ee, the respiratory or breathing organs; the gills.
BRANCHIAL, branky-al, belonging to the branchiæ or gills.
BROCHONIANA, brok-o-ne-ane-ah. See note, p. 189.

BULIMUS, bewly-muss; said to be derived from *Bulin*, an African word.

BURNETTI, Bur-nett-i, named after Mr. Burnett.

BYSSUS, biss-uss, a bundle of silky, shining, thread-like filaments by which some molluscs attach themselves to stones or other substances.

BYTHINIA, bith-inny-ah, living in deep water.

C.

CADUCOUS, kad-yewk-uss, falling off, as the shedding of hair or bristles.

CALCAREOUS, kal-kare-e-us, of the nature of lime.

CANTIANA, Kan-she-ane-ah, Kentish, inhabiting Kent.

CANCELLATED, kansel-ate-ed, cross-barred, like lattice-work.

CAPERATA, kapper-ate-ah, wrinkled.

CAPULOIDES, cap-you-loi-dees, resembling a handle or haft.

CARDINAL, kar-din-al, belonging to the hinge; *cardinal teeth* are those placed near the *umbones*.

CARINATED, karry-nate-ed, keeled.

CARINATUS, karry-nate-uss; CARINATA, karry-nate-ah, keeled.

CARNIVOROUS, kar-nivvor-us, flesh-eating; feeding upon animal matter.

CARTUSIANA, kar-toozy-ane-ah, Carthusian; the shell to which this name is applied was first found near a Carthusian monastery.

CARYCHIIDÆ, kar-iky-id-ee, a family of land mollusks.

CARYCHIUM, kar-iky-um, of or belonging to a herald. See p. 184.

CELLARIUS, sell-airy-uss, living in cellars.

CINEREA, sin-er-ea, of the colour of ashes.

CINEREOUS, se-neery-us, resembling ashes; ash-coloured.

CLASS, a primary (first) division of the animal kingdom.

CLAUSILIA, claw-silly-ah, having a small *clausium* or appendage which closes the mouth of the shell.

CLAVATE, clay-vate, club-shaped.

CLAVIFORM, clavy-form, in the form of a club.

COCHLICOPA, kok-liko-pah, shell having a notch or nick.

COLUMELLA, koll-you-mella, a small pillar or column.

COMPACTA, kom-pak-tah, compact.

COMPLANATUS, kom-pla-nate-uss; COMPLANATA, kom-pla-nate-ah, flattened.

COMPRESSA, kom-pressah, compressed.

COMPRESSED, pressed together, flattened.

CONCAVE, kon-kave, hollow.

CONCENTRIC, kon-sent-rik, having or surrounding the same centre.

CONCHIFERA, konk-ifferah, shell-bearing; having a shell; the class which comprises the *bivalve* shells.

CONCHOLOGY, kon-kollo-je, literally, a discourse or treatise upon shells; but as the shell is only a portion of the mollusc, Conchology treats also of the soft parts of the animal for which the shell forms a protection or covering.

CONCINNA, kon-sinnah, neat, elegant.

CONGENER, konjin-er, one of the same stock or kind

CONICA, konny-kah, conical.

CONOIDEA, kon-oidy-ah, resembling a cone, conical.

CONSTRICT, konstrikt, to contract, to narrow.

CONTECTA, con-tek-tah, covered.

CONTINUOUS, kon-tin-you-us, joined together, uninterrupted by a space or gap.

CONTORTED, kon-tort-ed, twisted.
CONTORTUS, con-tort-uss, twisted.
CONTRACTILE, kon-trak-til, having the power of shortening or drawing itself into smaller dimensions.
CONVEX, kon-veks, rising into a circular form, the opposite of *concave*, or hollow.
CORNEUS, korny-uss, CORNEA, korny-ah, CORNEUM, korny-um, } horny.
CORVUS. See note p. 189.
COSTATA, koss-tate-ah, ribbed.
CRISTATA, kriss-tate-ah, crested.
CRYSTALLINE, kristal-line, like crystal, clear, transparent.
CRYSTALLINUS, kriss-tally-nuss, resembling crystal.
CURTA, kurt-ah, short.
CURVIROSTRIS, kurvy-ross-triss, with curved beaks.
CYCLOSTOMA, sy - klosstom - ah, round-mouth.
CYCLOSTOMATIDÆ, sy-klosstom-at-id-ee, a family of molluscs.
CYGNEA, signy-ah, belonging to swans.
CYLINDRICAL, sill-indrik-al, in the form of a cylinder.

D.

