

THE COLLECTOR'S MANUAL
OF BRITISH
LAND AND FRESHWATER
SHELLS.

BY

LIONEL E. ADAMS.





JOHN BROOKS HENDERSON

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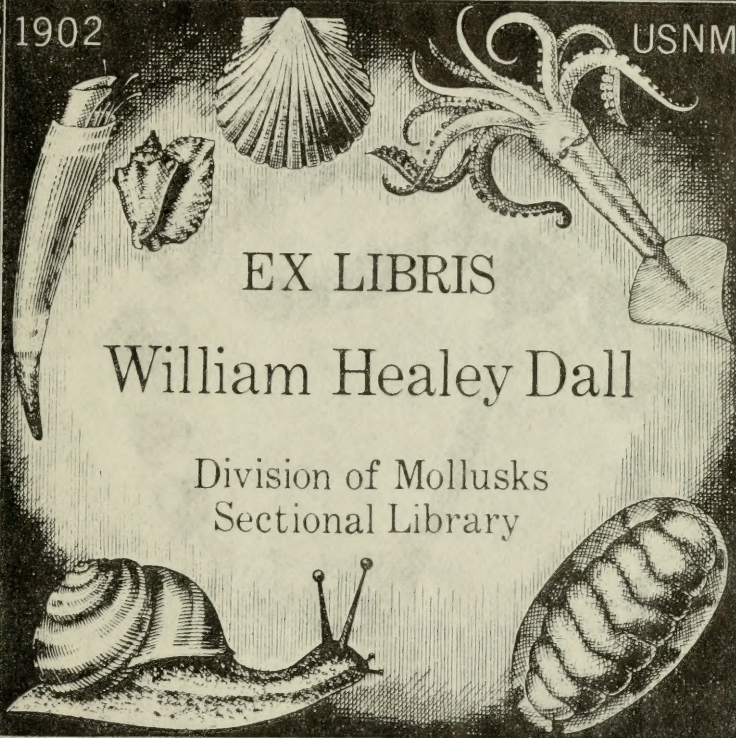
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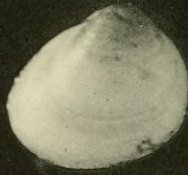
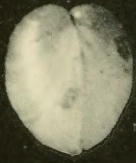
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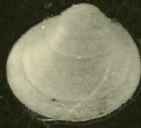
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PLATE X.

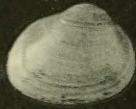
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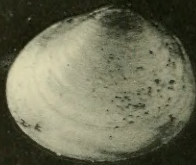


PLATE X.

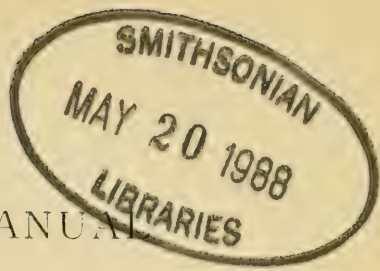
Fig. 1. *Pisidium fontinale*.

„ 2. „ *nitidum*.

„ 3. „ *milium*.

„ 4. „ *pusillum*.

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THE
COLLECTOR'S MANUAL

OF

BRITISH LAND AND FRESHWATER
SHELLS.

CONTAINING FIGURES AND DESCRIPTIONS OF EVERY SPECIES, AN
ACCOUNT OF THEIR HABITS AND LOCALITIES, HINTS ON
PRESERVING AND ARRANGING, ETC.; THE NAMES
AND DESCRIPTIONS OF ALL THE VARIETIES
AND SYNOPTICAL TABLES SHOWING
THE DIFFERENCES OF SPECIES
HARD TO IDENTIFY.

Also, with the permission of the Recorder and Referees,
THE CONCHOLOGICAL SOCIETY'S CENSUS OF COMITAL DISTRIBUTION

BY

LIONEL ERNEST ADAMS, B.A.,
¹¹¹

HON. TREASURER OF THE CONCHOLOGICAL SOCIETY OF
GREAT BRITAIN AND IRELAND.

ILLUSTRATED BY

*GERALD W. ADAMS, M.R.C.S., ALFD. SICH, F.E.S.
AND THE AUTHOR.*

SECOND EDITION.

LEEDS: TAYLOR BROTHERS,
1896.

TAYLOR BROTHERS, PRINTERS, LEEDS.

Dedicated
TO
THE MEMORY OF
HENRY AND ARTHUR ADAMS,
AUTHORS OF
"THE GENERA OF RECENT MOLLUSCA,"
BY
THEIR NEPHEW.

PREFACE
TO THE
SECOND EDITION.

THE very favourable reception which the first edition of this little work received has encouraged me to undertake a second, and I venture to hope that the care bestowed upon the thorough revision, or rather re-writing of the whole and bringing it up to date has not been thrown away.

It is to be regretted that, of necessity, many of the old familiar names—almost household words that call up so many associations—have to give way to others by the inexorable law of priority, but it is to be hoped that the present system of nomenclature is now fairly crystallized. I know I have laid myself open to criticism by including so many varietal names, but as it is impossible to satisfy both ‘splitters’ and ‘lumpers,’ I have taken the latest list of the Conchological Society of Great Britain and Ireland as fairly enumerating those names which are current among British conchologists. It is, besides, at the option of anyone to disregard those which seem to him superfluous.

I have the greatest pleasure in acknowledging the able and cordial assistance that I have received from many friends and correspondents. To the referees of the Conchological Society I am indebted for permission to print the ‘Census’ brought up to the date of publication. For the ever ready help with facts, opinions, and references that I have received from my friend Mr. J. W. Taylor my obligation is especially great, and I am under particular obligations to my friend Mr. W. Denison Roebuck for the assistance he has given me during the last ten years in the study of slugs.

To Dr. Scharff, of Dublin, I am indebted for permission to reproduce some of the figures in his 'Slugs of Ireland,' and to Mr. A. Sich for his drawings of *Arion ater*, and of *Amalia sowerbyi*. Mr. J. Wetherall has kindly photographed the four smaller *Pisidia*, a feat that several have attempted with, I think, inferior results.

Though it is impossible to attempt a complete list of the very numerous friends and correspondents who from time to time have given me much valuable assistance, I must mention Messrs. R. D. Darbishire, E. A. Smith, C. Oldham, G. Sherriff Tye, J. Rogers, J. R. B. Masefield, W. Moss, Canon Norman, and the Rev. J. W. Horsley.

In conclusion I cannot refrain from a tribute to the study of conchology itself. To it I owe many valued friends, and, engaged in it I have spent some of the happiest times of my life. An hour with my collections or a stroll along a country lane in search of snails has often done more to dissipate the worries of an arduous professional life than anyone but a naturalist would believe.

LIONEL E. ADAMS.



INTRODUCTION.

THE object of this little manual is to enable the novice to collect, identify, and arrange systematically the various shells—both land and freshwater—which abound in almost every part of these islands.

Remembering the difficulties that I at first encountered in identifying the various species, I have paid special attention to the points of difficulty which are likely to present themselves to other beginners.

To this end I have framed synoptical tables of the differences between those species of the *Arions*, *Vertigos*, *Pisidia* and *Hyalinix* which are most closely allied, and also a table showing the generic distinctions between the *Arionidæ* and the *Limacidæ*.

I have also shown in a tabular form the relations which the different classes, orders, and genera bear to one another.

I have taken as a model the “British Conchology” of the late Dr. Gwyn Jeffreys, but have brought the nomenclature and arrangement up to date. I am also indebted to Forbes and Hanley’s work, to Dr. R. F. Scharff’s “Slugs of Ireland,” to the “Journal of Conchology” and many other works; also to many friends and correspondents for several facts and hints.

With the exception of the *Pupæ* and *Vertigos*, which I have myself enlarged from actual specimens, the plates of the shells and some of the slugs have been drawn by my brother, Gerald W. Adams, a collector like myself. Most of the drawings have been taken from shells in my own cabinet, though, here and there, a friend has been generous enough to lend me some fine or rare specimen to copy.

SIZE OF FIGURES.

Where there is no "size-line" the figures may be taken as the natural size, except in the case of the three largest bivalves, which, for convenience sake, are figured smaller than the average size of adult specimens. In these cases I have stated their dimensions besides the figures and also in the descriptions.

I have used millimetres for measurements, except for the mussels where it would have been absurd, and for the slugs, which latter are understood to be measured, fully extended, from the nose to the extremity of the keel.

TRANSLATION OF NAMES AND GLOSSARY OF TERMS.

I have translated and accented the names of the genera, species and varieties, and have appended a glossary of all the technical terms which I have been compelled to use. Dr. Jeffreys points out that it may be a guide to some to remember that in the pronunciation of names ending in *-inus* those derived from the names of animals usually have the penultimate syllable long, as they are formed from the Latin (*Neritīna*, *anatīna*, etc.); while those words which have a similar termination, but are derived from the names of vegetable or mineral substances (*Achātīna*, *crystāllīnus*, etc.) being derived from the Greek, have the penultimate short. It may also be remembered that the long and the short syllables in the classics are in fact the accented and unaccented syllables respectively.

PLATES AND DESCRIPTIONS INSUFFICIENT FOR IDENTIFICATION.

It should be borne in mind that plates and descriptions are at best but a second-rate substitute for a direct examination of the objects themselves, and that more may be done towards the identification of difficult species by a careful comparison with a good collection of well authenticated specimens than by working with plates and descriptions alone.

For the better identification of species let me advocate the advantage of comparison *en masse*. When we compare two individuals we are as likely as not to perceive casual or individual peculiarities, whereas, if we have before us a series of (say) *Hyalinia cellaria* and also a series of *H. glabra*, the eye catches the specific agreements and differences and rejects the individual ones.

Doubtless every describer of shells has been puzzled to find simple geometrical terms suitable to their forms, which are often complex. I have followed the authorities in using such terms as *ovate*, *sub-cylindrical*, etc., though they are vague, and do not express to what degree the object is oval or cylindrical. Dr. Jeffreys calls *Limnæa stagnalis* "elongated," which it certainly is; but what *shape* is "elongated"? This difficulty, however, affects the describer more than the collector, who can glance at a plate where the shell is figured. Some ludicrous results of attempting to realize form from description may be seen in the drawings of the old naturalist Gesner, who depicts elephants, whales, besides other beings more fearful and wonderful still, from the descriptions of persons who had seen them, or professed to have done so.

THE PLEASURES OF COLLECTING.

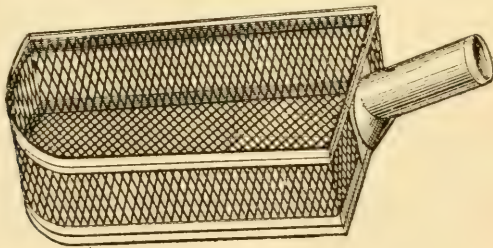
The pleasures of collecting anything are too patent to need to be dwelt on here, but the pleasures of collecting objects of Natural History in any branch have additional charms—the charms of the country.

WAYS AND MEANS OF COLLECTING.

I have often been asked by would-be collectors such questions as "How do you set about collecting?" "What implements are necessary?" and most frequently, perhaps, "Where do you look for shells? I know the 'Garden Snail' and one with yellow bands, but I never see all these you have in your cabinet."

To those desirous of information the following hints may prove serviceable:—

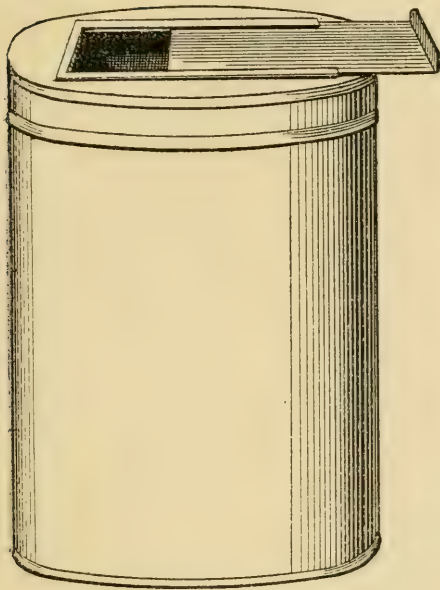
When going out for a ramble after shells very few preparations are necessary. For pond work a scoop is essential and better than a net, which is an abomination. After experimenting with scoops of many shapes and sizes, I have obtained one that suits me better than any other. It is of oblong form, five inches in length, with one corner rounded off and with perpendicular sides an inch and a half high. The bottom and sides are of perforated zinc, the rim being strengthened by a band of tin sharply folded. A ferrule at the back admits the end of a walking stick. Rounded rims are not good for scraping shells off flat surfaces, and often break them in so doing. The square corner is often useful for digging a shell out of hard mud or gravel, but the rounded corner is the one generally useful. This scoop can be carried conveniently in the pocket. Any intelligent tinsmith can make it. I would warn collectors against scoops of a soup-plate shape and especially against one with a rounded rim. My friend, Mr. Charles Oldham, was the first to point out to me the handiness of a pair of forceps for picking small shells, such as *Pisidia*, out of the scoop.



Small Zinc Collecting Scoop.

A store of tin boxes of various sizes is required, and in selecting these it should be remembered that those opening with a hinge or a spring are more handy than those the lids of which have to be removed every time a shell is dropped in. Small nib-boxes and match-boxes are very good for small shells, and should be padded with a little moss to prevent the more delicate species being broken by being rattled together in the pocket or blown out by the wind when the box is

opened. *Tin* boxes are much better than "chip" boxes or pill-boxes,

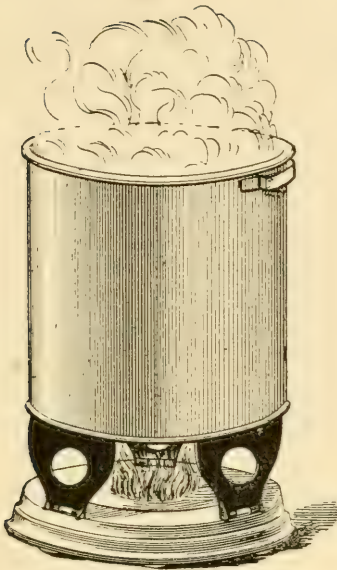


Collecting tin with sliding door in the lid to insert shells without removing the lid; convenient for a side coat pocket.

as they are less likely to get broken, and do not come to pieces when wet. Hispid shells should be put into a box by themselves, and only a few together, as their neighbours' slime is apt to spoil their personal appearance. For the minute species of freshwater shells a small wide-necked bottle filled with water may be found useful to dip the fingers in, and so wash off the shells, which often adhere persistently, and require much time to dislodge in

safety. The shells will sink to the bottom, and the water may be poured away. For the minute and delicate species of both land and water, it is not a bad plan to keep one or two small glass tubes in the waistcoat pocket. Along one side of these a strip of gummed paper (stamp-edging is very good) should be fastened to hold the glass together if cracked by a fall. Such tubes are obtainable at a homœopathic chemist's.

Any one who has tried it knows how difficult it is to get *boiling* water to clean the shells at night in an hotel or lodging-house, and even if this be forthcoming, how impossible it is to carry on operations in peace and quietness. To meet this difficulty I have a small spirit lamp with a folding tripod stand. This is packed in a small tin box which acts as the pan to boil the water. The whole apparatus takes up little room in a knapsack, and renders one independent of others



Portable Spirit Lamp
and Pan.

be sure to regret it.

The following incident may point the moral :—

Some years ago at Bagdad, on the desert under a bush of scrub I came upon a couple of dead *Helix caperata* which I wanted to preserve carefully for the sake of the locality. Now, though I had had two years' experience of Egyptian and Arabian deserts, I had never found a single snail (though I had heard of *Helix desertorum*), and I might, therefore, be excused for not encumbering myself with a receptacle. However, I was carrying with me the key of my bedroom door, according to the inconvenient foreign custom, which key, of native make, was large enough for a mediæval church door. Now, for the first time, I regarded its size with favour, as I was enabled to drop the shells down the hole (like bullets down the muzzle of a blunderbuss), which I then plugged up. By the time I reached home I had forgotten the shells, nor did I remember them till I began to wonder why my door would not open in spite of my increased efforts. I suddenly remembered the shells and then—well, Tableau !

and can be used in the quiet of one's own room. There is, however, sometimes a difficulty in the disposal of the boiled corpses. My usual plan is to wait for a lull in the traffic and carefully empty them out of the window. This plan is not perfect, I must admit, for, in spite of all reasonable care, this operation has on several occasions given rise to much profanity in the street below.

Finally, remember never to be without a receptacle of *some* sort when out, even though not on a regular expedition. Should you happen to be thus unprovided, you will

Yet another incident — On the north coast of Ireland I was once collecting *Pupæ* and *Vertigos* among the sand drift, and having forgotten to bring the little tubes which I usually carried for the purpose, I put the shells into the bowl of my pipe and covered them carefully with tobacco. On my way home I thought I could enjoy a smoke, and I did—till suddenly I remembered the shells and then—well, Tableau, as before !

I have often put small shells into my mouth and kept them under my tongue, forgotten them, smoked pipes, and found them all safe when I got home. I would not, however, recommend this practice, as some of the *Hyalinæ* (*alliaris* and *glabra*) bite the tongue and have an unpleasant taste, as also do *Ancylus fluviatilis* and sometimes *Limnæa peregra*, besides which *L. truncatula* and probably other species are often infested with undesirable parasites.

LEAVES AND MOSS.

A good plan for dealing with dead leaves and moss is to take a quantity home, spread it out to dry and search the siftings. This saves much time while out, and often yields a good supply of *Hyalinæ*, minute *Helices*, *Pupæ*, *Vertigos*, etc. But this should be done with judgment, as by taking away all the sheltering moss and the eggs of the animals a restricted habitat may easily be destroyed.

SNAIL-TRAPS.

It often happens that we come across a good shell in a likely place, and whenever we find a single individual we may infer that some of his immediate relatives are not very far distant. A large flat stone, log, piece of old matting, or a cabbage leaf laid over the place will frequently be found, after a day or two, to have some of the desired objects adhering to its under side. I have frequently set traps of this nature, which visited periodically have been very productive.

WHERE TO COLLECT.

No ponds or ditches should be passed by without examination, however barren they may appear ; and not only should the weeds be

examined, but the mud should be sifted with the scoop in search of bivalves.

By the water's edge the stalks and leaves of flags, rushes, and sedges should be examined for the *Succineæ*, which are amphibious. On the mud *Limnæa truncatula* and other species are found.

On land search all moist and shady spots, especially during and after rain, under logs, stones, among dead leaves and decaying vegetation, among nettles and healthy vegetation, on the bark of trees and at their roots among the moss, on old stone walls, and in damp cellars. *Acicula lineata* and some of the *Arions* feed on dead fungi which should therefore be examined. Mr. Roebuck once informed me that Mr. Soppitt had observed that *Pupa anglica* particularly affects the moss *Hypnum cuspidatum*, a fact which I subsequently had the pleasure of verifying at Scarborough. *Agriolimax leviss* and *Hyalinia nitida* are found by the side of water in very wet places. The rejectamenta of rivers after floods often yield a good harvest, but the uncertainty of exact locality in this case is a drawback unless we can tell where the shells have been brought from, which is generally impossible.

Last, and perhaps least, search trunks of trees. *Buliminus montanus* is our only species that makes trees its usual habitat, which are supposed to be its feeding and breeding ground. In the South of England, however, during the summer shells do ascend trees in great numbers. In the beech woods of Cooper's Hill, near Cheltenham, Mr. Oldham observed *Helix hispida* var. *hispidosa*, *H. nemoralis*, *H. rufescens*, *Pupa secale*, *Clausilia bidentata*, *C. laminata*, *Buliminus obscurus*, *B. montanus*, and *Cyclostoma elegans* on the trunks, and a subsequent visit of my own to this conchologists' paradise confirmed his observations with the exception of *C. elegans*. The late Mr. C. Ashford also mentions *Helix aspersa* (Q. J. C., vol. v., p. 160) "a dozen or more stationed in the day-time on the upper branches of a *Genista* in the Public Gardens of Bournemouth." I have witnessed this in Kent :

and also *Helix lapicida* and *H. nemoralis* at the height of thirty or forty feet up beech trunks at Ewell.