DECIDUOUS, de-sid-you-us, falling off; applied to parts of an animal which are not permanent, but fall off during its lifetime, as in some species of shells the hairs or bristles, in others the apex, or some of the upper whorls.
DECOLLATA, de-koll-ate-ah, beheaded.
DECOLLATED, de-koll-ate-ed, taken off from the neck, beheaded.
DECORTICATED, de-korty-kate-ed, peeled, stripped of the bark, applied to shells when the *epidermis* is rubbed off.
DENTICLE, denty - kl, a small tooth.
DENUDED, de-new-ded, stripped, made naked.
DEPRESSA, de-press-ah, pressed downwards.
DEPRESSED, de-press'd, pressed down.
DEPRESSIUSCULA, de-pressy-ussk-youl-lah, slightly depressed.
DEXTRAL, deks-tral, on the right hand; a spiral shell is dextral when the mouth or aperture faces the observer's right hand, the shell being held with the apex upwards.
DEXTRORSA, deks-tror-sah, turned to the right.
DIAMETER, di-ammy-tur, a line which passing through the centre of a circle, or other curvilinear figure, divides it into two equal parts.
DIFFUSED, dif-fews'd, dispersed, scattered, widely spread.
DILATATUS, di-lay-tate-us, enlarged, expanded.
DILATE, de-late, to widen, to spread out.
DILLWYNII, Dill-winny-i, named after Mr. Dillwyn.
DISC (*Lat.* discus), a round flat plate; in ancient times a quoit made of stone, metal, or wood, either with or without a hole in the middle; it differed from the quoit of the present day in being flat on both sides.
DISCIFORMIS, dissy-form-iss, disc-shaped.
DISCOID, diss-koid, resembling a disc.
DIVERGE, de-vurj, to extend in different directions from the same point.
DORSAL, dor-sal, belonging to the back.
DRAPARNALDI, drap - ar - nal - di, named after Draparnaud, a celebrated French conchologist.
DREISSENA, Dry-see-nah, named after M. Dreissens.

DREISSENIDÆ, Dry-seen-id-ee, a family of bivalve molluscs.
DUBIA, dewby-ah, doubtful.

E.

EDENTULA, e-dentewl-ah, toothless.
ELEGANS, elly-gans, elegant.
ELONGATA, e-long-gate-ah, lengthened.
ELONGATED, e - long - gate - ed, lengthened, drawn out.
EMBRYO, em-bre-o, the offspring or young in the first stages of its growth before it is born.
ENTIRE, en-tire, not interrupted, not notched or fringed ; plain.
EPIDERMIS, eppy-dermiss, the outer or scarf-skin ; in shells, the horny outer covering.
EPIPHRAGM, eppy-fram, the plate or film with which some molluscs close the aperture of their shell ; it is secreted by the mantle.
EQUILATERAL, eekwe-latter-al, having the sides of equal breadth.
EQUIVALVE, eekwe-valve, having the valves of equal length.
ERICETORUM, er-ice-et-ore-um, inhabiting heaths.
ERODE, e-rode, to gnaw, to eat away.
EROSION, e-ro-zhun, an eating away.
EVERETTI, Ever-ett-i. See note, p. 189.
EXALBIDA, eks-albid-ah, whitish.
EXCAVATUS, eks-kah-vate-uss ; EXCAVATA, eks-kah-vate-ah, hollowed out.
EXCLUDE, eks-klude, to hatch, to give birth to.
EXCORIATED, eks-ko-re-ate-ed, worn away, rubbed off, as the skin or the epidermis.
EXCRETORY, eks-kree-turry, having the power of ejecting or getting rid of useless digested matter.
EXOTIC, eks-ottik, foreign.

F.

FAUNA, fawn-ah, a term applied to animals, as *Flora* is to plants. The Fauna and Flora of a country are the animals and plants which inhabit it.
FECUNDATION, fe-kun-day-shun, the act of making prolific or fruitful.
FERRUGINOUS, fer-roojin-us, of the nature of iron ; of the colour of iron-rust.
FILAMENT, filla-ment, a slender thread.
FILIFORM, filly-form, like a thread.
FISSURE, fish-ure, a cleft.
FLAVESCENS, flay-vess-ens, yellowish.
FLAVUS, flave-uss, yellow.
FLEXIBLE, fleks-ibble, capable of being bent.
FLEXILE, fleks-il, easily bent.
FLEXUOUS, fleks-you-us, bending, winding in a curved direction.
FLUVIATILE, flewvy-at-ile, living in rivers.
FLUVIATILIS, floovy-ate-il-iss, living in rivers.
FOLIACEUS, fo-le-a-shus, leaf-like ; of the thickness of a leaf.
FONTINALE, fontin-ale-e, living in fountains.
FRAGILIS, fradge-il-iss, frail.
FULVUS, ful-vuss, tawny, yellow.
FUSCA, fuss-kah, dark brown.
FUSCOUS, fuss-kuss, of a dark brown colour.
FUSIFORM, fewsy-form, spindle-shaped, swelling in the middle and tapering more or less towards each end.

G.

GAGATES, gay-gay-tees, jet.
GAPING, gape-ing, yawning, opening the mouth ; when the margins of bivalve shells do not meet they are said to be *gaping*.

GASTEROPODOUS, gaster-oppo-dus, belonging to the *Gasteropoda*, a class of molluscs whose foot is attached to the belly or lower part of the body.

GELATINOUS, je-lattin-us, resembling jelly; sticky.

GENERIC, je-nerrik, belonging to a genus.

GENUS, jee-nuss, a race; a term applied to a group of species which resemble each other more or less closely.

GEOMALACUS, jee-o-malla-kuss, earth-mollusc.

GIBBOSA, gibb-o-sah, hump-backed; swollen.

GIBBOUS, gib-bus, convex, prominent, projecting.

GIGAXII. See note, p. 189.

GILL, the organ of breathing in fishes, and some molluscs.

GLABER, gla-ber; GLABRA, glabrah, smooth.

GLUTINOSA, glue-tin-o-sah, slimy, glutinous.

GRACILIOR, grah-silly-or, more elegant.

GRANULE, gran-youle, a grain, a small particle.

GRANULAR, gran-youl-ur, consisting of grains.