GEOLOGICAL FORMATION IN RELATION TO MOLLUSCAN LIFE.

It may be remembered that peaty soils yield little or nothing. The red sandstone districts of the Midlands are very poor, though not so those in Devon; and the desolate and repulsive millstone-grit districts are particularly barren.

The sandy and calcareous soil of the oolite formation on the other hand is not at all barren, except in places where it contains a large percentage of iron and little calcareous matter, as in the Northampton Sand. Sand hills by the sea are very favourite habitats for *Helix nemoralis*, *H. aspersa*, *H. virgata*, etc.

Pine woods do not harbour molluscs—the resin perhaps being distasteful to them. The bracken, too, is shunned by all species except *Vertigo edentula*.

Calcareous districts are always fruitful, especially pure chalk, while granite and shale are not.

I have observed that ponds surrounded by oak trees do not usually contain shells—perhaps the tannic acid does not agree with them.

It is certain that there is some relation between plants and the soil and molluscs; but of this relation very little is known, and there is therefore a wide field for observation and experiment.

BEST TIME FOR COLLECTING.

The times of the year when the most perfect specimens are obtained are—first, the early spring when the animals have just emerged from their winter-quarters and *before they commence to form a new lip*; secondly, the autumn, just before they hibernate and *after the formation of the lip*. I think the spring is the best time for the aquatic and the autumn for the terrestrial species. All through the summer, of course, shells are to be found, and those with the immature lip, which is thin, should be handled and cleaned very carefully,

as much of the character of the shell often depends upon this lip. Throughout the winter much may be done, except when frost fastens down the stones or snow covers the face of the earth. But it should be remembered that winter captures as a rule present a more weathered appearance than those taken in summer.

It may be necessary to remind the beginner that molluscs like hot moist weather ; dry weather has the tendency to dry them up altogether. After a shower of rain, or even before it is over, the snails will come out and climb over the hedges or rocks, and the slugs commence their march towards the lettuces. Many of my most successful days have been spent in pouring rain. I have sometimes observed *Helix hortensis* appear before the rain has actually arrived—no doubt being sensitive to the moisture of the atmosphere.

PREPARING SHELLS FOR THE CABINET.

Univalves.

The “booty” should be cleaned as soon as possible after being captured. Plunge the shells into boiling water, and see that it *does* boil ; hot water not boiling will not do. The larger species may be left in for half-a-minute, but more than a few seconds is often fatal to the thorough cleaning of many of the smaller species—especially the *Hyalinice*, which break off short if boiled too hard. Many collectors advocate the addition of a spoonful of salt in the water, but I have never found any advantage in this.

The animals of the larger univalves are easily extracted with a piece of wire or a hair-pin, but for the smaller species, as *Hyalinia pura*, fine needles are the best implements. The points of these may be easily bent in a candle or gas flame to different shapes and curves to reach obstinate fragments “round the corner.” Common wooden matches form excellent handles.

Should a fragment of the larger species remain inside, which will often happen in the case of the *Viviparice*, fill the shell with water

and shake it violently. Obstinate fragments may sometimes be removed by a strong thin jet of water made by placing the thumb against the mouth of a tap of running water. The *Clausiliae* are very hard to clean. I have sometimes, though rarely, succeeded by letting them crawl on a plate and pouring boiling water quickly over them, when they die with their bodies partly outside the shell and so capable of being taken hold of.

When the animals have been removed, the shells should be placed in a basin of clean warm water in which they should all be washed with soap and then well rinsed before being put out to dry on a piece of blotting-paper. In the case of the minute *Pupæ*, *Vertigos*, etc., no internal cleaning is necessary; they may be left to dry up and then washed. Most shells are improved by a gentle application of soap and hot water with a moderately soft tooth-brush; and some that are often encrusted with hardened mud, as the *Viviparæ*, should be carefully scraped with a pen-knife. I have sometimes found common washing-soda more effective than soap for the fresh-water species. But it is a fatal mistake to use *acid* in any form.

The operculum of those species which possess one should be gummed on to a plug of cotton-wool inserted in the mouth of the shell.

Bivalves.

A pen-knife carefully inserted will separate the animal from the shells of the bivalves, which should be instantly tied up or screwed up in a piece of tissue paper till dry. Should this not be done, the ligament will harden with the valves open, and the shell cannot then be closed without snapping the ligament.

Slugs.

A set of slugs preserved in spirit forms an interesting feature in a collection; and some guidance is necessary here.

The animals must not be plunged alive into spirit and straightway sealed up. If this is done they will exude a thick coat of mucus, which surrounds them like a cocoon, and, moreover, they will shrink up to a very small uninteresting mummy.

They should be drowned in cold water, and when dead should be cleaned of the inevitable mucous coat with a paint-brush. They should then be put into methylated spirit and water (in proportion of 1 spirit to 3 water). After three or four days they should be again wiped and transferred to a mixture of equal spirit and water, and finally, after another interval of the same length, to a mixture of 3 spirit to 1 water.

By this means their tendency to shrink is minimized, and they are more apt to retain their markings, which pure spirit is apt to obliterate.

The various slugs in glass tubes, arranged in trays on cotton wool and carefully labelled, have a novel and attractive appearance in a collection. The corks of these tubes should be forced down just below the rim of the tube and sealed by a coat of shellac dissolved in spirit.

The shells of most slugs are covered by the mantle, under which the blade of a pen-knife or scalpel should be inserted to effect their removal. Many prefer to kill the animals first in boiling water, which method recommends itself on the score of humanity and convenience: but in this case the animal is useless for further preservation.

The shells thus extracted may be gummed on strips of black card.

The skins of slugs may be preserved in the following manner:—Drown the animal, wipe it dry, lay it on its back and cut *nearly* all the sole away; then remove the contents of the body and straightway flatten out the skin, inside downwards, on a piece of white cardboard. The skin should be well stretched out and the tentacles “teased” into position. The skin will dry in position and will adhere to the card. Care should be taken to get the card thick, or the inevitable

shrinkage will cause it to cockle. The shell may be placed beside the skin and the name and locality written on the card. When the skin is thoroughly dry it should be varnished with colourless varnish, which will bring out and preserve the markings. The small species will be found more difficult to deal with.

DARTS.

There is a curious internal organ connected with the reproductive system of about two-thirds of our British *Helices* and also of *Hyalinia nitida* and *H. excavata* which deserves attention. These "darts" are not only exquisitely beautiful objects in themselves, but they have a specific value which is particularly useful in distinguishing *Helix hortensis* from *H. nemoralis*. These little objects under the lens resemble curiously flanged spear-heads. They are enclosed in a pouch, the "dart sac," from which they are best separated by dissolving away the "sac" in a solution of caustic potash. They show well mounted on black card. For a full account of this organ I must refer those interested to a series of papers and illustrations in the "Journal of Conchology," vol. iv., by the late Mr. C. Ashford, of Christchurch (Hants.).

THE ARRANGEMENT OF A COLLECTION.

Much of the pleasure derived from a collection consists in its arrangement. A cabinet with drawers is undoubtedly the best receptacle, but a series of flat boxes will answer the purpose very well.

Various methods of setting out the specimens are adopted. Some prefer slabs of wood or glass covered with stone-coloured paper, on which the shells are fastened with gum. This is doubtless an excellent plan for showing off the shells, especially in a museum or a perfect collection where the shells are not supposed to be touched; but in the case of a collection which is constantly receiving better specimens to be substituted for those already stuck down, this method has an obvious drawback. There is no doubt that specimens are best shown and protected by glass-topped boxes. These are made rectangular

or circular of various sizes. The rectangular boxes should be chosen so as to fit the drawers of the cabinet as nearly as possible, and should all be equal in height. Unfortunately they are expensive.

A cheaper method is that of a series of glass tubes from $\frac{1}{4}$ to 1 inch in diameter. These are very handy and allow of the contents being turned over to see the under side of a specimen, which is impossible with boxes. The mouths of the tubes should be plugged with cotton wool, which is a better dust excluder than cork, though perhaps not so neat. Glass tubes may now be bought very cheap, and of all shapes and sizes; but those who do not care to go to the expense of buying them can easily make them in the following manner. Buy a few yards of glass tubing (which is exceedingly cheap) of the desired thickness, nick the surface with a file and with a comparatively slight pressure the tubing will snap in two at the nick with a straight edge. Tubes so made will, of course, have two open ends.

Some arrange their shells on cotton wool in cardboard trays. This method has the advantage of allowing the specimens to be easily changed and if necessary taken up and handled. These trays may be obtained from many naturalists.

Minute shells may be kept in the small glass tubes already mentioned. A series of the commoner species can be mounted on a strip of card, which is put into a tube or glass-topped box. Some of the delicate white species, as *Helix pulchella*, *Cæcilioides acicula*, etc., are better shown on black. Where a very delicate object has been in question I have stuck a wire into the lower surface of a cork and fixed the object to the other end of the wire, so that when the cork is put into the tube the object does not rattle and is held in position in the middle of the tube.

For mounting shells on card Gum Tragacanth should always be used as it does not glaze when dry like Gum Arabic.

A valuable shell should never be stuck down, but placed in a nest of cotton wool in a glass box or tube.

DAMP AND DUST.

The great enemies of the specimens are damp and dust. The drawers of the cabinet should be frequently aired if the room is at all damp.

Dust is more difficult to cope with, and is exceedingly difficult to remove thoroughly. It is drawn into even the best cabinets by currents of air caused by change of temperature, to avoid which the following plan has been adopted. A hole at the back of the cabinet is made and plugged with cotton wool and the outside is covered with a piece of wire gauze to keep the wool in place. The currents of air now cease to rush through all the smaller crevices and form one general flow through the "dust trap," leaving the dust on the wool, which is renewed when required.

Mr. J. R. Hardy, of the Manchester Museum, informs me that he has adopted the plan of fastening a strip of velvet along the edge of the doors of some of the cabinets with very satisfactory results.

LABELLING AND REGISTERING.

As soon as possible the shells should be labelled, even the duplicates which are to be stored away to gladden other collectors' hearts. Both the *name* and the *locality* should be carefully recorded; some add the date of capture.

The collector cannot do without a register. There are various methods of arranging this, but the following has commended itself to me as the most practical:—Get a good-sized note book, keep a separate page for each species, with the name written at the top and the localities in a marginal column. I give a specimen:—

Azeca tridens.

Derbyshire.	A few specimens found among moss at the foot of limestone rocks at Matlock Bridge, Sept., 1880.
Essex.	Sparsely among dead leaves, near Coggeshall. 1881.
Worcester.	Specimens received, coming from Evesham. 1881.
Cheshire.	A single specimen in moss on a wall at Marple, Cheshire. Aug., 1882. etc., etc.

There should be some spare pages at the end of the register for occasional notes. For instances, after a district has been well worked, a list of all species found in it should be made and the extent of the district explored should be accurately stated.

IDENTIFICATION.

Most of our large towns and many of the smaller ones boast of some sort of museum where British shells have a place, and should any stranger wish for further information than can be obtained through the glass cases, the curator will always be ready to give courteous attention to his enquiries. It is to be regretted that in many museums minute shells are often placed at a distance of several inches from the surface of the glass case. The curators of the Manchester Museum at Owens College, however, have set a good example by bringing all small objects close to the glass so that a pocket lens may be used to examine them.

It may not be out of place to mention here that the referees of the Conchological Society are always ready to identify and name any shells or slugs sent to them. Specimens thus sent are carefully returned if desired, and it should not be forgotten that in all cases the exact locality should be specified.

EXAMINATION OF MINUTE SPECIES.

A good pocket lens is a *sine quâ non* to determine small species and examine the sculpture, etc., of the larger ones.

Working with minute species by artificial light is often trying, especially if the light is bad, but this may be remedied by fixing a large lens so as to concentrate the light upon the object, and then with another lens examine the shell thus illuminated.

A CAUTION.

A caution may be useful to the collector not to admit into his collection any shell whatever without the most conclusive evidence of its being British. I have repeatedly been presented with foreign

shells by persons of the highest integrity, with the assurance that they came from such and such a place in the British Isles. I am sure the majority of collectors have undergone similar experiences.

In order that a collection may be of any value, it should be, like Cæsar's wife, "above suspicion."

NUMBER OF BRITISH SPECIES AND VARIETIES.

Though the entire list of British land and freshwater species is limited to 127, there are numerous varieties; so that while a fair collection is within the reach of most people—often within the range of a single county—an absolutely perfect collection is never arrived at. As an example of what a single district with a radius of five miles from a head-quarters may produce, I instance Stafford with 32 aquatic, 38 terrestrial species; total 70. This being a red sandstone district is not particularly favourable for land shells. Other districts I have worked in the South and North of England are much richer, but I take Stafford as an average field for research.

VARIETIES.

For the vexed question of varieties there is not room to enter here. Suffice it to say that the beginner need not trouble himself about them, but will be able to distinguish them by degrees. The present formidable array is that authorized by the Conchological Society.

It should be noted that a single varietal name will not always fully describe a given specimen; in such cases the names may be combined thus:—*Helix rotundata* var. *turtoni-albida*; *H. nemoralis* var. *rubella-minor-albolabiata*, 123(45).

FOREIGN SHELLS RECENTLY INTRODUCED INTO THE BRITISH ISLES.

Within the last few years several mollusks have been noticed for the first time in the British Isles. *Planorbis dilatatus*, which came from America about 1864 in cotton bales, has made itself at home near Manchester and Burnley, and has been admitted to rank with

indigenous species. *Physa acuta* (at Kew Gardens and Glasgow), *Helix villosa* (Cardiff), *H. terrestris* (Dover), *Bulimus goodallii* (Bristol), and *Clausilia parvula* (Stourbridge), all of which have been introduced recently and have been found alive, have not been accorded this privilege. A few dead specimens of *Pupa cinerea* have been found near Stonyhurst, but this southern form has probably been received from abroad by some member of the Jesuit College and turned out purposely or not as may be.

SPECIES OF DOUBTFUL ORIGIN.

Dreissensia polymorpha, first noted in 1824, is supposed to have come in ballast. Mr. B. B. Woodward, however, mentions as remarkable the finding of a single valve in the alluvial deposit of the London district.* *Sphaerium pallidum* is also suspected of being a foreign importation. Mr. Woodward, in the same paper, says "*Helix pomatia* and *H. aspersa* are not found anywhere [in Britain] in pre-Roman deposits, though frequently found with Roman remains. They were probably introduced about that time. . . . *H. cantiana* was probably introduced after this time."

INDIGENOUS SPECIES RECENTLY NOTICED.

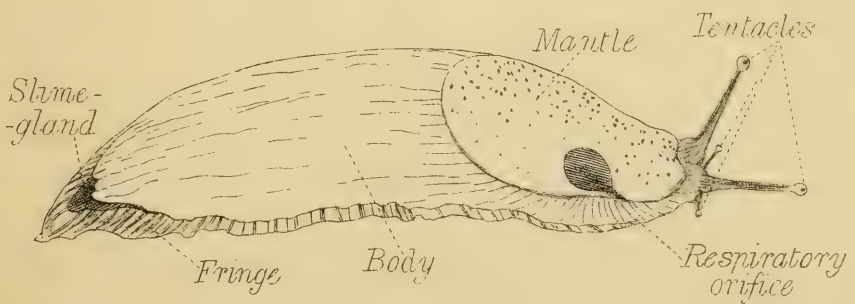
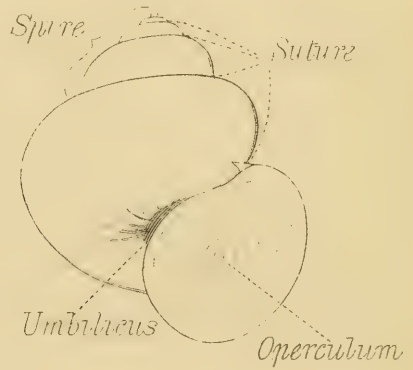
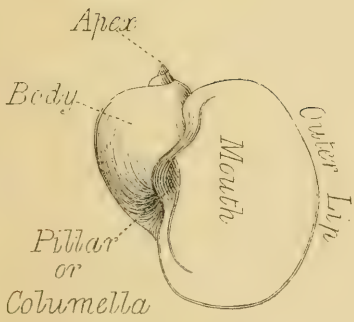
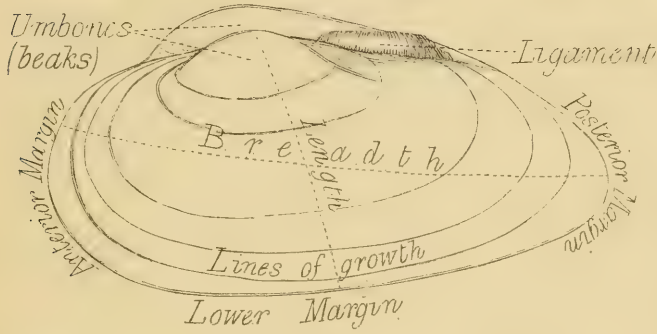
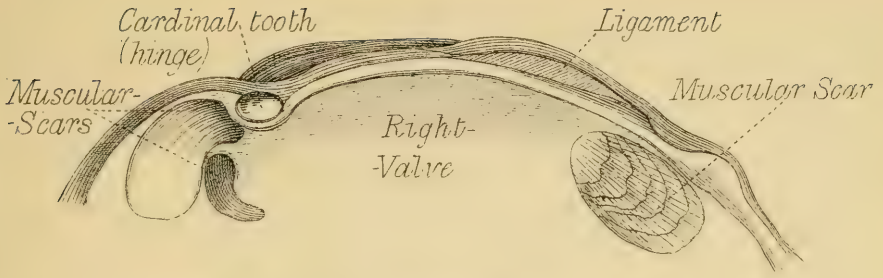
Testacella maugei, *Helix pisana*, and *H. obvoluta* were formerly under the ban of suspicion, but are now recognised as indigenous. *Limax cinereo-niger*, *Hyalinia lucida*, and *Vertigo moulinsiana*, though they have escaped notice until quite recently, can hardly have been introduced from abroad, and may fairly claim to be included in the British list.

Hyalinia glabra (now called *helvetica*), noticed and figured by Turton in 1840 and brought to notice by Mr. T. Rogers in 1870, has an undoubted claim to rank as British.

The plate on the opposite page is intended to illustrate the terms for the different parts of shells and slugs.

* Proc. "Geologists' Magazine," Aug., 1890.

Plate XI.



SYNOPTICAL TABLE OF THE CHARACTERS OF THE ARIONIDÆ & LIMACIDÆ.