GRANULATED, gran-you-late-ed, covered with small grains.

GREGARIOUS, gre-gāry-us, flocking together, living in common. The *a* is long, as in care.

H.

HABITAT, habby-tat, natural abode, dwelling-place.

HALIOTIDEA, hally-o-tide-eah, resembling Haliotis, the ear-shell.

HALIOTOID, hally-o-toid, ear-shaped.

HELICIDÆ, hel-iss-id-ee, a family of land molluscs.

HELIX, he-liks, a coil.

HELMII, Helmy-i. See note, p. 189.

HENSLOWANA, Henslow-ane-ah, named after Professor Henslow.

HERBIVOROUS, her-bivvo-rus, eating herbs.

HERMAPHRODITE, her-maffro-dite, an animal which is both male and female.

HINGE, in bivalve shells, the part where the valves are joined together by the *ligament*, and teeth.

HISPID, hiss-pid, rough, shaggy, hairy.

HISPIDA, hisspid-ah, bristly.

HORTENSIS, hor-ten-siss, living in gardens.

HYALINE, hyal-in, glassy, transparent.

HYBRIDA, hybrid-ah, hybrid, the offspring of two distinct species.

HYPNORUM, hip-no-rum, living among Hypnum, a genus of mosses.

I.

IMMATURE, immat-your, imperfect, not full grown.

IMPREGNATED, im-preg-nate-ed, made prolific, or fruitful.

INCONSPICUOUS, in-con-spik-you-us, not to be seen; scarcely visible.

INCRASSATA, in-crass-ate-ah, thick, solid.

INCURVED, in-kurve'd, bent inwards.

INDENTATION, in-dent-a-shun, an impression, or hollow, like that formed by the bite of a tooth.

INDIGENOUS, in-did-jin-us, native, not foreign.

INEQUILATERAL, in-eke-we-latter-al, having the sides of unequal breadth.

INFLATA, in-flate-ah, blown out, inflated, swollen.

INFLECTED, in-flekt-ed, bent inwards.

INOPERCULAR, in-op-erkyoul-ar, or INOPERCULATE, in-op-erkyoul-ate, without an operculum.

INSTABILIS, in-staybil-iss, unsteady, inconstant.

INTERMEDIA, inter-meedy-ah, intermediate, lying between two extremes.

INTERSECTED, inter-sekt-ed, divided, cut across; lines which cross each other are said to *intersect* one another.

INVERTEBRATE, in-verty-brate, having no backbone.

INVOLUTA, in-vo-lute-ah, enfolded.

INVOLUTE, invo-lute; INVOLUTED, invo-lute-ed, rolled inwards.

IRIDESCENT, irry-dess-ent, coloured like a rainbow.

L.

LABIOSA, lay-be-o-sah, having a large lip.

LACUSTRIS, lak-uss-triss; LACUSTRE, lak-uss-tre, living in lakes.

LÆVIS, lee-viss, smooth.

LAMELLATA, lammel-ate-ah, furnished with small plates.

LAMELLATED, lammel-ate-ed, provided with plate-like layers. (Lat. lamella, a small leaf, or a plate of metal.)

LAMELLIBRANCHIATE, lam-elly-branky-ate, belonging to the Lamellibranchiata, an Order of bivalve molluscs which have *leaf-like* gills.

LAMINATA, lammy-nate-ah, having plates or folds.

LAMINÆ, lammy-nee, thin plates or layers.

LAMINATED, lammin-ate-ed, having plates or layers.

LANCEOLATE, lance-o-late, like the head of a lance.

LAPICIDA, lappy-side-ah, a stone-cutter, a lapidary.

LARVA, larve-ah, the grub or caterpillar of insects; plural, larvæ, lar-vee.

LATERAL, latter-al, belonging to the side; in bivalve shells the *lateral* (or side) *teeth* are those which are placed at a greater or less distance from the umbones, towards the sides.

LATIOR, layshy-or, broader.

LEACHII, Leachy-i, named after Dr. Leach.

LIGAMENT, ligga-ment, the horny and elastic ridge by which the two parts of bivalve shells are united; it is placed behind the umbones, and is either external or internal.

LIMAX, li-max, slug.

LIMACIDÆ, li-mace-id-ee, a family of land molluscs.

LIMNÆA, lim-nee-ah, living in marshes.

LIMNÆIDÆ, lim-nee-id-ee, a family of univalve molluscs.

LINEAR, linn-e-ar, like a line, consisting of lines.

LINEATUS, li-ne-ate-us; LINEATA, li-ne-ate-ah, marked with lines.

LINES OF GROWTH, the lines (*striæ*) formed by the edges of the successive layers of shelly matter deposited by the animal from time to time as it constructs its shell.

LINGUAL RIBBON, ling-gwal ribbon, the tongue-like organ with which the mouth of Gasteropodous molluscs is provided; it is armed with teeth, which vary in number, shape, and arrangement in the different genera and species, and serves for the attrition or mastication of food.

LIPS. When a univalve shell is held with the apex upwards and the mouth facing the observer, that portion of the margin on the right side, which takes its rise on the penultimate whorl, and is continued downwards and round till it reaches the base of the axis or pillar of the shell, is called the *outer lip*; the *inner lip* (or *columellar lip*), when present, is con-

tinued from the other along the base of the penultimate whorl.

LOBE, a division ; a distinct part.