	1. ARIONIDÆ.		2. LIMACIDÆ.		
	1. <i>Arion</i> .	2. <i>Gomatacus</i> .	1. <i>Amalia</i> .	2. <i>Limax</i> .	3. <i>Agriolimax</i> .
<i>Shield</i> ..	Granulated.	Granulated.	Granulated.	Concentrically striated.	Concentrically striated.
<i>Respiratory orifice</i>	In front of centre of mantle margin.	In front of centre of mantle margin.	Behind centre of mantle margin.	Behind centre of mantle margin.	Behind centre of mantle margin.
<i>Shell</i> ..	None; or composed of irregular scattered granules.	Distinctly formed.	Distinctly formed.	Distinctly formed.	Distinctly formed.
<i>Caudal Slime Gland</i>	Protrudes longitudinally.	Opens by a transverse slit.	Absent.	Absent.	Absent.
<i>Dorsal Keel</i>	None; end of body pointed (except <i>minimus</i>).	None; end of body rounded.	Well developed, extending the whole length of back from shield to caudal extremity.	Confined to caudal extremity.	Confined to caudal extremity.
<i>External Anatomical characters</i>	Reproductive pore near the pulmonary aperture.	Reproductive pore close to the tentacles.	Never banded.	6 convolutions of intestine.	4 convolutions of intestine. Never banded.
<i>Diagnostic character</i>	Slime gland longitudinal.	Slime gland transverse.	Dorsal carination extending the whole length of back.	Presence of bands, conjoined with absence of slime gland.	Absence of bands, conjoined with absence of slime gland.

Family.—ARÍONIDÆ.

Genus.—ARÍON *Férussac.*

The *Arions* have a *slime-gland* at the extremity of the tail, but no dorsal carination. *Respiratory orifice* in front of the centre of the mantle-margin. The *shield* is granulated or shagreened, not concentrically striated as in the *Limacidæ*.

I. ARÍON ÁTER (*black*) *Linné.* Pl. I., f. I.

Body with oval rugosities, which are much coarser than in any other *Arion*, and form long ridges with deep furrows down the back; *mantle* finely granulated; *foot-fringe* usually marked with transverse striæ, which are often black; *slime* colourless; *colour* black in the type, but extremely variable; *shell* none, or composed of scattered calcareous granules. The young are light coloured, very occasionally banded on the body; *foot-sole* white, occasionally bordered with black; *length*, 3 to 5 inches.

The “Black Slug,” or “Hodmetod” * as it is called in the eastern counties, is the largest member of the genus.

Its range extends over the whole of the British Isles, and it is often pestilently common. At Stafford I once saw a field of cabbages ruined by its depredations.

It is not only extremely common in kitchen-gardens and places where there is rank or decaying vegetation, but it may be found on moors, in peaty and boggy places usually shunned by molluscs.

* In other parts of the country *Helix aspersa* is called the “Hodmetod.”

Usually no shell is to be found, but now and then there are a few calcareous granules, and in rare instances in chalky districts these granules form a solid lump of considerable size. The foot-sole is sometimes bordered with black or brown, according to the colour of the animal.

It seems to prefer decaying vegetation to fresh. I have several times found it engaged in acts of cannibalism, and I once found a colony of the beautiful var. *albolateralis* feeding upon excrement. These habits are "not nice," and I have never had the courage to try this species as an article of diet.

The very young are pale yellowish white. The tentacles first begin to turn bluish, then black, and then the back, the colour gradually spreading down to the fringe. These changes do not always vary directly as the size of the animal—perfectly black individuals sometimes occurring only a third of the adult size.

Very little is known, as yet, of the causes of the colouration of slugs. Differences of food, geological formation of habitat, inheritance and protective mimicry may all or some of them combine to produce the various striking and beautiful forms we meet with.

This is a fascinating though most difficult problem, but one which can only be lightly touched on here.

Dr. Scharff ("Slugs of Ireland," page 554) says:—"I think that the colours of slugs in Ireland are at all ages, as a rule, protective" (and if in Ireland, why not every-

where else?) and he instances a beautiful example of protective mimicry in the case of *Geomalacus maculosus*. The results of my own collecting tend to show that climate may be a factor in the matter.

Dealing first with inland localities, I find that I have taken more brilliant forms and those more abundantly in the south of England (*where the climate is warmer*) than in the north. In the northern counties I have very rarely taken adult specimens other than the type; in the Midlands coloured varieties only occasionally appear, while the southern and western counties often teem with coloured forms—the type sometimes being a rarity.

Secondly, dealing with coast localities—all along the south coasts of England and Wales, Cardigan Bay, and the west coast of the Isle of Man and the north coast of Ireland (*all of which are noted for a mild climate*) I have taken coloured forms abundantly; while on the coasts of Lancashire and North Wales and the east coast of England from the Thames to the Tees (*where the climate is more bracing*) I have no personal records for anything but the type.

But before we can generalize confidently we require a vastly greater amount of observations.

To identify this species it is only necessary to irritate it, when it will contract into a completely hemispherical lump. With the exception of *Arion minimus*, this is the only member of the genus that can assume this shape, and it very rarely has any traces of banding.

A curious habit of this species is to sway from side to side when irritated. It is a ludicrous sight to see half-a-dozen of the creatures wagging together.

It must be remembered that the eight following varietal forms are by no means all the differently coloured varieties met with. What used to be called the variety *pallescens* (white body and mantle, blue tentacles, and a yellow or orange fringe), is now considered an approach to the perfectly white form, which I have never seen. On the north coast of Ireland I once found an individual of a brilliant salmon-pink colour, and in South Devon I found another of the same beautiful colour; both were very young specimens.

Var. I. *rúfa* (*Lin.*). Unicolourous red or brownish.

Var. II. *brúnnea* (*Roeb.*). Colour of burnt-sienna.

Var. III. *plúmbea* (*Roeb.*). Uniform pale lead colour.

Var. IV. *reticuláta* (*Roeb.*). Skin with the groove between the rugosities darker than the rugosities themselves, so as to present a reticulated appearance.

Var. V. *bicolor* (*Roeb.*). Back brown, sides primrose-yellow, colours sharply defined; *fringe* orange.

Var. VI. *swámmerdámii* (*Kal.*). Black, foot-fringe yellowish or orange.

Var. VII. *álbolaterális* (*Roeb.*). Black above, sides and foot white, colours sharply defined; *fringe* orange.

Var. VIII. *álba* (*Lin.*). Entirely white.

2. ARION SUBFUSCUS (*somewhat tawny*) *Draparnaud.*

Body grey or tawny yellow, with one longitudinal dark band on each side, and often a diffused band down the suture; *mantle* granulated, coloured and banded similarly to the body; *rugosities* shorter and less prominent than in *Arion ater*; *fringe* white with dark cross-streaks; *foot-sole* white; *slime* yellow or orange; *shell* none; *length* 2 to 3 inches.

The above description is that of a typical *subfuscus*, but we meet with bandless examples, and others in which the bands are all diffused into one broad dark patch over the body and mantle, extending to the lower edge of the lateral bands.

This species is most probably what English conchologists have called *Arion flavus*.

It is intermediate in size between *Arion ater* and *Arion hortensis*. When the bands are present it need not be confused with a colourless form of *Arion ater*, which is extremely rarely banded; nor need it be mistaken for *Arion hortensis*, which always has a yellow or orange foot-sole, that of *Arion subfuscus* being invariably white.

It has a wide distribution throughout the whole of the British Isles, but it is never very abundant.

It is found in the open country, and Mr. Roebuck informs me that it occasionally frequents pine woods and heather-covered moors.

The colouring is due to the slime which contains the pigment and comes off the animal on to the fingers like paint.

Var. I. *aurantiaca* (Loc.). Brilliant orange.

Var. II. *brúnnea* (Lehm.). Unicolourous brownish, the bands being obsolete.

3. ARÍON MÍNIMUS (*smallest*) *Simroth*. Pl. I., f. 2.

Body light grey or whitish, tinged with lemon-yellow, with faint indication of a lateral band down each side; *rugosities* pointed, arranged in longitudinal rows; *mantle* granulated, banded like the body; *foot-sole* yellowish; *slime* yellow; *length* 20 to 23 mm.

This species has been lately differentiated by Dr. Scharff, "Journal of Conchology," vol. vi., p. 267 (Oct., 1890). Mr. W. Denison Roebuck and others had, however, before this discriminated it from its congeners, but without venturing to accord it specific rank. Dr. Scharff, in the article above referred to, says:—"The wrinkles on the body form the chief characteristic of this interesting little slug. These, when examined by a lens, are found to possess pointed projections, which cause a peculiar glittering appearance when the light falls on them. These little spikes, which I have not noticed in any other form, are only seen when the animal is at rest. The body is then generally drawn up in a semi-circular position, which is so often assumed by *Arion ater* . . . but never seen in other slugs . . . as regards its habitat, *Arion minimus* is peculiar to the open country . . . fungi appear to be their natural diet."

Mr. Roebuck has recorded it for most parts of Great Britain. It is a common species everywhere.

It is apt to be mistaken for the young of *ater*, which is usually of a very similar colour when of the same size, and the resemblance is increased by the hemispherical form they both assume. It may be at once identified by its lateral bands, which *ater* is without, and by its rugosities which are small pointed projections arranged in symmetrical rows, whereas those in *ater* are very long and irregular. These projections are lengthened out and flattened somewhat when the animal is in motion. The foot-sole is usually overhung by the body instead of projecting beyond it, as is the case with most species, and the posterior extremity of the body is rounded off and not pointed as in the other *Arions*. Mr. Beulah, of Brigg, has long known this slug, and says a friend of his calls it the "Hedgehog Snail"—a happy allusion to its distinctive character.

4. ARION HORTÉNSIS (inhabiting gardens) *Férussac*. Pl. I., f. 3.

Body slender, grey, often with a greenish tinge, with blackish or purple side-bands; *rugosities* very long; *mantle* granulated, with dark side-bands; both *mantle* and *body* being darker in dorsal region; *foot-sole* always yellow or orange; *slime* yellowish; *shell* none, or rarely consisting of a few loose granules; *length* 1 to 1½ inches.

This species is well named. It is generally, though not exclusively, found in gardens.

Its range extends throughout the British Isles. Very young specimens much resemble *Arion minimus*, but the rugosities are sufficient to distinguish them. The yellowish

or orange tint of the foot-sole is a constant diagnostic character of *hortensis*, though it is possible to scrape off the slime from the foot-sole, leaving it a pallid colour. Its skin, as has been so often remarked, is wonderfully tough to crush.

Var. I. *rufescens* (Moq.). Reddish, with black bands.

Var. II. *subfúsca* (C. Pfr.). Orange, with brown bands.

Var. III. *nigra* (Moq.). Black, with lateral grey bands.

5. ARÍON CÍRCUMSCRÍPTUS (*banded*) Johnston.

[=ARÍON BÓURGUIGNÁTI *Mabile*.]

Not so long and slender as *Arion hortensis*, though similarly banded. A dark diffused band down the centre of the back, usually divided in the dorsal line by a whitish line; *foot-sole* brilliant white. Colour varying from white to very dark slate, with darker markings. Occasionally the markings are very faint and the animal nearly white; *slime* milky; *length* 1 inch.

This is a very common species throughout the British Isles. It is "sluggish" to the last degree, being rarely found on the move.

In its habitat it frequents open fields more than gardens.

The colour of the head and tentacles varies according to the colour of the animal, sometimes dark and sometimes light.

Var. *subfúsca* (Roeb.). Brownish with dark bands.

TABLE SHOWING THE DIFFERENCES IN THE *ARIONS*.

	<i>Arion ater</i> .	<i>A. subfuscus</i> .	<i>A. minimus</i> .	<i>A. hortensis</i> .	<i>A. circumscriptus</i> .
<i>Bands</i>	None.	Present.	Present.	Present.	Present.
<i>Foot-sole</i> ..	White, rarely bordered with body colour.	Pale white.	Yellow.	Yellow or orange.	Brilliant white.
<i>Slime</i>	Colourless.	Yellow.	Yellow.	Thick clouded yellow, very tenacious.	Clouded white.
<i>Size</i>	3 to 5 inches (largest species).	2 to 3 inches.	20 to 23 mm. (smallest species).	1 to 1½ inches.	1 inch.
<i>Rugosities</i> ..	The coarsest of all <i>Arions</i> , forming ridges and furrows.	Less prominent and shorter than <i>ater</i> .	Separate projections, not overlapping, but arranged in rows.	Long and not prominent; giving the back a smooth appearance.	As in <i>hortensis</i> .
<i>Diagnostic characters</i>	Hemispherical form at rest; absence of bands.	Bands mark it off from <i>ater</i> ; its size when adult, from the others.	Pointed rugosities; hemispherical shape at rest.	Yellow or orange foot-sole.	White foot-sole.

Genus.—GEOMÁLACUS *Allman.*

Genital pore near the base of the upper tentacles; *caudal gland* opening by a transverse slit; *body* rounded at caudal extremity (not pointed as in *Arion*); *shell* solid.

G. MACULÓSUS (*spotted*) *Allman.* Pl. I., f. 5.

Body cylindrical, dark grey; spotted on body and mantle with yellow or white; *shell* solid, and shaped like that of a *Limax*.

This beautiful species was discovered in 1842 in Kerry, near Lough Caragh, by William Andrews. Dr. Scharff has taken it at Darrynane, in the extreme west of Ireland, up to an elevation of 1,000 feet, and also at Castletown, Berehaven, near Glengariff, and at Cork. Besides the above British localities, it is only known to exist in Portugal.

Dr. Scharff says:—"The dark grey lichens [on which it feeds] with the white and yellow fructification conceal the slug perfectly, and there is no doubt that we have here a most striking instance of protective colouring."

Mr. T. Rogers, of Manchester, informs me that he once kept one of these slugs alive for more than two years, in both of which it produced fertile eggs; the young ones, however, died when they had attained about half their full size.

The figure of this slug I have copied with Dr. Scharff's kind permission from the excellent figure in his "Slugs of Ireland."

Family.—LIMACÍDÆ.

Body more or less carinated ; *respiratory orifice* behind the centre of the mantle-margin ; *shell* distinctly formed ; no *slime gland*.

Genus.—AMÁLIA *Moquin-Tandon*.

This genus is a link between *Arion* and *Limax* [see table, p. 20]. It differs from *Arion* (1) in the position of the *respiratory orifice*, which, in *Amalia*, is placed *behind* the centre of the mantle-margin ; (2) the *shell* is distinctly formed ; (3) the *slime-gland* is absent ; (4) it is carinated ; while it resembles *Arion* in having the *mantle* granulated.

I. A. GAGÁTES (*jet*) *Draparnaud*.

Body dark lead colour, paling on sides, bandless, marked with rugosities parallel to the keel ; *mantle* granulated, rounded oblong in shape, marked with a horse-shoe shaped groove ; *tentacles* slate colour ; *keel* extending the whole length of the body from the mantle to the posterior extremity ; *slime* colourless ; *foot-sole* pure white ; *length* 2½ inches.

Mr. R. D. Darbshire was the first to notice this species in Britain, finding a specimen at Portland, in 1852. He presented it to Professor Forbes, who identified it. It is said, however, that B. J. Clarke found it in Ireland in 1843.

It is a local slug, though with a wide range throughout the British Isles as far north as the Clyde. It mostly affects sea-coast counties, though it occurs in Shropshire, Notts, and Hereford, and on one occasion I took two individuals of the var *plumbea* at Stafford. It is found near Dublin and on the west coast of Ireland. The

drab-coloured variety is the form commonly met with in England.

Var. I. *plúmbea* (*Moq.*). Lead colour, darker above.

Var. II. *ráva* (*Williams*). Drab-brown colour.

2. *A. SÓWERBYI* (*after Sowerby*) *Férussac*. Pl. I., f. 10.

[=*L. MARGINATUS* *Jeffreys.*]

Body a warm brown colour, darker above; *mantle* marked with a groove in the shape of a horse-shoe, but with three angles like a truncated diamond, the fourth angle of the diamond being cut off by hinder edge of the mantle. The *body* and *mantle* speckled with the black; *shell* often very thick; *keel* very pronounced, extending the whole length of the back from mantle to posterior extremity; *foot-sole* yellowish; *slime* sticky; *length* 2½ inches.

This is also a somewhat local species, but has a slightly wider range than the last.

It may be pointed out that a transverse section of this slug, just behind the mantle resembles a bracket (—), while a similar section of *gagates* is in the form of a circumflex accent (∧).

I am not certain if the angles of the 'truncated diamond' can always be observed, as Dr. Scharff says that in Irish examples the marking in question is often faint. The same author points out that the colour of *sowerbyi* "is always brown or a bright yellow-brown, while in the variety [*ráva*] of *A. gagates* it is always a light drab brown. Both species may be distinguished merely by the touch. Whilst *A. carinata* [i.e. *sowerbyi*] feels like a sticky lump of fat, *A. gagates*, owing to its

more watery mucus, glides readily through the fingers." Perhaps the *foot-sole* is the most constant characteristic, being pure white in *gagates* and yellowish in *sozwerbyi*.

Var. *nigréscens* (Roeb.). Animal nearly black.

Genus.—LÍMAX *Linné.*

The *Limaces* have the mantle concentrically striated, the *respiratory orifice* (as in *Amalia*) behind the centre of the mantle-margin; *carination* confined to caudal extremity; *shell* distinctly formed; no *slime-gland*.

I. L. MÁXIMUS (*largest*) *Linné.* Pl. I., f. 6.

Body grey with a pink tinge, 2 dark lateral bands; *mantle* mottled darkly, oblong, obtusely pointed behind; *shell* oblong, convex above, convex below; *slime* colourless; *length* 4 to 6 inches.

This handsome slug is common throughout the British Isles. Colonies may sometimes be found in holes in walls and it commonly frequents cellars. I have found them "coming to sugar" on trees at night, when I have been moth hunting. Though not so abundant in the open country as other slugs, they may be found under logs in damp places.

This species, like many others, is not guiltless of cannibalism, even without the "extenuating circumstance" of hunger. On one occasion I placed two large individuals in a tin box with plenty of moss and a piece of cabbage leaf, and the next day I was surprised to find one only—of greater size than before—and no wonder, for he had devoured the whole of his companion with the exception of the mantle and shell.

Var. I. *cinérea* (Moq.). Spotless, mantle dark blue.

Var. II. *férussaci* (Moq.). Mantle marked with small black points, 4 rows of spots on body.

Var. III. *kryníkii* (Kal.). [= *jonstoni* (Moq.).] Ground colour a clear translucent lavender, *mantle* spotted with black, back marked with points and 2 fascia of black.

Var. IV. *lilacína* (Roeb.). Ground colour lilac or purplish.

Var. V. *fasciáta* (Moq.). Very dark grey on body and mantle, passing to cream white at sides, ridge of *keel* whitish ; a white band on body at each side of *keel*.

Var. VI. *pállido-dorsális* (Huds.). With two black stripes enclosing a median pale dorsal stripe ; *keel* much paler ; sides gradually paling downwards from the black stripes.

Var. VII. *maculáta* (Pic.). *Mantle* and *body* covered with black spots.

Var. VIII. *cellária* (D'Arg.). *Mantle* spotted with black, the 4 fasciæ on back, black, interrupted.

Var. IX. *Mülleri* (Moq.). Ash-coloured : back with white bands and a double row of black spots.

2. L. CINÉREO-NÍGER (*ashy-black*) Wolf.

This species may be distinguished from the last by the following characteristics :—“The shield is unicolorous without markings, or only slight traces towards the edge ; the respiratory orifice is margined with the colour of the body, of a darker hue ; the dorsal keel is in colour usually different from the general tint of the body ; the lower

surface of the foot is divided longitudinally into three differently coloured bands, the median one white, the two lateral ones dark. There are also important differences between the two species in the genital apparatus." ("Journal of Conchology," vol. iv., p. 41). The usual colour of the type is black and the rugosities on the body are larger than those of *maximus*. I also learn from Mr. W. Denison Roebuck that this is probably the real *maximus* of Linné, our *maximus* not being found in Sweden.

This slug, though local, has a wide distribution throughout the British Isles, and when its differences from *maximus* become better known, it will probably be found to be somewhat commoner than is generally suspected. I once found two specimens of the var. *maura* and one of *luctuosa* under the same log in a boggy place on Cannock Chase, where I have never seen anything else but *A. ater*. I have often visited the spot since, but never found another.

Var. I. *luctuosa* (Moq.). Unicolorous dark drab.

Var. II. *ornata* (Less.). Black; with whitish keel and dorsal band and 2 rows of white spots.

Var. III. *maura* (Held). Uniform jet black.

3. L. FLÁVUS (*yellow*) Linné. Pl. I., f. 7.

Body broadest just behind the mantle, yellow with a faint dark network, which appears to show from beneath the skin; coarsely tuberculated; *mantle* oval; *fringe* slightly more yellow than the body; *head* greenish; *tentacles* clear blue; *sole* cream white; *shell*, broad, rather thin, characterised by the nucleus slightly projecting over the edge; *length* 4 inches

This fine slug has a wide distribution throughout the British Isles as far north as Elgin. Its habitat is restricted to cellars and the vicinity to human habitations. Its distinctive characteristic is the blue colour of the tentacles.

Var. I. *viréscens* (Fer.). Of a greenish glassy appearance, usual markings scarcely visible.

Var. II. *colubrīna* (Pini.). Shield and body widely and irregularly spotted with black.

Var. III. *suffūsa* (Roeb.). Shield and body suffused with uniform dark tinge caused by the coalescence of the darker markings, shading off paler below.

Var. IV. *ruféscens* (Moq.). Reddish, markings indistinct.

Var. IV. *maculáta* (Kal.). Brown, with black markings.

4. L. MARGINÁTUS (*keeled*) Muller. Pl. I., f. 8.

[=L. ARBORUM B.-CH.]

Body light slate colour or pale greenish grey, having a semi-transparent gelatinous appearance, with two bands of dark colour along each side showing a lighter ridge on the dorsal line; *mantle* with two bands along each side and a broad suffused band down the centre, obtusely pointed behind; *head* pale with a dark line on each side coming from under the mantle along each side of the head level with and running along the upper tentacles which are light coloured and slender; *foot-sole* pale with a darker line down the centre; *Shell* solid, often a cuboidal mass; *Slime* colourless; *Length* 3 inches.

The 'Tree Slug,' as it may still be called in spite of its change of name for the sake of priority, is distributed over the whole of the British Isles as far north as

Sutherlandshire. It is abundant in Scotland, Ireland, Man, and the North of England; scarcer in the South of England. It has a habit of climbing trees, and is said to suspend itself from a branch by a thread of mucus. When placed on a plate or wet leaf it will move about actively, constantly raising itself up after the manner of a stoat, presumably for the same purpose of observation. I have often found individuals with a shell of abnormal development forcing the mantle into a hump and sometimes wearing a hole in it. Now and then an individual is found with the shell gone through the hole, which may possibly be caused by other slugs eating it away for the sake of the lime. I have seen a case where the shell of an *Ag. agrestis* has disappeared through a hole in presumably a similar manner. It should be noticed that the bands on the mantle are constant in this species, though those on the body are not.

Var. I. *nemorósa* (*Baud.*). Greyish red, banded along the mantle and on each side of the keel.

Var. II. *bettónii* (*Sord.*) Back spotted with black and white, median band white with a dusky band on each side; *mantle* with median band dusky, the side bands being alternately dusky and white.

Var. III. *maculáta* (*Roeb.*). Ground colour as in type, with the markings reduced to small rounded black spots and a thin continuous band along each side, which shows a tendency to break up into spots.

Var. IV. *rupicola* (*L. and P.*). Smaller ; dorsal band pale or wanting ; keel very gradually produced for two-thirds the length of the back, nearly black.

Var. V. *pállens* (*L. and P.*). Pale, dorsal line pale extending for two-thirds the length of the keel ; mantle pale with almost invisible bands.

Var. VI. *alpéstris* (*L. and P.*). Somewhat smaller, with a pronounced keel extending a quarter the length of the back, shield blackish, often obscurely banded ; back unicolorous with a pale median line.

Var. VII. *fúlva* (*Norm.*). Reddish brown suffused with black on the back ; shield reddish brown, scarcely obscured by small blackish specks.

Genus.—ÁGRIOLÍMAX *Malm.*

Dr. Scharff says:—" *Agriolimax* has only 4 convolutions in the intestines instead of 6, and these 4 are altogether different in position from those in *Limax*. In the last genus the left lobe of the liver formed the apex of the intestinal one ; in *Agriolimax* it is the right. The species of *Agriolimax* rarely possesses bands."

I. A. AGRÉSTIS (*inhabiting fields*) *Linne.* Pl. I, f. 9.

Very variable in colour and markings ; *shell* oblong ; *slime* milk white ; *length* 1½ inches.

This is the common "Field Slug" or "Dew Slug," which, unhappily, does not confine itself to its nominal habitat, but swarms everywhere, especially where its absence would be much appreciated. Its characteristic distinction is its *milk-white slime*. I once captured an

individual of the typical form coupling with one of the var. *nigra*.

Var. I. *punctáta* (*Picard*). Greyish or white with very small black points.

Var. II. *lilacína* (*Moq.*). Lilac or purple.

Var. III. *álbida* (*Picard*). Entirely white.

Var. IV. *nigra* (*Butterell*). Jet black.

Var. V. *reticuláta* (*Müll.*). Ash-brown with darker mottling, *mantle* unicolorous, paler.

Var. VI. *sylvática* (*Moq.*). Grey spotted thickly with dark purple.

Var. VII. *trístis* (*Moq.*). Brownish, shield with 2 lateral brown bands, sometimes with an intermediate third.

Var. VIII. *obscura* (*Moq.*). Reddish with brown spots.

Var. IX. *rufescens* (*L. and P.*), Yellowish or reddish, with a few obscure spots.

2. A. *LÆVIS* (*smooth*) *Müller*. Pl. I., f. 4.

Slender, chocolate brown, unicolorous, the *shell* resembling that of *A. agrestis*, though smaller, may be seen through the mantle; *slime* colourless; *footsole* same colour as body; *length* $\frac{3}{4}$ inch.

This is our smallest slug. It may at once be recognised by its uniform chocolate colour and its extremely active and lively habits. It frequents the same damp situations as *Hyalinia nitida*, and I have found it on flags some distance out in the water. It is of general distribution in England and Scotland, but hitherto locally recorded for Wales, and I have taken it in the North of Ireland;

Dr. Scharff says it is very local in that country, and only records it for Dublin.

Family.—TESTACÉLLIDÆ.

Genus.—TESTACÉLLA *Cuvier*.

Body of a firm texture, cylindrical; *tentacles* four; *mantle* situated at the caudal extremity; small, usually covered by the shell, which is ear-shaped.

The Snail Slugs form a link between the naked slugs with rudimentary shells, and the snails which live within their shells. Their shells, though rudimentary, are external, and are situated at the extremity of the tail, covering the vital organs. Like many slugs they are carnivorous, but to a much greater extent. Jeffreys (*British Conch.*, vol. 1, p. 153), says, "They will not eat dead animals," which is not the case with many slugs and snails. They are nocturnal in their habits and subterranean. The same authority goes on to say, "they only sally out at night in search of their prey, burying themselves deep in the ground in the daytime. . . . Heavy rains destroy a number of them. The average length of life in the *Testacellae* appears to be five or six years."

1. T. HALIOTÍDEA (resembling the Venus' ear shell, *Haliotis*) *Cuvier*.

Pl. II., f. 1.

Body pale yellow, capable of great extension, marked with furrows of a darker colour branching out from a point just under the shell and extending to the head; *mantle* almost concealed by the *shell*, which is ear-shaped and very slightly convex above; *length* 3 inches.

This species is found interruptedly throughout the length and breadth of England, as far north as Durham. In Wales it is recorded for Chepstow and Tenby; and in Youghal for Ireland. It occurs in the Channel Islands, but not in Scotland. It may however turn up in various localities hitherto unsuspected, as its subterranean habits facilitate its escaping notice.

2. *T. SCÚTULUM* (*little shield*) Sowerby. Pl. II., f. 2.

Differing from the last species in the furrows, which in this species branch off from a point outside and in front of the shell. It differs also in colour, which is ochre-yellow or brownish. *Shell* like that of *T. haliotideae*. *Length* 3 inches.

This species has a more restricted range in England than the last; with the exception of Lewes, and sparingly in Lancashire and Cheshire, it only occurs along the eastern side of this country as far north as Yorkshire. It is, however, found in Scotland, at Paisley. Though not found in Wales, it has a wider distribution in Ireland than the last species, being found at intervals along the south and east coasts. Like *T. haliotideae*, it occurs in Guernsey.

3. *T. MAÚGEI* (after Mauge), *Férussac*. Pl. II., f. 3.

This species differs from the other two in being much larger (4 inches in length), in colour deep brown, and in the furrows, which in this species branch out from under the shell much more widely than either of the others, as if the junction were much further underneath. *Shell* much larger and more cylindrical.

It has been thought that this species was imported in foreign mould to nursery gardens at Bristol, but this is now considered erroneous, its claim to rank as an indigenous species having been fairly established by its occurrence over a large district in the south-west of England and Wales, in Yorkshire, Berks., and Middlesex, and also in the south of Ireland and in Jersey.

Var. *viridans* (Morelet). Greenish brown, like bronze; ventral disc bright orange-red.

Family.—VITRINIDÆ.

Genus.—VITRINA *Draparnaud*.

Body incapable of being contained within the shell; *mantle* expanded over the lip of the shell when the animal is in motion; *tentacles* 4; *shell* globular, thin, transparent; *spire* very short; *mouth* obliquely semi-lunar; *umbilicus* none.

V. PELLÚCIDA (*transparent*) Müller. Pl. II., f. 4.

Spheroidal, very thin, transparent, green; *spire* scarcely raised; *mouth* large; A. $3\frac{1}{2}$ mm. B. $6\frac{1}{4}$ mm.

The *Vitrinas* are a link between the slugs and snails proper. They have the same tooth formation and mantle as the slugs, while their shells resemble those of the *Helices*.

Our pretty little English species is found in almost all parts of the British Isles. This shell, like a bubble of clear greenish-tinted glass, is a truly beautiful object, especially when set out on white cardboard or with a background of cotton wool. Two varieties are found,

TABLE OF ALLIED HYALINÆ.

	1. <i>H. lucida</i> .	2. <i>H. cellaria</i> .	3. <i>H. helveticæ</i> .	4. <i>H. alliaris</i> .	5. <i>H. nitidula</i> .	6. <i>H. nitida</i> .
<i>Body</i> ..	Cobalt blue	Slate grey.	Bluish grey.	Darker than No. 2.	Dark grey with a brownish tinge, speckled.	Slaty black, coarsely speckled.
<i>Foot</i> ..	Underside of foot-sole also cobalt.	Yellowish, pointed narrow, keeled behind.	Sole separated from upper part of foot by a dark line.	Very long and narrow.	Narrow in front, swollen and keeled behind.	Narrow, keeled.
<i>Tentacles</i> ..	Similar in shape to No. 2.	Long and slender.	Upper long, lower very short.	Short.	Short, bulbs, small.	Thick.
<i>Smell</i> ..	—	Said to smell of garlic occasionally	Smells of garlic occasionally.	Smelling strongly of garlic.	—	—
<i>Whorls</i> ..	6—7	5—6.	5—5½.	4—5.	4—5.	5.
<i>Suture</i> ..	Not so marked as in No. 2.	Broad and deep.	Slight.	Similar to No. 3.	Less marked than No. 2.	Very deep.
<i>Mouth</i> ..	Broader in proportion than No. 2.	Obliquely and deeply semi-lunar.	More circular than No. 2, but more interrupted by penultimate whorl.	Narrow.	Round.	Round.
<i>Umbilicus</i>	Similar to No. 2.	Rather broad, showing penultimate whorl.	Less open than No. 2, not showing penultimate whorl.	More open than No. 2.	Very broad.	Narrow.
<i>Diam. of Periphery</i>	14 mm.	10 mm.	9½ mm.	6 mm.	8½ mm.	6½ mm.
<i>Colour and Texture of Shell</i>	Fawn colour, opaque, bluish white below.	Horn colour above, opaque white below.	Darker and clearer than No. 2, less white below.	Thicker in proportion and more glossy than No. 2, darker, with less white below.	Not so glossy nor so transparent as No. 2.	Clear chocolate brown, very glossy; not white below; strongly striate.
<i>Diagnostic Characters</i>	Apex flat, opaque colour, expansion of last whorl. Size.	Size and suture.	Darker than No. 2, and mouth more circular. Apex raised, mantle darkly visible through shell.	Smell of garlic.	Dull appearance, large umbilicus.	No white below; deep suture; animal nearly black.

but the shell is very uniform. I have, however, a specimen taken in the north of Ireland with two milk-white bands running in a spiral direction from apex to mouth.

Under a lens, or even with the naked eye, the operation of breathing can be well observed. In autumn, winter, and early spring, especially after rain, our little friend is abroad on dead leaves and among moss.

Var. I. *depressiuscula* (Jeff). Oval and flatter on both sides.

Var. II. *dillwynii* (Jeff.). Globular, *spire* produced.

Family.—ZONITIDÆ.

Genus.—HYALÍNIA Agassiz.

[= ZONITÉS De Montfort.]

The identification of the different species of this interesting genus (the *Zonites* of our youth) often gives more trouble to the novice—to whom they all look pretty much alike—than all the rest of the British land and freshwater shells put together, except the vexatious *Pisidia*. To simplify matters for the beginner I have framed a synoptical table of comparison of those species most liable to be confused (*see p.* 43). Young specimens of some of the larger species require care lest they be mistaken for adult specimens of some of the smaller ones, and *vice versâ*. For instance, the young of *nitida* are apt to be mistaken for adult examples of *radiatula*, and the young *nitidula* for adult *pura*. It is a good plan in such cases to count

the whorls—a full-grown *radiatula* has $4\frac{1}{2}$, while *nitida* has 5. If, therefore, the shell under consideration is the size of an adult *radiatula* but has only 3 whorls, the observer will know that an extra whorl and a half would make the shell too large for a *radiatula*, and he may conclude it to be a young *nitida*.

The *animals* should also be studied and compared. It may be remarked that *fulva*, *crystallina*, and *excavata* are unmistakable when their several characteristics have been pointed out.

Sub-genus.—PÓLITA *Held.*

I. H. LÚCIDA (*clear*) *Draparnaud.*

[=H. DRAPARNALDI (*Beck*)].

Very slightly convex above; *apex* flat, fawn colour above, semi-transparent bluish white below; *whorls* 6-7, finely striated transversely, last whorl increasing towards the *mouth*, which is oval and very oblique; *umbilicus* wide. A. 6 mm. B. 14 mm. *Animal* cobalt blue all over, including foot-sole; darker on back, head, and tentacles. The mantle shows a dark collar through the shell when the animal is out and extended.

This handsome species, the largest of our British *Hyaliniæ*, is undoubtedly indigenous, though only recently admitted to rank as such.

The shell when adult is easily distinguishable from *cellaria* by its greater size and flattened appearance, its opaque fawn colour, its expansion of the last whorl towards the mouth, and its extra whorl. The animal too is very distinct in colour.

It has been recorded for the Isle-of-Man, the Channel Isles, Cornwall, Devon, Bristol, Lancashire, Hants, and Middlesex in England, Glamorgan in Wales, and Dublin and Limerick in Ireland. Its alleged occurrence in Scotland requires confirmation.

Var. *albina* (Moq.). Whitish.

2. H. CELLÁRIA (*inhabiting cellars*) Müller. Pl. II., f. 5, 5a.

Compressed, glossy, semi-transparent, pale horn colour above, clouded white below; *spire* nearly flat; *mouth* deeply semi-lunar; *whorls* 5-6; *umbilicus* broad and deep. A. $3\frac{1}{2}$ mm. B. 10 mm. *Animal* light bluish grey, footsole nearly white.

This is the commonest of our *Hyalinie*, being distributed over the whole of the British Isles as far north as Caithness.

It is found under stones and logs everywhere, though more abundantly in some localities than others.

In the neighbourhood of Dover, for instance, this and indeed all the *Hyalinie* are comparatively rare.

Its partiality for cellars and damp dark outhouses, which is peculiar to some extent to the last species also, has given it its appropriate specific name.

Var. I. *complanata* (Jeff.). Spire flat.

Var. II. *albina* (Moq.). Pale transparent greenish; or clouded or clear white.

3. H. HELVÉTICA (*Swiss*) Blum. Pl. II., f. 6.[=H. GLABRA (*smooth*) Jeffr. non Studer].

Convex above and beneath, very glossy and smooth, rather dark transparent horn-colour, very slightly marked with white below; *spire* raised and produced to a point; outline of *mouth* forming about three-quarters of a circle; *whorls* 5-6; *umbilicus* deep, but narrower than that of *cellaria* and not showing the last whorl. *Animal* with a black mantle showing a distinct black band through the shell. A. 5 mm. B. $9\frac{1}{2}$ mm.

Investigation has at last settled the dispute as to what the species we have been accustomed to call *glaber* was called on the continent. It appears to be the *helvetica* of Draparnaud, as Mr. Taylor had suspected many years ago.

This is a local species, though, as it is becoming better known, its distribution is found to be wide, extending over Great Britain as far north as Argyle and the Clyde Isles. There are no records for Ireland or Isle of Man; it is however found in the Channel Isles. Though known to Dr. Gray and figured by him in 1841 as a variety of *alliaria*, it was left to Mr. T. Rogers, of Manchester, to bring it into notice in 1870.

Many seem to confuse it with *alliaria*, and it has been considered by some authorities to be merely a variety of that species. There are, however, some very distinct differences between the two English forms. The adult *helvetica* is, of course, much the larger and is thinner in proportion to its size; but the distinction that I believe

to be constant, and therefore diagnostic, is that the umbilicus of *alliaria* expands with its growth, while that of *helvetica* contracts, so that in full grown specimens of *helvetica* the last whorl hides the penultimate when viewed from beneath, which is never the case with *alliaria*. The garlic smell of *alliaria* I have very often observed in *helvetica*, and *alliaria* is occasionally without it.

But it is rather with *cellaria* that the confusion is likely to arise. *Helvetica* is more glossy (in fact it is the most glossy of all our British species); its form more globose and compact, the sculpture almost absent, and the spire usually more raised and pointed. Unlike *helvetica*, *cellaria* always leaves the penultimate whorl exposed when viewed from beneath; and the suture of *cellaria* is broader and deeper. The colour is not much to rely on, but usually that of *helvetica* is darker and clearer than that of *cellaria*.

Mr. E. Collier of Manchester was the first to call my attention to the fact that this species will completely clean out other small shells when put into a box with it. He instanced *H. fulva* which was completely cleaned out by this means. I have since observed the same cannibalism in *H. nitidula*; *Helix rotundata* and *V. pellucida* when placed in a tube with the above, fall an easy prey, the shells being beautifully cleaned.

Var. *viridans* (Cockl). Greenish white.

4. H. ALLIÁRIA (*smelling of garlic*) Müller. Pl. II., f. 6.

More convex above though less so below than *cellaria*; *whorls* 5, the last smaller in proportion than the *cellaria*; *spire* slightly raised; *mouth* narrow; *umbilicus* rather wider in proportion than that of *cellaria*; *animal* smelling of garlic. A. $2\frac{1}{2}$ min. B. 6min.

According to the Conchological Society's records this species has a slightly wider distribution than *cellaria*; but it is not usually so abundant. It is found under stones and logs, etc., often abundantly. I have never found it in the Isle of Man, where *cellaria* is very plentiful, but it is recorded for that island.

Its odour of garlic is sometimes very powerful. I have especially noticed it in the north of Ireland, where I have sometimes smelt the animals before I found them. The odour is not, however, a certain mark of identity, as I have taken *helvetica* in North Wales and in Northamptonshire and Cheshire with this peculiarity; and *cellaria* is also said to possess it occasionally.