LONGITUDINAL, lonjy-tewdin-al, measured by the length ; running in the longest direction.

LUBRICATE, lewbry-kate, to make smooth or slippery.

LUBRICOIDES, loobry-koi-dees, of a smooth appearance.

LUBRICUS, loobry-kuss ; LUBRICA, loobry-kah ; LUBRICUM, loobry-kum, smooth, slippery.

LUNULE, lune-yule, in bivalve shells, a depression situated near to and in front of, as well as sometimes behind, the umbones.

LUSTROUS, luss-truss, bright, shining.

LUTEA, looty-ah, yellowish.

M.

MACULATED, mak-you-late-ed, spotted.

MACULOSUS, mak-you-lo-suss, spotted.

MAJOR, ma-jor, larger.

MALACOLOGY, mal-ak-ollo-je, the science which treats of molluscous animals.

MARGARITACEA, margar-i-taysy-ah, pearly.

MARGARITACEOUS, margar-i-tay-shuss, pearly ; resembling a pearl.

MARGARITIFER, margar-ity-fur, pearl-bearer.

MARGINAL, marjin-al, on, or near to, the margin or edge.

MARGINATUS, marjin-ate-uss ; MARGINATA, marjin-ate-ah, bordered.

MARITIMA, mar-itty-mah, maritime ; inhabiting sea-coasts.

MATURE, perfect, full-grown.

MAUGEI, Mawjy-i. See note, p. 189.

MAXIMUS, maksim-uss, largest.

MEMBRANACEOUS, mem-bran-a-shuss, formed of fine membranes, or fibres interwoven.

MICROSCOPIC, mykro-skop-ik, so small as to be visible only by the aid of a microscope, or powerful magnifier.

MICROSTOMA, mi - krosstom - ah, having a small mouth.

MINIMUS, minny-muss, MINIMA, minny-mah, MINIMUM, minny-mum, } smallest.

MINOR, mi-nor, smaller.

MINUTISSIMA, min-you-tissy-mah, smallest, most minute.

MOLLUSC, moll-usk, a soft-bodied animal.

MONTANUS, mon-tay-nus, inhabiting mountains.

MORTONI, Mor-tow-ni. See note, p. 189.

MOULINSIANA, mool-insy-ane-ah, named after M. des Moulins, a French conchologist.

MUCUS, mew-kuss, a slimy fluid which in the case of molluscs is *secreted* (or separated from other fluids) by the mantle.

MUCRONATA, mew - cro - nate - ah, pointed.

MUSCULAR IMPRESSIONS or SCARS, pit-like marks or impressions in bivalve shells, which are caused by the attachment of the muscles of the animal. See Introduction.

N.

NACREOUS, naykree-us, like mother-of-pearl.

NANA, nay-nah, a dwarf.

NATATION, na-ta-shun, the act of swimming.

NAUTILEUS, nau-tilly-uss, resembling a nautilus, a tropical marine shell.

NELSONI, Nelson's.

NEMORALIS, nemmo-ray-lis, living in groves.

NERITIDÆ, ner-rit-id-ee, a family of univalve molluscs.

NERITINA, nerry-ti-nah, diminutive of Nerita, a genus of marine shells.

NITENS, ni-tens, shining, glossy.
NITIDULUS, nit-iddyoul-luss, somewhat shining.
NITIDUS, nitty-duss, NITIDA, nitty-dah, NITIDUM, nitty-dum, } shining.
NOCTURNAL, nok-turnal, belonging to night; performed during the night.
NOMENCLATURE, no-men-klayt-your, the act of naming; a list or catalogue.
NORMAL, nor-mal, according to rule; having the usual form or structure.
NUCLEUS, newkly-us, literally a kernel; a central point around which matter is collected; the tip or first formed portion of a shell.

O.

OBLIQUE, ob-leek, not straight, slanting.
OBLONG, ob-long, longer than broad.
OBLONGA, ob-long-gah, oblong.
OBLONG-OVATE; between oblong and ovate.
OBSCURUS, ob-skew-russ, obscure, hidden.
OBSOLETE, obso-leet, somewhat indistinct, not well defined, as *obsolete striæ*, or lines.
OBTUSALIS, ob-tew-sale-iss; OBTUSALE, ob-tew-sale-ee, obtuse, blunt.
OBTUSE, ob-tewss, blunt.
OBVOLUTA, ob-vo-loot-ah, wrapped up.
OCHRACEA, o-kraysy-ah, ochreous, yellow.
OCHRACEOUS, o-krayshuss, of the colour of ochre, brownish-yellow.
OPALESCENT, o-pal-essent, like the opal, reflecting different colours.
OPAQUE, o-pake, not transparent.
OPERCULATED, op-erkyou-late-ed, having an operculum, or lid.
OPERCULUM, op-erkyou-lum, the lid either shelly or horny which closes the mouth of some univalves; it is attached to the foot of the animal.
ORDER, a secondary division of the animal kingdom. See Class.
ORGAN, a natural instrument of action—the lungs are the organs of breathing, the ears are the organs of hearing, the nerves the organs of feeling, &c.
ORGANIC, or-gannik, having organs, as animals and plants; rocks, metals, &c., are *inorganic* bodies, that is, they have no organs.
ORGANISM, or-gan-izzm, of organic structure.
ORIFICE, orry-fiss, an opening, a perforation.
ORNATA, or-nate-ah, adorned, ornamented.
OVAL, o-vul, egg-shaped, but having the ends of equal breadth, or nearly so. See OVATE.
OVALIS, o-vay-liss, OVALE, o-vay-le, } oval.
OVATA, o-vate-ah, egg-shaped.
OVATE, o-vate, shaped like an egg, with the lower end broadest.
OVIPAROUS, o-vippah-rus, producing eggs.
OVOVIVIPAROUS, o-vo-vi-vippah-rus, a term which means that the eggs are hatched and the young retained for a time within the body of the parent before they are born.