Var. *virídula* (Jeff.). Greenish white.

5. H. NITÍDULA (*slightly glossy*) Draparnaud. Pl. II., f. 8.

Compressed, thin, very slightly glossy, whitish beneath; *whorls* 5, convex; *striae* in line of growth strong, and very slight longitudinally; *spire* slightly raised; *suture* rather deep; *mouth* round except where interrupted by body of shell; *umbilicus* very broad and deep. A. $3\frac{1}{2}$ mm. B. $8\frac{1}{2}$ mm.

This shell has as wide a distribution as any other member of the genus as far as Great Britain is concerned. It

has also a wide distribution in Ireland. In the north of the island it is very abundant. It is not recorded for the Isle of Man. Like the rest of the genus it frequents moist places under stones and logs almost everywhere.

Its dull appearance serves to mark it off from the others except *pura*, which small specimens much resemble, especially on account of the cross striæ common to both species alike, and which in the young of *nitidula* are more noticeable than in the weathered adults. The size of the whorls is a guide in this case and the unfinished look of the young *nitidula*. The animal of *pura* is also usually lighter.

Var. I. *nitens* (Mich.). Last whorl expanding at the mouth.

Var. II. *Hélmii* (Ald.). White or greenish—a beautiful object, and rare.

6. H. RADIÁTULA (*minutely rayed*) Alder. Pl. II., f. 10.

Compressed, thin, highly glossy, and exquisitely marked transversely; *whorls* $4\frac{1}{2}$; *animal* nearly black. A. $1\frac{7}{8}$ mm. B $3\frac{3}{4}$ mm.

As Jeffreys points out, this very pretty little shell frequents moister places than *pura*. It is found in damp moss in woods and under decaying logs. Under a lens it is a beautiful object and need never be mistaken for the next species, which it resembles in shape and size, but care should be taken not to confound it with the young of *nitida* which is usually found in similar damp habitats.

It is slightly more local than *pura*, notably in Wales, and it is never abundant as is often the case with *pura*. It is found in all the four provinces of Ireland and has recently been added to the Manx list.

Var. *viridescēnti-álba* (Jeff.). Greenish white.

7. H. PÚRA (*clear*) Alder. Pl. II., f. 9.

Compressed, very thin, pearly white; faintly striated in the line of growth and still more faintly longitudinally; *whorls* 4; *mouth* nearly circular; *umbilicus* narrow but deep. A. $1\frac{7}{8}$ mm. B. $3\frac{3}{4}$ mm. *Animal* cream colour.

This delicate little species extends from end to end of Great Britain, but is not found everywhere.

In the 'Journal of Conchology,' Vol. VII., p. 151, Messrs. Standen and Nelson point out conclusively that the white form is the type that Alder named *pura* (doubtless from its clear pearly appearance). and that he regarded the brown form as a variety. Though Alder did not give a special name to the brown form, it seems to have been known to his contemporaries as *nitidosa*.

At present it is only locally known in Ireland, though I found it very plentifully in the north, the white form very considerably preponderating. In Scotland also this is said to be the case. In the Midlands I have taken about an equal proportion of the type to the variety, and I have observed the same equality in the west of England and in Kent.

Var. *nitidosa* (Gray). Pale horn colour.

Sub-genus.—VÍTREA *Fitzinger.*

8. H. CRYSTÁLLINA (*crystalline*) Müller. Pl. II., f. 13, 13a.

Depressed above, more convex below, thin transparent pearly white ; *whorls* 5, compressed ; *mouth* semi-lunar ; *umbilicus* exceedingly small ; A. $1\frac{5}{8}$ mm. B. $3\frac{1}{2}$ mm.

The iridescent appearance and symmetrical form of this little shell cause us to regret that it is one of the smaller instead of the larger members of the genus.

It is easily identified from its colour and the compressed appearance of the whorls, but especially by its umbilicus, which is so small that a pin of moderate size will hardly enter.

It is common everywhere in moist sheltered situations.

Var. I. *complanata* (*Jeff.*). Nearly flat on both sides, the last whorl larger.

Var. II. *contracta* (*Westl.*). Last whorl very narrow.

Sub-genus.—CÓNULUS *Fitzinger.*

9. H. FÚLVA (*tawny*) Müller. Pl. II., f. 14.

Pyramidal, thin, glossy, clear horn-colour, *whorls* $5\frac{1}{2}$; *mouth* narrow ; *umbilicus* merely a slight indent, only found in adult specimens. A. $2\frac{1}{2}$ mm. B. $2\frac{1}{2}$ mm.

This pretty little shell is a link between the *Hyalinix* and the *Helices*. Its quaint pyramidal shape prevents the possibility of mistaking its identity.

Its distribution extends over the whole of the British Isles. Common under rotten branches, and logs and stones, and among moss in woods.

Var. I. *mortóni* (Jeff.). Spire depressed, sharply carinated.

Var. II. *alderi* (Gray). Smaller, dark brown.

Var. III. *virídula* (Taylor). Greenish white.

Sub-genus.—ZONITOÍDES *Lehmann.*

10. H. NÍTIDA (*glossy*) Müller. Pl. II., f. II, IIA.

Rather solid, glossy, semi-transparent, clear chocolate brown, striated transversely, microscopically granulated; *whorls* 5; *spire* raised, *apex* blunt; *suture* deep; *mouth* round; *umbilicus* narrow but deep. A. $2\frac{1}{2}$ mm. B. $6\frac{1}{2}$ mm.

It is found at the roots of grass, among moss and under stones in moist places, often with *Ag. lævis*, usually not very abundantly, but Mr. J. R. B. Masfield once found a large colony at Tenby.

Young specimens may be mistaken for *radiatula*, but under a lens that species is seen to be more regularly striated and glossy. The most distinctive characteristic is perhaps the absence of white round the umbilicus and the clear chocolate brown colour of the entire shell.

Both this and the next species possess a 'dart,' which connects them closely with the *Helices*.

It has a very wide distribution throughout the whole of the British Isles, and is even reported to exist in Shetland.

Var. *albina* (Moq.). Transparent greenish.

II. H. EXCAVÁTA (*hollowed out*) Bean. Pl. II., f. 12.

Not very glossy, semi-transparent, light brown, coarsely striated transversely; *whorls* $5\frac{1}{2}$, nearly cylindrical; *spire* raised; *suture* very deep; *mouth* nearly circular; *umbilicus* very broad and deep. A. $2\frac{1}{8}$ mm. B. $5\frac{1}{8}$ mm.

This is a well-marked species. Its broad and deep umbilicus, convex spire, cylindrical whorls, and coarse appearance combine to render it easy of identification. Moreover it possesses a 'dart.'

Young shells are slightly carinated.

It is found in various parts of the four kingdoms, but it is a local species. It does not seem to frequent calcareous soils.

It should be looked for under stones, at the roots of grass, among dead leaves, etc., principally in woods.

Var. *vitrina* (Fer.). Greenish white.

Family.—HELICIDÆ

Genus.—HÉLIX Linné.

Body capable of being wholly contained within the shell; *tentacles* 4; *shell* conical; *spire* rarely much depressed.

Sub-genus.—PÁTULA Held.

I. H. ROTUNDÁTA (*rounded*) Müller. Pl. III., f. 15.

Circular, depressed, rather thin, semi-opaque, horn colour, marked at regular intervals with rufous brown; strongly ribbed in line of growth; *whorls* 6-7; strongly carinated; *umbilicus* large and open. A. $2\frac{1}{2}$ mm. B. $6\frac{1}{2}$ mm.

This is perhaps the commonest of our land shells. It is found everywhere under stones and logs, among moss, and in fact in most sheltered spots. In some districts, however, it is much scarcer than in others. Along the Yorkshire and the Kentish coasts it is comparatively scarce, though less so inland in those parts. The white or greenish variety is a beautiful object, and is often found in colonies.

a. Size. Var. I.—*minor* (*Jeff.*). Smaller.

b. Shape. { Var. II. *túrtoni* (*Flem.*). Spire flat.
 { Var. III. *pyramidális* (*Jeff.*). Spire raised.

c. Colour. { Var. IV. *álba* (*Moq.*). Pale green or white.
 { Var. V. *rúfula* (*Moq.*). Fawn colour without the rufous brown markings.

d. Deformities. { Monst. I. *sinistrórsu*m (*Taylor*).
 { Reversed.
 { Monst. II. *scaláریفó*rme (*L. E. Ad.*).
 { Whorls disunited.

2. H. RUPÉSTRIS (*inhabiting rocks*) *Draparnaud.* Pl. IV., f. 1.

Sub-conical, rather solid, semi-transparent, rather glossy, dark horn-colour; closely and regularly striated in the line of growth; obtusely carinated, especially when young; *spire* raised; *suture* very deep; *mouth* gibbous; *umbilicus* wide and deep. A. $1\frac{7}{8}$ mm. B $2\frac{7}{8}$ mm.

This is a hardy little creature, and may be found on stone walls and carboniferous limestone rocks at a considerable elevation. It has a wide range throughout England and Wales and Ireland, and it has been

recorded for Arran and Sutherland in Scotland and Isle of Man. It is gregarious.

Var. I. *viridescénti-alba* (Jeff.). Greenish white.

Var. II. *trochóides* (Kregl.). Spire more elevated, umbilicus narrower.

Sub-genus.—PÚNCTUM Morse.

3. H. PYGMÆA (*minute*) *Draparnaud*. Pl. IV., f. 2.

Circular, depressed, thin, semi-transparent, glossy, yellowish horn-colour; striated finely and regularly in the line of growth; *whorls* 4; cylindrical; *spire* more or less raised; *umbilicus* large. A. $\frac{3}{4}$ mm. B. $1\frac{1}{2}$ mm.

This is the smallest of the *Helices*. It frequents moist situations in woods and under hedges among dead leaves. It has a wide range throughout Great Britain and Ireland, and is often plentiful. A good plan that saves much time is to take a quantity of dead leaves home, and after drying them to examine the siftings.

H. pygmæa is a very pleasing object under a powerful lens—the close-set, well-marked striæ appearing as a surprise to the observer.

Sub-genus.—ACANTHÍNULA Beck.

4. H. LAMELLÁTA (*having plates*) *Jeffreys*. Pl. II., f. 16.

Globosely conic, semi-transparent, horn-colour; *epidermis* raised into ridges in the line of growth; *whorls* 6, turreted; *spire* blunt; *umbilicus* distinct. A. 2mm. B. $2\frac{1}{4}$ mm.

This little shell, which inhabits the north of Great Britain, as far south as Stafford, many parts of Ireland and Anglesea, frequents dead leaves, especially those of

the beech and holly, being often very abundant where it occurs.

It somewhat resembles an immature *Pupa* in shape, but a second glance will detect the distinct umbilicus and its turreted whorls with the epidermal ridges. It is one of those few species of which no one has been ingenious enough to find varieties.

5. *H. ACULEÁTA* (*spiny*) Müller. Pl. II., f. 15.

Pyramidal, turreted owing to its rapidly increasing convex *whorls*, of which there are 4 to $4\frac{1}{2}$; *epidermis* raised into ridges in the line of growth and produced into spines, which rise in symmetrical fringes round the whorls. A. $2\frac{1}{2}$ mm. B. $2\frac{1}{2}$ mm.

This is a beautiful object under a lens. It has a very extensive range throughout Great Britain, and also in Ireland. It is very abundant round Coleraine.

Owing to its colour and shape, as well as to the fact that its spines facilitate the accumulation of dirt, it is very likely to be passed over as a small lump of earth.

Var. *álbida* (*Jeff.*). Colourless.

Sub-genus.—VALLÓNIA Risso.

6. *H. PULCHÉLLA* (*minutely beautiful*) Müller. Pl. IV. f., 3.

Nearly circular, rather solid, semi-transparent, dull white; *whorls* $3\frac{1}{2}$; *mouth* nearly circular, trumpet-shaped; *umbilicus* wide and shallow. A. 1m. B. $2\frac{1}{4}$ mm.

This beautiful little shell is found under stones, among the roots of grass on stone walls and sometimes on sand-hills in most parts of Great Britain and Ireland. Unlike *H. ericetorum*, it is more common on the east coast of

Scotland than on the west. I have frequently taken it in ants' nests under stones. The variety is not uncommon.

At Beaumaris, where it is abundant, I found comparatively few individuals of the type, and the same remark applies to Northamptonshire.

Var. *costata* (Müll.). Marked in line of growth with epidermal ribs.

Sub-genus.—CHÍLOTRÉMA *Leach.*

7. H. LAPICÍDA (*stone-cutter*) *Linné.* Pl. IV., f. 4.

Circular, compressed, dark rufous brown, dull, semi-transparent; *whorls* 5; *mouth* obliquely oval, surrounded by a strong white reflected rim; very strongly carinated; *umbilicus* large. A. $6\frac{1}{2}$ mm. B. $16\frac{1}{2}$ mm.

This strikingly formed shell is found in many parts of England, as far north as Yorkshire, rarely in Wales, and not at all in Ireland. Its only Scottish habitat at Hawick has been destroyed. It occurs chiefly in calcareous districts, but not exclusively; it is fairly common at Maidenhead (Berks), where the soil is gravelly, and at other places where limestone is not present.

The name 'stone-cutter' is due to its supposed habit of boring into rocks. This idea is, of course, erroneous, but it does ensconce itself in crevices of rocks, whence it emerges after rain. The white form is very rare. I once took a single specimen at Ewell near Dover, on the trunk of a birch tree. In the same spot I have taken two scalariform specimens.

Var. I. *albina* (*Menke*). White.

Var. II. *minor* (*Moq.*). Smaller and darker.

Var. III. *nigréscens* (*Taylor*). Darker, peristome white.

Var. IV. *subánguláta* (*Pascal*). Periphery rounded without keel.

Monst. *scalarifórme* (*L. E. Ad.*) Whorls disunited.

Sub-genus.—GONÓSTOMA *Held.*

8. H. OBVOLÚTA (*wrapped up*) *Müller.* Pl. IV., f. 5.

Circular, flat above, compressed below, moderately solid, opaque reddish brown, hispid, *whorls*, $6\frac{1}{2}$, compressed; *mouth* triangular, surrounded by a strong pinkish-white rim with 3 denticles; *umbilicus* large. A. 5 mm. B. $12\frac{1}{2}$ mm.

This peculiar shell, sometimes known as the 'Cheese Snail,' is found along the northern ridges of the South Downs from Duncton, Graffham, and Singleton, Up-Park in Sussex, through Ditcham and Stoner, in Hants, and Crabbe Wood near Winchester. It is found under dead fallen boughs.

I have seen a young sinistrorse specimen in the possession of Mr. W. Heathcote of Preston, which is said to have come from Mitcham in Surrey.

Monst. *sinistrórsu*m (*L. E. Ad.*). Reversed.

Sub-genus.—POMÁTIA *Leach.*

9. H. POMÁTIA (*operculate*) *Linné.* Pl. III., f. 1.

Globose, solid, opaque, cream-colour, with 5 or less bands of dull red, coarsely striated in the line of growth, *umbilicus* narrow. A. 43 mm. B. 43 mm.

The 'Apple Snail,' as it used to be called, is the

largest of our land snails. The above term was applied to it under the misapprehension that *pomatia* was derived from the Latin *pomum*, an apple, whereas it is from the Greek *poma*, an operculum. It has no true operculum, but, when retiring into winter quarters, forms a very thick epiphragm from a secretion of the mantle, which hardens on exposure to the air like plaster-of-Paris. When this thick plate closes the entrance, the animal retires deeper into the shell and fortifies itself still further against the cold by a succession of thin films.

Whether this snail was introduced by the Romans as an article of food is doubtful; at any rate the coincidence of its local and restricted range in the vicinity of Roman military stations and villas is very striking, and Mr. B. B. Woodward (Proc. Geol. Mag., August, 1890, "Mollusca of the London district," says, "*H. pomatia* and *H. aspersa* are not found anywhere in pre-Roman deposits, though frequently found with Roman remains."

Jeffreys argues against the theory of its Roman introduction on the ground there are several such localities where it does not exist, which negative evidence is hardly convincing, especially as regards the northern places he instances (York, and Wroxeter near Shrewsbury), where the colder climate might be expected to disagree with its southern constitution, and the soil is not calcareous. Jeffreys also points out that the shell has not been found in any

recognised stratum of the Upper Tertiary formation in this country, and this would lead to the inference that it was introduced later. There is also a theory that it was introduced by the monks in the middle ages; but this interesting question has yet to be worked out. Morton, in his "Natural History of Northamptonshire," published in 1712, mentions that "The Great Edible Snail, though common in some places in the *Southern* parts of *England*, yet can scarce be brought to live with us; as appears by an experiment made by the late Lord *Hatton*, who put a great many live ones of this kind into a convenient coppice near his house at *Kirby*, with intentions that they should breed there, but in a short time they all dy'd."

About 1810 General Arbuthnot brought some from abroad and introduced them into a shrubbery at Woodford, Northants, where they throve for some thirty years; now no trace of them remains.

A curious thickening of the lip is often found in this species, and I once found a perfect pearl, which was detached from the shell, in a specimen I collected at Charing in Kent.

It is found in Hants, Sussex, Kent, Surrey, Oxford, Gloucester and Bedfordshire.

On the continent it is considered a delicacy, being fattened on vine leaves and is hence called the 'vine snail.' It may be seen exposed for sale in the markets.

I can recommend those interested in the subject to read Dr. J. Reynes' charming little book "L'Escargot," and also Reeve's interesting "Edible British Mollusks."

The white variety has been found in England, though not the reversed form, which is not very uncommon on the continent.

Var. *albida* (Moq.). White.

10. H. ASPÉRSA (*besprinkled*) Müller. Pl. III., f. 2.

Globose, solid, opaque, yellowish with 5 dark brown bands, which are interrupted at intervals by lighter markings; *whorls* $5\frac{1}{2}$; *umbilicus* none. A. 35m. B. 35mm.

Everyone knows the "Common Garden Snail." Those, however, who only regard it as an object of immediate extermination have no idea of its beauties when met with under happier auspices.

The proprietor of a London garden, for instance, strolling out after a shower of rain, when he fixes his stern gaze upon our friends regaling themselves upon his pet sun-flowers, generally collects them in an empty flower-pot, and then heaves them stealthily into his neighbour's garden, whence, perhaps the next day, they return in a similar manner. This person, I say, is not in the frame of mind to appreciate their beauty; and, indeed, near towns they are *not* beautiful, being mostly without any epidermis and covered with dirt.

The finest and most beautifully marked specimens that I have seen were taken in the Isle of Man. In various parts of England *H. aspersa* still forms an article of food,

and in Venice and other parts of the Continent I have seen baskets-full collected for this purpose. The taste is insipid, and the animals are apt to be tough if not well boiled. As nourishing food, however, they rank with calf's-foot jelly, oysters, etc. The "band formula" may be used for this species as for *H. nemoralis*.

Though it has a wide distribution throughout the British Isles, it is thought by some to have been introduced not earlier than the time of the Romans.

It is a pity that Dr. Jeffreys and others described some of their varieties as having more than one characteristic. The form *tenuior*, for instance, is not always "dwarfed," nor is the var. *conoidea* always "thinner." Of course, it may be objected that a full-sized individual with a very thin shell is not the v. *tenuior*, at any rate of Shuttleworth, or a conical individual with a thick shell the var. *conoidea* of Jeffreys; but in all probability if these conchologists had seen more examples they would have left out the secondary characters, which for practical purposes may be disregarded. The form *unicolor* represents what is usually known as v. *grisea* (Moq.). *Exalbida* is local, but often not uncommon where it occurs, especially in the west of England and in Kent.