P.

PALATAL, pal-a-tal, belonging to the palate.
PALLIAL, pally-al, belonging to the mantle.
PALLIAL IMPRESSION, the mark or groove in bivalve shells, caused by the muscular attachment of the mantle.
PALLIDA, pally-dah, pale.
PALUDINA, pal-you-dine-ah, living in marshes.

PALUDINIDÆ, pal-you-dynid-ee, a family of freshwater molluscs.

PALUSTRIS, pal-uss-triss, living in boggy places.

PARASITE, parrah-site, an animal or plant which attaches itself to another.

PARASITIC, parrah-sittik, existing on or inhabiting some other body.

PAUCISPIRAL, paw-se-spiral, having only a few whorls; with a short spire.

PECTINATED, pektin-ate-ed, toothed like a comb.

PECTINIBRANCHIATA, pek-tinny-branky-ate-ah, an Order of molluscs, so named because their gills are pectinated, or comb-like.

PEDICLE, ped-ikkle, a short foot-stalk.

PELLUCIDA, pel-lewsid-ah, transparent.

PENULTIMATE, pe - nulty - mate, almost the last; the last but one.

PEREGRA, perry-grah, a traveller.

PERIPHERY, per-iffery, the circumference or outer line of a circle; in spiral shells the centre or widest part of the last, or body-whorl.

PERISTOME, perry-stome, the margin of the mouth or aperture of univalve shells.

PERVERSA, per-verse-ah, turned or twisted the wrong way.

PHYSA, fy-sah, a bladder.

PICTA, pik-tah, painted.

PICTORUM, pik-tow-rum, belonging to painters.

PISANA, pi-sane-ah, belonging to Pisa, a town in Italy.

PISIDIOIDES, Pi-siddy-oi-dees, resembling Pisidium.

PISIDIUM, Pi - siddy - um, pea-shaped.

PLANORBIS, plan-orbiss, a flat coil.

PLICATE, pli-kate, } folded.
PLICATED, pli-kate-ed, }

POMATIA, po-maysheah, having an operculum.

POLYMORPHA, polly-mor-fah, many-shaped.

POSTERIOR, pos - teery - or, the hinder part; in bivalve shells the side opposite to that on which the ligament is placed.

PROCESS, pross-ess, progressive change, as process of time, fermentation, decomposition, &c. The word is also applied to any part (of an animal, or other body) for which there is no particular name. For example, the operculum of the *Neritidæ* is provided with "a projection or plate-like appendage" (see p. 22); in this case the word *process* might have been used instead of appendage.

PROTUBERANCE, pro-tewberance, a projection, a swelling.

PULCHELLA, pul-kella, beautiful, the *ul* pronounced as in pulse.

PULMONOBRANCHIATA, pulmonno-branky-ate-ah, an Order of molluscs, so named because their gills resemble lungs.

PUPA, pew-pah, a doll or puppet; applied to the *chrysalis* of insects and a genus of land shells. See p. 150.

PURUS, pew-russ, clear.

PUSILLUM, pew-sill-um, } little.
PUSILLA, pew-sill-ah, }

PUTRIS, pew-triss, living among decayed matter.

PYGMÆA, pig-me-ah, dwarf, tiny.

PYRAMIDAL, pirr-ammy-dal, resembling a pyramid.

PYRAMIDALIS, py-rammy-day-lis, in the form of a pyramid.

PYRIFORM, pirry-form, pear-shaped.

Q.

QUADRILATERAL, kwodril-latteral, having four sides.

R.

RADIATA, ray-de-ate-ah, rayed.

RADIATE, ray-de-ate, to send out rays.

RADIATULUS, rady - ateyoul - uss, slightly rayed.
RECTANGULAR, rek - tangular, having right angles.
RECURVED, re-kurve'd, bent backwards.
REFLECTED, re-flekt-ed, bent, or thrown backwards.
REFRACTED, re-frakt-ed, abruptly bent as if broken.
RETICULATED, re-tik-you-late-ed, formed like network.
RETRACTILE, re-trak-tile, capable of being drawn backwards.
REVELATA, revvy - late - ah, discovered.
REVERSED, re-verse'd, turned the contrary or wrong way.
RINGENS, rinjens, grinning.
RIVICOLA, ri-vikko-lah, living in brooks.
ROSEO-LABIATA, rosy-o-la-be-ate-ah, having a rose-coloured lip.
ROISSYI, Roissy-i. See note, p. 189.
ROSEUM, rosy-um, rose-colour.
ROSTRATA, ross-tra-tah, beaked.
ROTUNDA, ro-tund-ah, round.
ROTUNDATA, ro - tun - date - ah, rounded.
RUDIMENTARY, roody-mentar-e, imperfect, not fully formed or developed.
RUFESCENS, roo-fess-ens, of a reddish colour.
RUFILABRIS, roofy-lab-riss, having red lips.
RUFOUS, roo-fus, red, or reddish.
RUGOSA, roo-go-sah, wrinkled.
RUGOSE, roo - gose, rugged, wrinkled.
RUPESTRIS, roo-pest-riss, living among rocks.
RYCKHOLTII. See note, p. 189.

S.

SCALARIFORM, skay-lare-iff-orm, resembling a ladder, or stairs.
SCALARIFORMIS, skale-airy-form-iss, resembling a ladder, or stairs.
SCALDIANA, Scaldy-a-na. See note, p. 189.
SCHLECHTII. See note, p. 189.
SCUTULUM, skewtyoul-um, a small shield.
SECALE, se-kale-e, a grain of rye.
SECRETE, se-kreet, to separate.
SECRETION, se-kre-shun, literally that which is separated, applied to animal fluids when they are separated from one another by the act or process of secretion or separation.
SEGMENT, seg-ment, a part cut off.
SEMI, semmy, when joined to a word means half, as semi-circle, half a circle ; semi-transparent, half transparent, &c.
SERICEA, se-rissy-ah, silky.
SERICEOUS, se-rish-us, silky.
SERRATE, serr-ate ; SERRATED, serr-ate-ed, jagged or toothed like a saw.
SESSILE, sess-il, literally that which sits, applied to parts of an animal or plant which are not attached by a stalk, but are seated in close contact with it.
SETACEOUS, se-tay-shus, bristly.
SHAGREEN, shah-green, the skin of a kind of fish, or leather in imitation of it. The surface of the skin is covered more or less roughly with granules, hence any substance resembling it in that respect is said to be shagreened.
SINISTRAL, sin-iss-tral, on the left hand ; a univalve shell is sinistral when the mouth or aperture faces the observer's *left hand*, the shell being held with apex upwards. See DEXTRAL.
SINISTRORSA, sin - iss - tror - sah, turned to the left.
SINUATA, sin-you-ate-ah, hollowed, curved in and out.
SINUOUS, sinnyou-us, bending in and out.
SIPHON, or SYPHON, si-fon, a tube or pipe.

SOLIDULA, soll-idd-youll-ah, rather solid.

SOLIDUS, solly-dus, SOLIDA, solly-dah, SOLIDUM, solly-dum, } solid.

SPECIES, spee-shees, the last or lowest division in the classification of created things; the individuals which collectively form a *genus*.

SPECIFIC, spe-siffik, that which constitutes or belongs to a species.

SPHÆRIIDÆ, spheery-id-ee, a family of freshwater bivalve molluscs.

SPHÆRIUM, spheery-um, a ball or sphere.

SPIRE, in univalve shells all the whorls except the last or body-whorl.

SPIRORBIS, spire-orbis, having a rounded spire.

SPLENDENS, splen-dens, bright, shining.

SPORE, the seed of flowerless plants.

STAGNALIS, stag-nay-liss, living in stagnant water.

STRIÆ, stri-ee, slender thread-like lines.

STRIATE, stri-ate; STRIATED, stri-ate-ed, having slender lines.

SUB, in composition means almost, somewhat, under, &c.; as sub-globular, somewhat globular.

SUBAPERTA, sub-ap-urt-ah, somewhat open.

SUBCYLINDRICA, sub-sill-indrik-ah, somewhat cylindrical.

SUB-GENUS, a subordinate or inferior genus, a lower division of a genus.

SUBGLOBOSA, sub-glo-bo-sah, somewhat rounded.

SUBMARITIMA, sub-mar-ittim-ah, living near the sea, but not quite close to it.

SUBMERGE, sub-merj, to put under water.

SUBRUFA, sub-roof-ah, somewhat red.

SUBSCALARIS, sub-skay-lare-iss, somewhat scalariform, resembling a ladder or stairs.

SUBSTRIATA, sub-stri-ate-ah, somewhat striated, or marked with slender lines.

SUCCINEA, suk-sinny-ah, amber-colour.

SUCCINEÆFORMIS, suk-sinny-e-formiss, shaped like Succinea.

SULCATE, sul-kate; SULCATED, sul-kate-ed, furrowed.

SUPER, soop-er, above, over, beyond, &c., as superstructure, that which is raised or built upon or above something; supernatural, beyond the usual laws of nature, miraculous.

SUTURE, soot-your, literally, a sewing together, a seam; in Conchology, the hollow line which separates the whorls of univalve shells.

SYNONYM, sinno-nim, a word or name which has the same meaning as another. Two names given to the same thing are said to be *synonymous*, sin-onny-mus.

T.

TENELLUS, ten-ellus, tender.

TENTACULATA, ten-tak-you-late-ah, having tentacles.

TENUIS, tennyou-iss, thin, slender.

TERRESTRIAL, terr-resstry-al, Earthly, belonging to the Earth; applied to species which live on the land, in contradistinction to those which are *aquatic*, or inhabit the water.

TESSELATED, tessel-ate-ed, chequered, variegated like a chessboard with alternate colours.

TESTACELLA, testah-sella, little shell.

TESTACELLIDÆ, testah-sel-id-ee, a family of land molluscs.

TESTACEOUS, tess-tayshus, shelly, composed of shelly matter.

TINCTA, tink-tah, dyed.

TRACTILE, trak-til, capable of being drawn out lengthwise.

TRANSMITTED, transe-mitt-ed, sent across or through; as transmitted light, that is, light which is made to pass through anything.