Size.	{	Var. I. <i>globosa</i> (Moq.). Larger, globular.
		Var. II. <i>minor</i> (Pic.). Smaller. A. 22mm. B. (maj.) 28mm. (min.) 23mm.
Texture.		Var. III. <i>tenuior</i> (Shuttl.). Thin, dwarfed.
Shape.		Var. IV. <i>conoidea</i> (Pic.). Conical, thinner.

- | | | |
|--------------------------------|---|---|
| Color
and
mark-
ings. | { | Var. V. <i>álbo-fasciáta</i> (Jeff.). Bands (123) and (45) coalescing, leaving a white band round the centre. |
| | | Var. VI. <i>exálbida</i> (Menke). Yellowish or whitish. |
| | | Var. VII. <i>nigréscens</i> (Moq.). Blackish, nearly unicolorous. |
| | | Var. VIII. <i>zonáta</i> (Moq.) Pale with the 5 bands distinct. |
| | | Var. IX. <i>unduláta</i> (Moq.). Marked with dark and light alternate undulatory markings. |
| | | Var. X. <i>flámmea</i> (Pic.). Marked as in var. 9, but with broad flammules. |
| Monst-
rosities. | { | Var. XI. <i>unícolor</i> (Moq.). Uniformly reddish. |
| | | Monst. I. <i>sinistrórsun</i> (Taylor). Reversed. |
| | | Monst. II <i>cornucópia</i> (Gmelin). Whorls dis-
united. |

Sub-genus.—TACHEA Leach.

II. H. NEMÓRALIS (*inhabiting groves*) Linné. Pl. II., f. 17.

Globular, solid, very brilliantly and variously coloured, the type having five bands; *whorls* $5\frac{1}{2}$; *umbilicus* distinct in the young, closed in the adult; inside of *lip* usually coloured; *dart* straight, length 7-8 mm. A. $16\frac{1}{2}$ mm. B. $22\frac{1}{2}$ mm.

This is the pretty and common snail which spots the country hedges after a shower. It is remarkably abundant on sandhills by the sea, and it has a great partiality for chalk and limestone, but it does *not* often inhabit 'groves' as its name would imply.

In a wood near Dover, I have seen it climbing the trunks of large beech trees in company with *H. lapídica*

and *L. marginatus*[=*L. arborum* (B.-Ch.)] during heavy rain, a habit which I have not noticed in the north of England, though I have often done so in the south of England and also on the continent. It is not recorded yet for Radnorshire, and a few of the Scotch and Irish counties, but further investigation will probably supply the gaps.

Thrushes devour it with great relish, first breaking the shell on a stone. These 'Thrush Stones' are well known to country people. The bank vole (*M. glareolus*), and probably other field mice, are very partial to *Helix nemoralis* and *H. aspersa*, and the empty shells may be found in their 'runs' in quantities. These mouse-eaten shells are always eaten through the side, the apex of the spire and the tip being left entire, and so need not be mistaken for those eaten by thrushes, which are always broken at the top of the spire. Mr. C. E. Wright, of Kettering, counted 96 mouse-eaten shells in one foot of a 'run' ten feet in length which was full of them. Along the sandhills on the north coast of Ireland I used to find fresh shells empty and apparently broken by rabbits' teeth, in numbers at the entrances to their burrows, but whether 'brer rabbit' or rats were to blame for this I could never discover. At any rate some of the lower animals know what is good, and I can from experience recommend this species and the next as delicacies. They should be left in an empty box to 'scour' for a couple of days, and then boiled and eaten cold with vinegar and pepper

They may not find favour just at first with some, but those who like periwinkles will not find *nemoralis* inferior. In France and Italy *H. nemoralis*, *H. pisana*, *H. pomatia*, *H. aspersa* and *H. lactea* are sold in the markets ready cooked. I would, however, caution those experimenting on snails to ascertain what they have been feeding on, as on one occasion I fed on a batch of *H. pisana* sent from Tenby and found myself very uncomfortable. On enquiry I learnt that they had been gathered from the wild celery. *Verb. sap.*

BAND-VARIATION IN HELIX NEMORALIS AND H. HORTENSIS.

No philosophical plan of treating the numerous variations of these species has yet been propounded, and until such is the case it is deemed the wiser plan to include in the list only variations of size, form, texture, colour of lip and ground-colour. A convenient method or formula, however, exists by which band-variations may be readily and accurately recorded. As all conchologists know, the type form has five bands, each of which is constant in its position on the shell, three of them being always above, and two always below, the periphery. The variation is usually by suppression or by coalescence of one or more of these bands, or both. Numbering the bands for convenience, 1, 2, 3, 4, 5, the uppermost being the first, and the lowermost the fifth band, the formula for

the type would be written thus: 12345. In the case of the suppression of a band, a cypher (0) is used in lieu of its number, thus—12045—signifying that the corresponding band is deficient. The unicolorous form is a case of the suppression of the entire series of bands, and for this the formula is five cyphers, thus—00000. In the case of coalescence of one or more bands, the numbers standing for the coalesced bands are enclosed within parentheses, *e.g.*—(12)3(45), which signifies that the first and second bands are fused together, also the fourth and fifth, the third only being free. Any combination of these formulæ may be used, as for instance, (12)305 signifies the coalescence of the first and second, and the suppression of the fourth. The black specimens afford an instance of the coalescence of all five bands, for which the formulæ is written thus—(12345). Additional bands which are to be considered as splits off the normal ones) are denoted by a small figure, thus—123₃45 or 12₃345.

1234¹5 indicates that a split occurs either of the 4th or 5th band forming an extra band intermediate.

1 : 345 indicates that traces only of band 2 are present.

123₄5 indicates that the 4th band is very narrow.

1234₅ indicates that the 4th band is very broad.

I have had the curiosity to work out the possible plain band combinations and the result is tabulated on p. 70.

It must be remembered that these are merely the *plain* combinations, and that the various possibilities of eccentricity, such as extra bands, interrupted bands, etc., are practically infinite when combined, as they may be with any or all of the groups (a), (b), to (h). Thus it is possible to have such a combination as the following :—

H. nemoralis, *m. scalariforme* + *m. sinistrorsum* + *v. major* + *compressa* + *libellula* + *roseolabiata* + *roseozonata*, 12345.

It is perhaps fortunate that there are certain practical limits to an infinite series. For instance, in cases where a band is wanting, the coalescence of other bands is uncommon. It is still more uncommon to find examples of *nemoralis* or *hortensis* possessing the upper and lacking the lower banding. The converse of this is also uncommon, though to a less degree, and confined to certain localities in England, though it is more common in Ireland. Perhaps the commonest form is that in which the third band alone is present (00300), an additional proof of the distinction between this species and *hortensis*, which is very rarely marked thus. The suppression of the third band alone is rare in both species alike.

a. size. $\left\{ \begin{array}{l} \text{Var. I. } \textit{major} \text{ (Fér.). Diam. 28mm. (after} \\ \text{Pascal).} \\ \text{Var. II. } \textit{minor} \text{ (Moq.). Diam. 16mm. (after} \\ \text{Pascal).} \end{array} \right.$

b. texture. Var. III. *ponderosa* (Malm). Shell thicker and heavier.

c. shape. { Var. IV. *comprensa* (Terver). Spire depressed.
 { Var. V. *cónica* (Pascal). Spire raised.

d. colour. { Var. VI. *libellula* (Risso). Yellow.
 { Var. VII. *rubella* (Moq.). Reddish.
 { Var. VIII. *castánea* (Moq.). Chestnut colour.
 { Var. IX. *olivácea* (Risso). Dark olive colour.
 { Var. X. *albina* (Moq.). Pale white.

e. lip. { Var. XI. *roseolabiáta* (Taylor). Peristome
 and rib pink or pale brown.
 { Var. XII. *ábolabiáta* (V. Mart.). Peristome
 and rib white.
 { Var. XIII. *bimargináta* (Moq.). Peristome
 black, rib white.

f. bands. { Var. XIV. *hyalozonáta* (Taylor). Bands trans-
 lucent.
 { Var. XV. *roseozonáta* (Ckl.). Bands pinkish.

g. markings. Var. XVI. *únduláta* (Gent.). Bands fading
 and deepening.

h. mon-
 trosties. { Monst. I. *sinistrórsun* (Taylor). Reversed.
 { Monst. II. *scalárifórme* (Taylor). Whorls
 disunited.

Plain Band combinations of *H. nemoralis*, *H. hortensis*,
and *H. aspersa*.

	5 Bands.	4 Bands.	3 Bands.	2 Bands.	1 Band.	0 Bands.
1	12345	02345	02045	00045	00005	00000
2	(12)345	0(23)45	020(45)	000(45)	00040	
3	1(23)45	02(34)5	02305	10005	00300	
4	12(34)5	023(45)	0(23)05	12000	02000	
5	123(45)	0(23)(45)	02340	(12)000	10000	
6	(123)45	0(234)5	0(23)40	00305		
7	1(234)5	02(345)	02(34)0	10040		
8	12(345)	0(2345)	0(234)0	02005		
9	(12)3(45)	10345	10305	02300		
10	1(23)(45)	10(34)5	12040	0(23)00		
11	(12)(34)5	103(45)	(12)040	02040		
12	(123)(45)	10(345)	00345	00340		
13	(12)(345)	12045	00(34)5	00(34)0		
14	(1234)5	(12)045	003(45)	10300		
15	1(2345)	120(45)	00(345)			
16	(12345)	(12)0(45)	10045			
17		12305	100(45)			
18		(12)305	12005			
19		1(23)05	(12)005			
20		(123)05	12300			
21		12340	(12)300			
22		(12)340	1(23)00			
23		1(23)40	(123)00			
24		12(34)0	10340			
25		(12)(34)0	10(34)0			
26		(123)40				
27		1(234)0				
28		(1234)0				

12. *H. HORTÉNSIS* (*inhabiting gardens*), Müller. Pl. II., f. 19.

Differing from *H. nemoralis* by its smaller size, more globular form, and relatively greater solidity; typical banding the same as in *H. nemoralis*; *outer lip* and *columella* usually white; *inner lip* excessively thin and coloured or banded like the rest of the shell; *animal* usually lighter in colour than *nemoralis*; *dart* curved, length 4mm. A. 16mm. B. 18mm.

H. hortensis, long a disputed species, has now been definitely separated from *H. nemoralis*. Its name *hortensis* (the garden snail) is as inappropriate as that of the last-named, since it rarely frequents gardens.

Though its range is not quite so extensive as *H. nemoralis* in England, Ireland, and Wales, it is of wider distribution in Scotland and will probably be found in every comital area in that country.

The two species are by no means invariably associated even when occurring in the same district, though occasionally, as in the limestone region of Derbyshire, they both swarm over the "tors." On sandhills near the sea, where *nemoralis* is usually abundant, *hortensis* is rarely, if ever, found. It varies in colour almost as much as *nemoralis*, but not concomitantly, the albino form, for instance, being much more common in *hortensis*.

With a little experience it may usually be distinguished from *nemoralis* by its general appearance; and it is a general, though not a universal rule, that, whereas white-lipped examples of *nemoralis* are yellow (resembling the

v. lutea of *hortensis*), the coloured-lipped *hortensis* are red. When, however, doubt exists, the “dart” should be procured by following the directions given in the Introduction, p. 12.

Mr. Chas. Ashford once informed me that “the rapid fading of the peristome tint appears to be peculiar to *H. hortensis* as distinguished from *H. nemoralis*. In fact it is an accidental colouring in the former case and a normal one in the latter.” This fact, which I have since fully verified, is an additional reason for considering the two species distinct.

The same variety often differs in different localities, the form *lilacina* for instance is sometimes found of a pale homogeneous lilac, more often clouded in patches, and sometimes, in South Devon for instance, almost runs into the *olivacea* form, and is there tinged with yellow. The handsomest and perhaps rarest form of both this and the last species is *v. roseo-zonata*.

a size. V. I. *minor* (*Moq.*). Smaller.

b. colour. { V. II. *albina* (*Moq.*). White.
 { V. III. *lútea* (*Moq.*). Yellow.
 { V. IV. *incarnáta* (*Moq.*). Reddish.
 { V. V. *olivácea* (*Taylor*). Olive brown.
 { V. VI. *lilacína* (*Taylor*). Bluish violet.

- c. lip. { V. VII. *roseolabiata* (Taylor). Lip pink.
 { V. VIII. *fuscolabiata* (von Mart.). Lip dark.
 { V. IX. *luteolabiata* (L. E. Ad.). Lip yellow.
- d. bands. { V. X. *roseozonata* (Ckl.). Bands reddish.
 { V. XI. *arenicola* (MacGill.). Yellow ; bands
 transparent.
- e. texture. V. XII. *tenuis* (Bandon). Thin and translucent.
- f. monstrosity. m. *sinistrorsum* (Taylor). Reversed.

Sub-genus.—ARIANTA, Leach.

13. H. ARBUSTORUM (*living in copses*), Linné. Pl. III., f. 18.

Globose, solid, glossy, brown and yellow, forming a sort of check pattern, with a single band of dark brown ; *lip* white ; *umbilicus* indistinct. A. 12mm. B. 20mm.

This is rather a local species, though often very abundant. It has a very extensive range throughout Great Britain, though it is only locally known in Ireland. Forbes records it for the Isle of Man, but it has escaped notice there of late years. It is not known in the Channel Isles.

It is found in ditches and hedgebanks, sometimes in woods, and it is usually very abundant where there is chalk or limestone.

The northern forms are usually smaller and more conical than the southern, besides being more strongly

marbled. The large flat shells from the Kentish coast approach the continental forms in appearance.

I know of a colony of *v. canigonensis* near Dover. This is a most striking form, but apt to be passed over for a dark *nemoralis*.

- | | | |
|-------------------------------|---|--|
| a. size. | { | V. I. <i>májor</i> (<i>Pfr.</i>). Larger. A. 20mm.
B. 27-30mm. |
| | { | V. II. <i>mínima</i> (<i>Pfr.</i>). Smaller. A. 10mm.
B. 14mm. |
| b. shape | { | V. III. <i>conóidea</i> (<i>West.</i>). Conical, larger,
irregularly striate. |
| | { | V. IV. <i>alpéstris</i> (<i>Zeigl.</i>). Conical. A. 12mm.
B. 15-18mm. |
| c. texture. | { | V. V. <i>fúscá</i> (<i>Fér.</i>). Dark, thin, trans-
parent with or without bands. |
| | { | V. VI. <i>canigonensis</i> (<i>Boubee</i>). [= <i>Repellini</i>
(<i>Taylor</i>)]. Unicolourous brown with
darker band. |
| d. colour
and
markings. | { | V. VII. <i>fuscéscens</i> (<i>D. and M.</i>), [= <i>Marmo-
ráta</i> (<i>Taylor</i>)]. Similar to type but
bandless. |
| | { | V. VIII. <i>lúteo-fasciáta</i> (<i>D. and M.</i>). Bands
translucent. |
| | { | V. IX. <i>cíncta</i> (<i>Taylor</i>). [= <i>pállida</i> (<i>Taylor</i>)].
Light yellow, with band. |
| | { | V. X. <i>flavéscens</i> (<i>Moq.</i>). Light yellow,
bandless. |
| | { | V. XI. <i>albína</i> (<i>Moq.</i>). White. |

Sub-genus.—FRUTÍCICOLA, *Held.*

14. H. CANTIÁNA (*Kentish*), *Montagu.* Pl. III., f. 3.

Compressed, thin, dull, creamy white with a pink tinge; closely striated in the line of growth; *whorls* 6-7, not keeled; *spire* obtuse; mouth pink inside; *umbilicus* narrow but deep. A. 10mm. B. 17½mm.

The “Kentish snail” is found nearly all over the South and East of England—especially fine and abundant in Kent. Mr. W. D. Roebuck informs me that it has the same range in England as the dormouse and the nightingale. It extends as far north as Warwickshire, where its range narrows to a single county (Notts.) and then spreads into Yorkshire, Durham and Northumberland; but there is reason to believe that its presence in these two last counties is due to “ballast.” In Wales it is only found in Glamorganshire, and it has not been recorded for Ireland or any outlying island except the Isle of Man.

Mr. B. B. Woodward in the article referred to on p. 60, says that this species was probably introduced after the time of the Romans. If so, it has found its way into such out-of-the-way localities that its aptitude for distribution must be great. I am informed that at Middlesbrough it has been recently imported, probably in ballast, and has established itself firmly. I have never observed that birds feed upon it, which may tend to its fitness to survive and therefore multiply. I have never taken it in *field* hedgebanks, or in waste places, except where there is also a road or path which would point to its diffusion by human agency.

V. I. *pyramidata* (Colb.). Spire more raised.

V. II. *rubescens* (Moq.). Reddish.

V. III. *galloprovincialis* (Dup.). Last whorl less depressed, striæ more regular and finer; *umbilicus* none.

V. IV. *alboincta* (Ckl.). Colour absent along the periphery.

V. V. *albida* (Taylor). White.

M. *sinistrorsum* (Taylor). Reversed.

15. H. CARTÚSIANA (after a Carthusian monastery), Müller.

Pl. III., f. 4.

Depressed, globose, semi-transparent, slightly glossy, whitish, tinted with brown except round the circumference of the shell, where the white ground colour usually forms a cincture; *whorls* 6-7; *mouth* with white internal rib; *umbilicus* almost hidden by the reflexion of the outer lip. A. 7mm. B. 12½mm.

The British localities for this species are the downs of Kent and Sussex; and in Norfolk, on the chalk near Long Stratton, I took a single dead specimen in 1890.

It is also said to have been found in Surrey, Yorkshire, Somerset, Bucks., Essex, and Glamorgan.

I have noticed that specimens from the sand-hills at Sandwich are very much darker and more transparent than those I have taken from a chalk-hill near Lewes and from the chalk downs of Dover. On the sand-hills at Sandwich the shell feeds on the Hound's Tongue

(*Cynoglossum officinale*), and much resembles in colour and position the clusters of burrs upon that plant, but its colour there depends apparently on the absence of chalk.

It is much smaller and smoother than *cantiana*.

Mrs. Fitzgerald, of Folkestone, who has collected this species for years and knows the district thoroughly, informs me that it shares with *A. glutinosa* the peculiarity of disappearing and reappearing at intervals.

Var. I. *minor* (Moq.). Diam. 10 mm.

Var. II. *lactescens* (Picard)=v. *albida* (Jenner). White.

Var. III. *leucoloma* (Stabile). Shell entirely white or with white peristome or rib.

Var. IV. *rufilabris* (Jeff.). Lip red instead of white.

16. H. RUFESCENS (reddish), Pennant Pl. III., f. 5.

Sub-conic, depressed, thick, semi-opaque, dull-brown or rufous, *periphery* usually bluntly keeled; *whorls* 6-7; *spire* short and blunt; *mouth* semi-lunar with white internal rib; *umbilicus* narrow but deep. A. 7½mm. B. 12½mm.

This species has an extensive range throughout Great Britain, as far north as Stirling. It is often very abundant in the south of England, but it is very local in some parts of the country. It has a wide range in Ireland, but is rare in the north-east district.

The white form is exceedingly common in most places where the type is found. It is a variable shell, and series from different localities are interesting.

- a. size. Var. I. *minor* (*Jeff.*). Smaller.
- b. shape. Var. II. *depressa* (*Taylor*). Spire flat.
- c. colour { Var. III. *rúbens* (*Mog.*). Deep dull reddish
 { colour.
- and { Var. IV. *álbo-cíncta* (*Cockl.*). With a white
 { band round the circumference.
- markings. { Var. V. *álba* (*Mog.*). White.

17. H. HÍSPIDA (*hairy*), *Linné*. Pl. III., f. 6, 7.

[=H. CONCINNA *Jeffreys.*]

Sub-conic, rather solid, rather glossy, greyish horn colour, often tinged with rufous; hispid but hairs deciduous; obtusely and very slightly keeled; *whorls* 6-7; *umbilicus* broad, open, and deep. A. 5 mm. B. 10 mm.

The 'Journal of Conchology' (April, 1892, p. 61) says: "The type specimen of this species in the Linnean collection is the form named by *Jeffreys* *H. concinna*. It has already been pointed out that no difference in the organization has as yet been detected between what have usually been termed *H. hispida* and *H. concinna*, and that they should probably be united together as a single species. It will be recollected that Dr. *Jeffreys* eventually considered that the two forms should not be separated, but as *H. concinna* had been accepted by others as a valid species, he restored it to specific rank, and it would appear almost against his own convictions of its specific value. If *H. concinna* be thus accepted as the type form

of *H. hispida*, we must *distinguish* the ordinary very hispid form, and perhaps we cannot do better than adopt Mousson's name, *hispidosa*."

This common shell is found throughout the British Isles as far north as Cantire. Though very few official records exist for Ireland it will doubtless prove a common species there, and it is so certainly in the north.

It is found in moist hedge-banks, at the roots of grass, and on decaying vegetation among moss, &c., having the same proclivities and habits as *H. rufescens*. I think it may be stated that wherever *H. rufescens* is found there will *H. hispida* be found also, though the converse is by no means true.

- | | |
|-------------------|---|
| a. size. | Var. I. <i>nána</i> (Jeff.). Smaller, depressed, with strong labial rib. |
| b. size and shape | Var. II. <i>subglobósa</i> (Jeff.). More globular, thinner, <i>umbilicus</i> small. |
| | Var. III. <i>hispidósa</i> (Mouss.) [= <i>H. hispida</i> Jeffreys]. Usually thinner, more hispid, <i>umbilicus</i> smaller. |
| | Var. IV. <i>dépiláta</i> (Alder). Shell openly umbilicate, glossy and practically not hispid. |
| | Var. V. <i>cónica</i> (Jeff.). Smaller, spire moreraised |
| c colour and | Var. VI. <i>subrífa</i> (Moq.). Solid, reddish-brown, with strong labial rib. |
| | Var. VII. <i>álbo-cíncta</i> (Tayl.). With a whitish peripheral band. |
| | Var. VIII. <i>álbida</i> (Jeff.). White. |

18. *H. GRÁNULÁTA* (*granulated*,) *Alder*. Pl. III., f. 8.

[=*H. SERICEA* *Jeffreys*].

Sub-globular, thin, rather glossy, pale greyish or yellowish white, thickly covered with white silky epidermal bristles; *whorls* 6, tumid; *spire* raised, obtuse; *suture* rather deep; *mouth* larger and deeper than *H. hispida*, with a stronger rib; *umbilicus* much smaller than that of *H. hispida*. A. 6 mm. B. 8 mm.

This is a local species, but abundant where it occurs. It has an extensive distribution throughout Great Britain, as far north as Skye, and also in all four provinces of Ireland.

Its chief distinction from *H. hispida* is its umbilicus which is very small, while that of the last species is broad and deep; besides which the form of *H. granulata* is more globular, the spire more raised, and the bristles thicker. The usual colour of *H. hispida* is much the darker.

It has the habit of falling from its station on the nettles or other plants at the least touch or shake. It is very difficult to clean perfectly.

a. shape. Var. I. *carinata* (*Taylor*). Sharply angulated at the periphery; aperture diam. 4mm., alt., $2\frac{1}{2}$ mm.

b. colour { Var. II. *cornea* (*Jeff.*). Horn colour, thin,
and { labial rib strong.
texture. { Var. III. *albida* (*Jeff.*). White.

19. *H. REVELÁTA* (*discovered*), *Michaud*. Pl. III., f. 9.

Somewhat globular; *spire* depressed; pale olive-green, covered scantily with short pale hairs; *whorls* 4—4½; *suture* deep; *mouth* nearly circular; *umbilicus* small. A. 5 mm. B. 8 mm.

This is a very local species, and not abundant where it occurs. Jeffreys says "In winter and dry weather it buries itself rather deep in the earth, and must be looked for by pulling up tufts of grass and large stones which are sunk in the ground, as well as by searching among the roots of shrubs and furze-bushes."

Its British range is restricted to the Channel Isles, Cornwall, and South Devon. Jeffreys also gives Notts. as a locality, but this does not seem to have been confirmed.

20. *H. FÚSCA* (*dusky brown*), *Montagu*. Pl. III., f. 10.

Sub-conical, so thin as to be almost membranaceous, glossy, pale yellowish brown, strongly striated in the line of growth; very faintly keeled; *whorls* 5—5½; *umbilicus* very small. A. 5½ mm. B. 8½ mm.

The shell of this species is almost membranaceous, and I have known it to collapse when the animal has been extracted, and to be blown up again without injury. It is difficult to extract the animal entire.

Though local it is sometimes abundant. Its range extends interruptedly throughout Great Britain from Devon to Sutherlandshire, and it also occurs in many parts of Ireland.

It is particularly hardy, and has been noticed actively crawling about during frost. It is found among under-wood, especially nettles, often in clusters on the stalks generally at the joints. Mr. Masefield, of Cheadle, Staffs., informs me that he finds it on the root leaves of the *Lychnis dioica* when it is not out on the nettle stalks, and also points out the striking resemblance it bears to the dead seed-capsules of that plant, especially when they are wet and transparent with dew or rain.

The variety is found not uncommonly in Park Woods, Bassenthwaite.

Var. *vitrea* (*Farrer*). Shell pale glassy green, animal milk-white, excepting tentacular retractors.

Sub-genus.—XERÓPHILA *Held.*

21. H. PISÁNA (*first noticed at Pisa*), *Muller.* Pl. III., f. II.

Sub-globular, solid; *striated* both spirally and in the line of growth, giving a reticulated appearance under a lens; nearly opaque, glossy, yellowish white, marked with dark bands varying in number, often interrupted; *whorls* 5—5½; interior of mouth rose colour; *umbilicus* very small. A. 12½mm. B. 18½mm.

This variable species is unmistakable from its markings and sculpture, though it somewhat resembles a large form of *H. virgata*. It is very local, being only found in the Channel Isles, Cornwall, Swansea, Tenby, and in Counties Dublin and Kildare, Meath and Louth. Though strictly a littoral species in the British Isles, it is found inland on the continent. The Rev. J. W. Horsley informs me that he has taken it at Tours and at Pau.

The var. *tenuis* corresponds with var. *fusca* of *arbus-torum*, the transparency being caused by the failure of lime in the shell.

In the south of France and in Italy it is collected in great quantities for food and may be seen exposed for sale in the markets. In Venice, on the Lido, I have seen this species in countless thousands adhering to nettles and other plants, apparently enjoying the noonday sun.

- a. size. Var. I. *minor* (*Bourg.*). Smaller. A. 9mm.
 B. 13mm.
- b. texture. Var. II. *tenuis* (*Taylor*). Translucent horn colour.
- c. colour and markings. { Var. III. *lineolata* (*Moq.*). Whitish, with several fine brown lines.
 { Var. IV. *albida* (*Moq.*). Whitish or pale yellow.
 { Var. V. *alba* (*Shuttl.*) White, usually with translucent markings.
- d. monstrosities { M. I. *scalátrifórme* (*Milnes*). Whorls dis-united.
 { M. II. *sinistrórsu*m (*Taylor*). Reversed.

22. H. ÍTALA (*Italian*), *Linné*. Pl. III., f. 14.

[=H. ERICETÓRUM (*inhabiting heaths*), *Muller*].

Almost circular, very depressed, thin, opaque, glossy cream colour, with one dark band above and several beneath; *spire* slightly raised; *whorls* 6, cylindrical; *mouth* nearly circular; *umbilicus* very large and open. A. 7mm. B. 18mm.

Found in considerable quantities on heaths, downs and sand-hills, especially near the sea. It occurs in Dovedale among the limestone rocks and over the barren hills. It has a very extensive range throughout the British Isles as far north as Caithness, though it is not recorded for the Channel Isles. In Scotland it is found chiefly, but not exclusively, on the western side.

It appears to be as fond of thistles as the donkey, but without that animal's reasonable excuse.

The largest specimen that I have seen is one which I found in a limestone quarry at Blisworth, Northants; it measures 22mm. in diameter.

The var. *hyalozonáta* is a beautiful object and very local; var. *lentiginósa* occurs near Dublin, at the Isle of Man, and at Tenby.

- | | |
|-------------------------------|---|
| a. size. | Var. I. <i>minor</i> (Moq.). Breadth 12mm. |
| b. shape. | Var. II. <i>instábilis</i> (Ziegl.). Spire more raised, smaller, darker. |
| c. colour
and
markings. | Var. III. <i>leucozóna</i> (Moq.). Markings coalesced except round the periphery which remains white. |
| | Var. IV. <i>hyalozonáta</i> (Ckll.). White with translucent markings. |
| | Var. V. <i>lentiginosa</i> (Moq.). Markings radiating from the centre. |
| | Var. VI. <i>álba</i> (Charp.). Entirely white. |
| d. monstrosity. | M. <i>sinistrorsum</i> (Jeff.). Reversed. |

23. H. CAPERÁTA (*wrinkled*), *Montagu*. Pl. III., f. 13.

Sub-conical, compressed, solid, opaque, dull, dirty white, streaked and banded by variable lines which are sometimes merely a row of spots, strongly and regularly striated, obtusely carinated; *whorls* 6; *mouth* nearly round, furnished with a white internal rib; *umbilicus* open and shallow. A. $5\frac{1}{2}$ mm. B. 10 mm.

Found under stones and on the stalks of grass on sandy soils, especially near the sea coast, where it is sometimes almost as abundant as the last species, and frequently found with it. It is also common in many parts of Ireland, and throughout Great Britain as far north as Sutherlandshire.

It is a particularly hardy animal, and will often be found feeding in winter when other snails are torpid. It has as great a power of enduring heat as cold, and I have observed it not only in many parts of southern Europe, but even on the desert in the neighbourhood of Bagdad.

It is, perhaps, apt to be confounded with the young of *H. virgata*, which are also carinated; but a very little experience will enable the collector to determine its identity.

It is usually smaller and more depressed and has a larger umbilicus than the adult of the last species; but the diagnostic character is the close regular striation of *H. caperata*, which should be compared under a lens with the coarse striation of *H. virgata*.

The forms *bizonalis* and *obliterata* are rare, the latter corresponding with the white forms with translucent bands of *H. virgata* and *H. itala*.

- | | | |
|-------------------------|---|--|
| a. size. | { | Var. I. <i>májor</i> (<i>Jeff.</i>). Breadth $12\frac{1}{2}$ mm. |
| | | Var. II. <i>gigáxii</i> (<i>Charp.</i>). Smaller, more depressed. |
| b. shape. | { | Var. III. <i>súbscaláris</i> (<i>Jeff.</i>). Spire raised, whorls more tumid. |
| | | Var. IV. <i>ornáta</i> (<i>Pic.</i>). Smaller, with one broad dark band above, normal below. |
| c. colour and markings. | { | Var. V. <i>bizonális</i> (<i>Moq.</i>). With two bands above. |
| | | Var. VI. <i>lutéscens</i> (<i>Pasc.</i>). Unicolorous sand colour. |
| | | Var. VII. <i>fúlva</i> (<i>Moq.</i>). Dark brown, sometimes slightly marked with white. |
| | | Var. VIII. <i>oblitéráta</i> (<i>Pic.</i>). White with translucent markings. |
| | | Var. IX. <i>álba</i> (<i>Pic.</i>). White without markings. |

24. *H. VIRGÁTA* (*striped*), *Da Costa*. Pl. III., f. 12.

Conical, globose, solid, almost opaque, cream-coloured, very variously banded (typical form having one band above and several below the periphery); *whorls* 6, tumid; *spire* raised; *mouth* nearly circular, furnished with an internal lip of a pinkish colour; *umbilicus* narrow, but deep. A. 10 mm. B. $13\frac{1}{2}$ mm.

This very variable shell is found on downs and sand hills, and also in hedge banks, especially near the sea coast. It is exceedingly abundant where it occurs, and as it

varies greatly in size, colour and shape, a good series ought to be secured.

It has a very wide range through Great Britain as far north as Northumberland, but with the single exception of Ayr it is not found in Scotland. It occurs in many parts of Ireland, from Antrim to Kerry.

The young are carinated.

The variety of colour and markings cannot fail to make this a favourite species with the collector. The commonest varietal forms are *lutescens* and *albicans*, which, I think, always occur wherever the type is found, the former, however, in the greater proportion; *albicans* is always smaller than the type found associated with it. Like *H. arbustorum*, this species is smaller and more conical in the north and larger and flatter in the south of England; and also, like that species, the largest individuals to be found in the British Isles occur in the neighbourhood of Dover. The beautiful *alba* form, though very local, is usually fairly plentiful where it occurs. It will be a guide to remember that in the true albino forms of *virgata*, *caperata*, and *itala*, the *nucleus* is white, as white individuals are often found having a dark *nucleus*—these are not true albinos. The albino form without the translucent bands is much the rarer. The *radiata* variety is a Kentish coast form, though it occurs in Mid-Kent at Charing. There is a colony near Hythe and one here and there to Rye (just within the

Sussex border), which I believe to be its western limit on the mainland, though it occurs in the Isle of Wight. The *hypozona* form occurs at Tenby in considerable numbers, and I have also taken it near Lyme Regis and near Canterbury. Var. *leucozona* is also very local. This handsome form is found at Tenby and at various places along the Kent and Sussex coasts, but the finest that have come under my notice are some I once took at Exmouth. Var. *nigrescens* is, perhaps, as rare as any and is apt to be passed over as *H. hispida* or *H. rufescens*, which it much resembles. It occurs at Tenby, Beachy Head, near Canterbury, and at the little village of Brookland in Kent. I can heartily recommend Tenby to the lover of this species. Here on the railway bank close to the town many of the varieties occur in small colonies, each colony often being confined to a few square yards. The Tenby forms are, however, small, owing presumably to the want of chalk. At Giltar Point, where the limestone crops out, there is found a curious form with purplish and white blotched markings. I have also taken a curious form here and also in Kent with a clear yellowish ground and a single dark peripheral band (var. *rufulo-sonata* Taylor). *Subalbida* is not often seen; *maculata* occurs not unfrequently. At Patricxbourne, in Kent, I have found a series of var. *epizona*, a form which has hitherto escaped notice.

a. size. { Var. I. *májor* (Taylor). Breadth 20-25 mm.
 { Var. II. *minor* (Taylor). Breadth 6½ mm.

- b. shape and colour. {
- Var. III. *súbglobósa* (*Jeff.*). Smaller, with double band above periphery, *umbilicus* very wide.
- Var. IV. *lineáta* (*Olivi.*) [= v. *submarítima* (*Jeff.*)]. Smaller, pyramidal, often darker.
- c. shape. {
- Var. V. *depréssa* (*Req.*). Spire depressed.
- Var. VI. *subapérta* (*Jeff.*). Depressed, *umbilicus* very wide, usually whitish.
- Var. VII. *carináta* (*Jeff.*) Depressed, keeled.
- d. colour and markings. {
- Var. VIII. *nigréscens* (*Grat.*). Markings coalesced, shell therefore almost entirely purple-brown.
- Var. IX. *leucozóna* (*Taylor*). Dark violet with white peripheral zone.
- Var. X. *maculáta* (*Moq.*). With the bands broken up into separate spots.
- Var. XI. *radiáta* (*Hidalgo*). Markings radiating from the apex, often resulting in a tessellated appearance.
- Var. XII. *hypozóna* (*Moq.*). Banded below, white above.
- Var. XIII. *épizóna* (*L. E. Ad.*). Blotched above the periphery, plain white below.
- Var. XIV. *lutescéns* (*Moq.*). Shell of a dull yellow colour.

- d. colour and markings. {
- Var. XV. *rufulozonáta* (Taylor). Coloured like *lutescens* with a single dark peripheral band.
 - Var. XVI. *subálbida* (Poiret). One band above periphery, rest of shell white.
 - Var. XVII. *álbicans* (Grat.). Whitish without markings, *nucleus* dark.
 - Var. XVIII. *álba* (Taylor). Pure white, markings (if any) translucent.
- e. monstrosity. m. *sinistrórsum* (Taylor). Reversed.

Sub-genus.—TURRÍCULA Beck.

25. H. TERRÉSTRIS (*earth inhabiting*), Tennant. Pl. IV., f. 6.

Pyramidal, greyish white with a broad dark band round each whorl, closely and evenly ribbed in line of growth; very sharply carinated, the *keel* forming ridges round the shell; *whorls* 8; *mouth* depressed and sharply angulate. A. $5\frac{1}{2}$ mm. B. 9 mm.

A colony of this Mediterranean species was noticed by Capt. McDakin, in 1890, near Dover, where it has now established itself. It is not at all clear how it came there, but it is just possible that, situated as it is near a railway bank, some foreigner threw some rubbish containing the shells out of the train window. Mr. E. A. Smith (Journal of Conch., vol. 6, p. 379) remarks:—"This is not the first record of it as British, for Jeffreys (Brit. Conch., I., p. 215) mentions the existence of a specimen in Dr. Turton's collection of British shells, marked 'Cornwall,'" and although he questioned its claim to be considered British,

he observed that "it is remarkable that this characteristic species, which had been so long considered as peculiar to the shores of the Mediterranean, has been lately found by M. l'Abbé Maillard at Beauvais, in the north of France."

Var. *grísea* (Moq.). Without banding.

Sub-genus.—CÓCHLICÉLLA *Risso.*

26. H. ACÚTA (*pointed*), Müller. Pl. IV., f. 7.

[=BULIMUS ACUTUS *Jeffreys*].

Long, conical, whitish, with a single dark band below the periphery; whorls 8-9; *umbilicus* very slight. A. 15 mm.; B. 5 mm.

In Great Britain this is a strictly littoral species, extending interruptedly from extreme north to south. In Ireland, where it is also very widely distributed, it is found in inland situations a hundred miles from the sea. It inhabits grassy cliffs, downs, and sand-hills.

There is in this species an internal calcareous body, much resembling a miniature continental sabot, which is probably analogous to the 'dart sac' of other Helices. This little object can be extracted and mounted on black card in a similar manner to the darts already described.

All the vars., except *alba*, are fairly common and generally distributed; var. *alba* is found plentifully at Bundoran.

a. size	{	Var. I. <i>infláta</i> (Moq.). Ventricose, streaked
and		with brown.
shape	{	Var. II. <i>elongáta</i> (Cr. and Jan.). Longer;
		A. 22 mm.; B. 5 mm.

b. colour
and
markings.

Var. III. *bizóna* (*Moq.*). With two dark bands, the only upper usually visible on the upper whorls.

Var. IV. *flammuláta* (*Bourg.*). Like var. III., but bands interrupted.

Var. V. *strigáta* (*Menke*). Streaked with alternate pale-brown and white transverse semi-transparent ribs.

Var. VI. *articuláta* (*Lam.*). With alternate transverse ribs of white and violet-brown.

Var. VII. *nigréscens* (*Taylor*). Dark violet-brown with a few very fine whitish transverse ribs.

Var. VIII. *álba* (*Req.*). White, sometimes with translucent markings.

Family.—PUPIDÆ.

Genus.—BULIMÍNUS *Ehrenberg.*

Sub-genus.—ENA *Gray.*

Shell cylindrically-conic, elongated.

I. B. MONTÁNUS (*inhabiting mountains*), *Draparnaud.*

Pl. IV., f. 8.