TRANSLUCENT, trans - loo - sent; TRANSLUCID, trans-loo-sid, transparent, clear.

TRANSVERSE, transe-verse, placed in a cross direction.

TRIDENS, try-dens, having three teeth.

TROPICAL, troppy-kal, belonging to, or inhabiting regions near, or within the tropics.

TRUNCATE, trunk - ate; TRUNCATED, trunk-ate-ed, cut short off, ending abruptly.

TRUNCATULA, trunk-ate-youl-lah, slightly truncate.

TUBERCLE, tewber-kl, a small swelling, a pimple.

TUBERCULATE, tew-burk-you-late; TUBERCULATED, tew-burk-you-late-ed, covered with small swellings or pimples.

TUMID, tew-mid, swollen.

TUMIDULA, tew-midyoul-ah, slightly swollen or tumid.

TUMIDUS, tewmy-duss, swollen.

TURRETED, tur-rit-ed, rising by gradations, or step by step, like a turret or small tower.

TURTONI, tur-tow-ni, Turton's; named after Dr. Turton, a celebrated English Conchologist.

TYPE, tipe, a mark, a model; in Natural History, the usual or common form or appearance of individuals of the same genus or species.

TYPICAL, tippy - kal, figurative, serving as a type or model.

U.

UMBILICAL, umbil-i-kal, belonging to the umbilicus.

UMBILICATA, umbil - i - kate - ah, having an umbilicus.

UMBILICUS, umbil-ike-uss, literally, the navel; in Conchology, a hollow or perforation in the base of the axis of some univalves; sometimes it is very deep, extending nearly to the apex and exposing the interior of the spire; in some cases it is shallow, and in others consists of a mere chink.

UMBO (plural UMBONES, um-bonees), a knob or boss; in bivalve shells the nucleus or prominent part in each valve near the hinge, answering to the apex in univalves.

UNCINI, un-si-ni, the teeth which are situated on the lateral or side areas (*pleuræ*) of the lingual ribbon. See LINGUAL RIBBON.

UNDULATED, und-youll-ate-ed, waved, curved in and out.

UNGUIFORM, ungwy-form, shaped like a finger-nail.

UNICOLOR, you-nikko-lor, of one colour.

UNIO, youny-o, a pearl.

UNIONIDÆ, youny - o - nid - ee, a family of freshwater molluscs.

UNIVALVE, youny - valve, having only one valve, or piece.

V.

VALVATA, val-vate-ah, valved (having an operculum).

VALVATIDÆ, val - vate - id - ee, a family of freshwater molluscs.

VALVE (*Lat.* valva), literally, one of the leaves of a folding-door; in Conchology, each part or piece of a bivalve or multivalve shell; a *univalve* has only one piece or valve.

VARIETY, a term applied to individuals or groups of individuals which differ distinctly but not specifically from the type or usual form of the species to which they belong.

VENTRAL, pertaining to the belly.

VENTRICOSA, ventry-ko-sah, swollen.

VENTRICOSE, ventry-kose, swollen, inflated.

VERMIFORM, vermy-form, worm-shaped.

VERRUCOSE, verr-you-kose, covered with warts, or wart-like tubercles; rough.

VERTEBRATA, verty-brate-ah, one of the great divisions of the animal kingdom, in which are included all animals whose bodies are provided with a vertebral column, or backbone.

VERTIGO, ver-ti-go, a turning round.

VIRESCENS, virr-ess-ens, of a greenish colour.

VIRGATA, ver-gate-ah, striped, banded.

VIRIDESCENTI-ALBA, virry-dess-enti-alba, greenish-white.

VIRIDULA, virr-iddyoul-lah, of a greenish colour.

VISCOUS, viss-kuss, sticky, adhesive.

VITREA, vittry-ah, glassy.

VITREOUS, vittry-us, glassy, resembling glass.

VITRINA, vittrin-ah, like glass, transparent.

VIVIPARA, vi-vipper-ah, producing its offspring alive and perfect.

VIVIPAROUS, applied to animals which bring forth their young in a living and perfect state, as distinguished from those which are *oviparous*, or produce eggs.

VOLUTION, vo-looshun, a spiral turn, a whorl.

VORTEX, vor-tex, a whirlpool.

W.

WHORL, whurl, each turn or wreath of a spiral shell.

WRINKLED, rinkle'd, marked with ridges and furrows.

Z.

ZELLENSIS, Zell-en-siss, from Zell, or Cell, one of the several Continental towns of that name.

ZONITES, zo-ni-tees, from *zona*, a girdle.

INDEX.

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PLATE I

Sphærium corneum,

Sphærium lacustre,

Pisidium pusillum,

Sphærium rivicola,

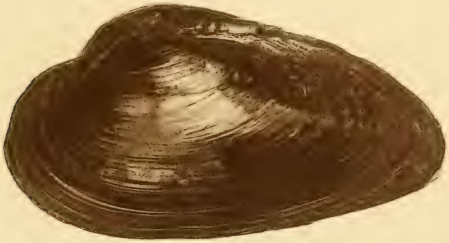
Pisidium amnicum,

Pisidium nitidum,

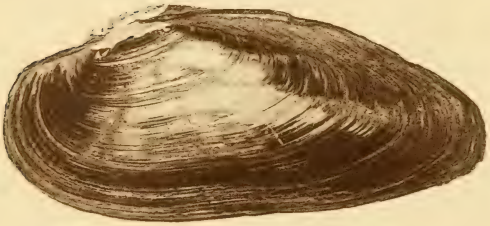
Sphærium ovale,

Pisidium fontinale,

Pisidium roseum,



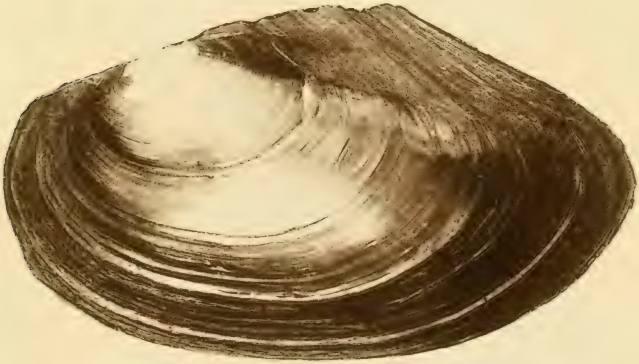
Unio tumidus,



Unio pictorum,

PLATE II.

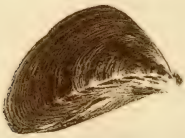
Unio Margaritifer.



Anodonta anatina.

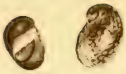
PLATE III.

Anodonta cygnea.



Dreissena polymorpha.

PLATE IV.



Neritina fluviatilis.

Valvata piscinalis.

Planorbis carinatus.

Valvata cristata.

Paludina contecta.

Planorbis lineatus.

Planorbis complanatus.

Planorbis nitidus.

Planorbis corneus.

Planorbis nautileus.

Paludina vivipara.

Planorbis albus.

Planorbis glaber.

Planorbis contortus.

Bythinia tentaculat

Planorbis spirorbis.

Physa hypnorum.

Bythinia Leachii.

Planorbis vortex.

Physa fontinalis.

PLATE V.

Limnæa glutinosa,

Limnæa palustris.

Ancylus fluviatilis,

Limnæa involuta,

Ancylus lacustris,

Limnæa truncatula,

Limnæa peregra

Limnæa glabra,

Succinea putris,

Succinea elegans.

Limnæa auricularia

Succinea oblonga,

Limnæa stagnalis.

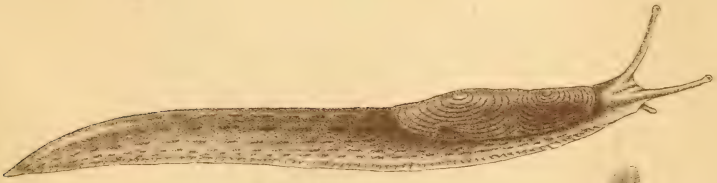
L. flavus.

L. agrestis.

L. lævis.

L. tenellus.

L. arborum.



L. maximus.

Testacella haliotidea.

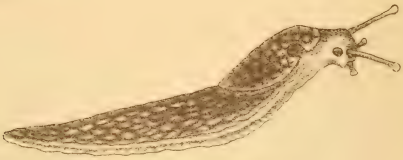
A. S. Foord lith.

Mintern Bros. imp.

Arion ater.

A. flavus.

A. hortensis.



Geomalacus maculosus.

Limax gagates.

L. marginatus.

A. S Foord lith.

Mintern Bros. imp.

PLATE VII.

Vitrina pellucida

Zonites glaber

Zonites nitidus

Zonites cellarius

Zonites nitidulus

Zonites excavatus

Zonites purus

Zonites crystallinus

Zonites alliarius

Zonites radiatulus

Zonites fulvus

Helix lamellata

Helix aculeata

Helix pomatia

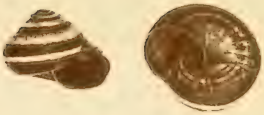
Helix nemoralis

var. hortensis

Helix arbustorum

PLATE VIII.

Helix Cantiana



Helix virgata

Helix Cartusiana

Helix caperata

Helix rufescens

Helix ericetorum

Helix olivolute

Helix conciuna

Helix hispida

Helix rotundata

Bulimus acuto-

Helix sericea

Helix rupestris

Bulimus montanus

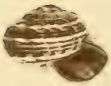
Helix [illegible]

Helix pygmæa

Helix [illegible]

Helix pulchella

Bulimus [illegible]



Helix [illegible]

Helix lapicida

PLATE IX.

Pupa secale

Pupa ringens

Pupa umbilicata

Pupa marginata

Vertigo antivertigo

Vertigo Moulinsiana

Vertigo pygmæa

Vertigo alpestris

Vertigo substriata

Vertigo pusilla

Vertigo angustior

Vertigo edentula

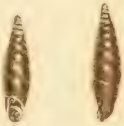
Vertigo minutissima

Balia perversa

Clausilia rugosa

Clausilia Rolphii

Clausilia biplicata.



Clausilia laminata

Cochlicopa tridens

Cochlicopa lubrica

Achatina acicula

Carycium minimum

Paludina contecta.

Cyclostoma elegans

Paludina vivipara

Vertigo.

Vertigo antivertigo.

V. Moulinsiana.

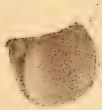
V. pygmæa.

V. alpestris.

V. substriata.

V. pusilla.

V. angustior.



V. edentula.

V. minutissima.

H. Groves del.

Mintern Bros. lith.