Globosely conic, slightly glossy, light brown; *whorls* $7\frac{1}{2}$; *spire* tapering, blunt; *lip* white, reflected; *umbilicus* narrow, deep. Immature specimens are keeled. A. 16 mm. B. 6 mm.

This is a local shell, being confined to the southern and western counties of England and to one locality in

Suffolk. It has the habit of ascending the beech and ash in the spring, presumably to feed and pair, descending in the autumn to hibernate. It is very abundant in Birdlip Woods, where it may be found on the trunks of the beech, sycamore, and ash. It closely resembles the little knobs on the beech trunks. The variety is very rare.

Var. *albina* (Moq.). Uniformly whitish.

2. B. OBSCURUS (*hidden*), Müller. Pl. IV., f. 9.

Of the same shape as the last species, but much smaller, rather shorter in proportion, and more glossy; transparent horn-colour; *whorls* $6\frac{1}{2}$. A. 9 mm. B. $3\frac{1}{2}$ mm.

The name *obscurus* was given to this shell in consequence of its habit of covering itself, by means of its slime or an exudation of the epidermis, with earth or any substance it comes in contact with,—thus rendering itself inconspicuous. In some districts, where the foreign matter is not suitable for attachment (as in the calcareous districts of Derbyshire), the shell is found clean and smooth in the crevices of rocks. Found commonly in hedge-banks among damp moss and earth, it seldom occurs in any quantities, though in Birdlip Woods, near Cheltenham, it may be taken in great numbers on the trunks of the beech trees, and I have also seen it on beech trunks near Dover.

Its range extends almost entirely throughout England and Wales; in Scotland it is (so far as has been recorded) confined to the eastern side of the kingdom, with the

single exception of Lanarkshire. It has been found near Dublin and in the eastern counties of Ireland. The variety is a rare and beautiful object.

Var. *albina* (Moq.). Pure white or colourless.

Genus.—PÚPA *Draparnaud*.

Sub-genus.—TORQUILLA *Studer*.

Animal with 4 tentacles; *shell* cylindrical, compact; *mouth* often furnished with teeth; *umbilicus* contracted. The *Pupæ* are gregarious.

I. P. SECÁLE (*a grain of rye*), *Draparnaud*. Pl. IV., f. 10.

Globosely conic, solid, opaque, rufous brown, striated in line of growth; *whorls* 8—9; *mouth* horseshoe-shaped, furnished with 8 or 9 white denticles. A. 8 mm. B. 3 mm.

There is no mistaking this species. It is far the largest of our *Pupæ*.

Though local it is abundant where it occurs—on rocks, in woods, chiefly in calcareous districts, in many parts of the south of England and Yorkshire and Westmorland in the north; also Jeffreys mentions its occurrence in South Wales. It is not found in Scotland or Ireland.

a. size. Var. I. *minor* (Moq.). Smaller. A. $6\frac{1}{2}$ mm.

b. size and shape. Var. II. *edéntula* (Taylor). Smaller, thinner, glossy, without denticles.

Var. III. *boileáusiána* (Charp.). Smaller, the larger plication being double and having a prominent additional fold at the angle of the *columella*.

c. colour. Var. IV. *álba* (Jeff.). White.

Sub-genus.—LÁURIA, *Gray.*

2. P. ÁNGLICA (*English*), *Férussac.* Pl. IV., f. 11.

[=P. RINGENS *Jeff.*]

Ovate, rather solid, glossy, dark purplish horn-colour; *whorls* $6\frac{1}{2}$; *mouth* horseshoe-shaped, furnished with 7 or 8 denticles of a reddish tinge; *umbilicus* small but distinct. A. $3\frac{1}{4}$ mm. B. $1\frac{1}{2}$ mm.

It lives amongst moss and leaves in moist situations. It is local in Scotland, the north of England, Ireland, the Channel Isles, and Anglesea. Mr. Roebuck once pointed out that it has a great partiality for the moss, *hypnum cuspidatum*, and my own experience has enabled me to confirm this.

Young specimens are carinated and furnished with internal septa which are visible from the outside.

Var. *pállida* (*Jeff.*). Whitish.

3. P. CYLINDRÁCEA (*cylindrical*) *Da Costa.* Pl. IV., f. 12.

[=P. UMBILICATA *Drap.*]

Cylindrical, glossy, pale horn-colour; *whorls* 6—7; *mouth* horseshoe-shaped, with a broad white lip; a denticle on the base of the penultimate whorl; *umbilicus* small. A. $3\frac{1}{2}$ mm. B. $1\frac{7}{8}$ mm.

This is a very abundant and common species throughout the British Isles on stone walls, among moss, dead leaves, and under the bark of trees. The young are carinated and have a well-marked umbilicus. Infant shells may be observed carried about by adults, presumably their mothers.

a. size. Var. I. *círta* (*Westl.*). Shorter, $2\frac{1}{4}$ mm.

- b. shape. { Var. II. *edéntula* (Mog.) Toothless.
 Var. III. *sempronii* (Charp.) Smaller,
 toothless, lip colour of shell.
- c. colour. Var. IV. *albina* (Mog.) White.

Sub-genus.—PUPÍLLA, Gray.

4. P. MUSCÓRUM (*inhabiting moss*) Linné. Pl. IV., f. 13.
 [=P. MARGINATA Drap.]

Cylindrical, rather solid, dull, brown horn-colour; *whorls* 6—7; striated finely in line of growth; *mouth* nearly circular, outside which is a white rib not quite on the margin which is thin and not reflected; furnished with a denticle similar to that of the last species.
 A. $3\frac{1}{4}$ mm. B. $1\frac{1}{2}$ mm.

This species is specially fond of sandy soils near the sea coast, but is also frequently found inland. Its range extends throughout the British Isles.

P. cylindracea and *P. muscorum* differ as follows:—

P. CYLINDRACEA.	P. MUSCORUM.
Smooth and glossy, ovate, mouth horseshoe-shaped with a thick reflected lip.	Dull and striated, cylindrical, mouth smaller, nearly circular, lip not reflected but thickened near the edge.

Var. I. *brévis* (Baud). Short, tumid, *peristome* white.

Var. II. *bigranáta* (Rossm.). Smaller, thicker, with two denticles.

Var. III. *edéntula* (Clessin). Without any denticle.

Genus.—VERTÍGO Müller.

Animal with only two tentacles; *shell* subcylindrical or fusiform, dextral or sinistral; most species with denticles; *umbilicus* minute.

In order to aid the collector to identify these minute shells I have tabulated some of the characteristic distinctions of those which are dextral and denticulate.*

The species have been conveniently arranged as follows:

A.—DEXTRAL, DENTICULATED. *V. antivertigo*, *V. moulinsiana*, *V. pygmæa*. *V. alpestris*, *V. substriata*.

B.—SINISTRAL. *V. pusilla*, *V. angustior*.

C.—DEXTRAL, WITHOUT TEETH. *V. edentula*, *V. minutissima*.

A. DEXTRAL, *denticulated*.

Sub-genus.—ÁLCEA Jeffreys.

I. *V. ANTIVERTÍGO* (*not reversed*) Draparnaud. Pl. IV., f. 14.

Oval, tumid, thin, semi-transparent, glossy, rufous horn-colour; *whorls* $4\frac{1}{2}$, tumid; *spire* short, abrupt; *mouth* semi-oval, contracted in the middle of the outer edge; *teeth* 6—9 of a reddish brown colour; *umbilicus* distinct. A. $1\frac{5}{8}$ mm. B. 1 mm.

Found in moist places under logs, stones, among moss, and on water plants by the water side. It is recorded for nearly all the English counties and for several in Scotland, but only locally, as yet, for Ireland and Wales.

Young specimens have only two denticles, one on the pillar and one at the base of the penultimate whorl.

Var. I. *óctodentáta* (*Stud.*). With 8 denticles.

Var. II. *séxdentáta* (*Mont.*). With 6 denticles.

* See page 103.

2. V. MOULINSIÁNA (*after Des Moulins*) Dupuy. Pl. IV., f. 15.

Barrel-shaped, very thin and glossy, light horn-colour, transparent; *whorls* $4\frac{1}{2}$, very tumid; *spire* short, blunt; *suture* very deep; *mouth* semi-oval, constricted at the outer edge; *teeth* 4; *umbilicus* distinct. A. $2\frac{1}{3}$ mm. B. $1\frac{3}{4}$ mm.

This is our largest and rarest species of *Vertigo*. Its variety *lilljeborgii* was first discovered in Co. Galway by the late Dr. Jeffreys in 1845: and it has also been found in the Aran Islands by Dr. Scharff. In England the type has been noted among rejectamenta of the Trent in Notts., and a large colony was discovered by Mr. C. P. Cambridge at Morden in Dorset, in 1889, and another colony near the same place in 1890. In the Dorset locality it was found on the stems of bulrushes, thus bearing out Jeffreys' idea (B.C., vol. 1, p. 256) that it should be looked for in marshy places.

It has been recorded for Otterbourne, Hants.: Hitchen and Rye House, Herts.

Var. I. *lilljeborgii* (*Westl.*). Rather less swollen than the type, labial rib not so stout.

Var. II. *bidentata* (*Jeff.*). With 2 denticles.

3. V. PYGMÆA (*minute*) Draparnaud. Pl. IV., f. 16.

Oval, somewhat cylindrical, semi-transparent, glossy, horn-colour; *whorls* $4\frac{1}{2}$, convex; *spire* blunt; *mouth* semi-oval; *teeth* 4—5, (1 on the *body*, 1 on the *columella*, 2 or 3 inside *outer lip*); *umbilicus* small, but deep. A. 2mm. B. 1mm.

This minute species is found in most parts of Great Britain and Ireland at the roots of grass, and under stones and logs in dry as well as moist situations, often in colonies.

It differs from the last species in being much smaller and more cylindrical in form. The outer lip, moreover, is not constricted or angulated.

Var. I. *pállida* (Jeff.). Lighter and narrower.

Var. II. *quádridentáta* (Stud.). With 2 palatal teeth.

4. V. ALPÉSTRIS (*inhabiting elevated situations*) Alder.

Pl. IV., f. 17.

Sub-cylindrical, semi-transparent, glossy, light horn-colour, sometimes striate in the line of growth; *whorls* $4\frac{1}{2}$, convex; *spire* short, blunt; *suture* excessively deep; *mouth* semi-oval and sub-angular; *teeth* 4, visible from the outside from the thinness of the shell (1 on *body*, 1 on *columella*, 2 within *outer lip*); *umbilicus* small but deep. A. 2mm. B. 1mm.

This shell differs from the last species in being more cylindrical, paler, and nearly transparent, and it has no strengthening rib on the outer margin. The striations are sometimes very faint.

It is a rare and local species, being confined to a few of the northern counties of England, with the exception of a single locality in Ireland (Coleraine), where I took a specimen that the late Dr. Jeffreys kindly authenticated. I have not heard of another authentic Irish record.

5. V. SUBSTRIÁTA (*slightly striated*) Jeffreys. Pl. IV., f. 18.

Ovate, thin, semi-transparent, glossy, very strongly and obliquely striate in the line of growth; *whorls* $4\frac{1}{2}$, cylindrical; *spire* very abrupt;

suture remarkably deep; *mouth* semi-oval, outer margin constricted; *teeth* 5—6 (2 or 3 on *body*, 1 or 2 on *columella*, 2 inside *outer lip*); *umbilicus* small. A. $1\frac{7}{8}$ mm. B. Imm.

This pretty little shell though local is found in many parts of the British Isles in moist situations at the roots of grass and under stones. Its strong striations, almost amounting to ribs, serve to distinguish it from any of the previously mentioned species, though in all cases the denticles should be carefully noted.

B. SINISTRAL.

Sub-genus.—VERTILLA *Moquin-Tandon*.

6. V. PUSILLA (*minute*) Müller. Pl. IV., f. 19.

Fusiform, glossy, thin, horn-colour; *whorls* $4\frac{1}{2}$; *spire* more tapering than most members of the genus; very slightly striated in line of growth; *mouth* semi-oval, constricted in the outer margin which is rather thick; *teeth* 6—7, (2 on *body*, 2 on *columella*, 2 or 3 inside *outer lip*). A. $1\frac{3}{4}$ mm. B. $1\frac{1}{8}$ mm.

This species is found very locally in England, chiefly in the north. It is recorded for two localities in the south west of Scotland; not for Wales. I found it sparsely among the sand hills at the mouth of the river Bann, and it has been found near Bundoran, Dublin and in Donegal. It is said to frequent similar situations to the others.

Var. I. *albina* (*Taylor*). White.

Var. II. *túmida* (*Westl.*). Smaller, more ventricose.

7. *V. ANGUSTIOR* (*narrower*) *Jeffreys*. Pl. IV., f. 20.

Fusiform, but narrower than the last species, glossy, semi-transparent, horn-colour; closely striate in the line of growth: *whorls* $4\frac{1}{2}$, the penultimate being the broadest; *mouth* sub-triangular and narrowed by a strong constriction of the outer margin; *teeth* 4—5, (2 on *body*, 1 on *columella*, 1 inside *outer lip* which is thickened and reflected); *umbilicus* indistinct. A. $1\frac{1}{2}$ mm. B. $\frac{7}{8}$ mm.

This species is also rare and local, being recorded for Derby and Notts. in England, Sutherland in Scotland, and for several places in Ireland.

V. PUSILLA.

V. ANGUSTIOR.

Larger, broader in proportion.	Smaller, narrower in proportion.
Last whorl broadest.	Penultimate whorl broadest
Mouth semi-oval.	Mouth triangular.
Outer lip very slightly contracted.	Outer lip very deeply contracted.
Teeth six to seven.	Teeth four to five.

C. DEXTRAL, *without teeth*.*Sub-genus*.—SPHÆRADIUM *Agassiz*.8. *V. EDÉNTULA* (*toothless*) *Draparnaud*. Pl. IV., f. 21.

Cylindrical, thin, glossy, horn-colour; slightly striated in the line of growth; *whorls* $5\frac{1}{2}$ — $6\frac{1}{2}$; *spire* abrupt; *mouth* nearly circular; *lip* thin; *umbilicus* narrow. A. $2\frac{1}{3}$ mm. B. $1\frac{1}{4}$ mm.

Found in several parts of Great Britain and Ireland, much more commonly than any other *Vertigo* except, perhaps, *pygmæa*

It has the peculiarity of taking kindly to the fronds of the bracken.

In the North of Ireland var. *columella* seemed to me the prevalent form.

Var. *columella* (*Von Mart*). Rather longer—the last whorl broader than the rest.

Sub-genus.—*ISTHMA* Gray.

9. *V. MINUTÍSSIMA* (*very minute*) Hartmann. Pl. IV., f. 22.

Cylindrical, glossy, different shades of horn-colour; closely striated in line of growth; *whorls* $5\frac{1}{2}$; *suture* deep; *mouth* similar to that of *edentula* but somewhat quadrangular; *umbilicus* small. A. $1\frac{3}{4}$ mm. B. $\frac{7}{8}$ mm.

This beautiful little shell has been recorded for the following localities, Portland, Isle of Wight, Cleethorpes, S. W. Yorks., Durham, in England; Edinburgh in Scotland, and Kerry in Ireland. It has not been yet met with in Wales.

It is gregarious, and its colonies though very populous are restricted in area.

It is much smaller, and narrower in proportion to its length than *V. edentula* and is more strongly striated.

VERTIGO.—DEXTRAL, DENTICULATED.

Names of Species.	1. <i>V. antiverigo</i>	2. <i>V. Mouliniana</i> .	3. <i>V. pygmaea</i> .	4. <i>V. alpestris</i> .	5. <i>V. substriata</i> .
<i>General appearance and texture</i>	Dark reddish, very glossy.	Very pale, very glossy, nearly transparent.	Fairly glossy.	Very glossy, thin.	Fairly glossy.
<i>Striations</i>	Faint and close in line of growth.	Microscopical in line of growth	Faint in line of growth.	Sometimes rather strong in line of growth, more often nearly smooth.	Very strong, oblique in line of growth.
<i>Teeth</i>	<i>Reddish in colour</i> $\left. \begin{array}{l} 2 \text{ or } 3 \text{ on body} \\ 1 \text{ on columella} \\ 3 \text{ or } 4 \text{ inside lip} \end{array} \right\} 6-9$	$\left\{ \begin{array}{l} 1 \text{ on body} \\ 1 \text{ on columella} \\ 2 \text{ or } 3 \text{ inside lip} \end{array} \right. 4-5$	Same as 3.	$4. \left\{ \begin{array}{l} 1 \text{ on body} \\ 1 \text{ on columella} \\ 2 \text{ inside lip} \end{array} \right.$	$\left\{ \begin{array}{l} 2 \text{ on body} \\ 1 \text{ or } 2 \text{ on columella} \\ 5-6. \quad 2 \text{ inside lip} \end{array} \right.$
<i>Locality and distribution</i>	Throughout the British Isles S. of Moray Firth.	S. W., S., and Mid. England; W. Ireland. Rare and local.	British Isles generally. Common.	Northern counties of England and N. Ireland. Rare.	Gt. Britain from Skye to Devon, and throughout Ireland.
<i>Most distinctive characteristics</i>	Large size, teeth reddish.	Much the largest of all except 2. Humid, pale, transparent.	Usually 5 teeth, oval form.	Lip thin, unreflected; apex blunt; suture deep; form cylindrical; light colour, transparent.	2 teeth on body, strong oblique striations.

Genus.—*BÁLEA Prideaux.*

Shell sinistral, turriculate, thin, finely striated and streaked with white in the line of growth.

B. *PERVÉRSA* (*turned the wrong way*) *Linne.* Pl. V., f. 5.

Sinistral, club-shaped, thin, dark horn-colour, semi-transparent, glossy, closely striated in the line of growth; *whorls* 7—8; *mouth* squarish oval, sometimes furnished with a denticle on the columella; outer lip thin; *umbilicus* narrow. A. 7 mm. B. $2\frac{1}{2}$ mm.

This shell though local is abundant where it occurs. Its distribution is very wide, extending over the whole of Great Britain. In Ireland it is locally abundant and has a wide range. It is found chiefly on the bark of trees; Dr. Jeffreys says:—"chiefly the beech, ash, sycamore and apple." I once found it on a willow near Maidenhead, in company with *Cl. bidentata*, the young of which it much resembles. This resemblance it is necessary to note or this local species may be passed over. It differs from the immature *Cl. bidentata* in being more slender, lighter in colour, having a deeper suture and being without any carination round the basal ridge, which carination is a marked characteristic of the young of that species.

It is not, however, entirely confined to trees. Mr. J. R. B. Masefield once took me to a thriving colony ensconced in a limestone wall on the top of Caldon Low (where there are no trees). We pulled down a great deal of wall in our search, but comforted our consciences by building it up again. The greenish form is very beautiful. It occurs very locally in colonies. It is ovo-viviparous.

Var. I. *viridula* (Jeff). Transparent greenish white.

Var. II. *simplex* (Moq). Without denticle.

Genus.—CLAUSÍLIA *Draparnaud*.

Shell fusiform, British species all sinistral; furnished with a *clausilium*; *mouth* denticulated.

This genus derives its name from a peculiar characteristic—a little door (Lat. *clausilium*).

This interesting provision of nature against the attacks of such enemies as beetles, &c., differs from an operculum thus:—It is not fastened to the *animal*, but to the pillar of the *shell* by an elastic filament. When the animal is within the shell this contractile filament draws the *clausilium* close over the aperture, about half a turn from the entrance, and when the animal emerges it pushes aside the little “spring door,” which then lies flat against the columella.

Sub-genus.—PIRÓSTOMA *Vest*.

I. C. BÍDENTÁTA (*with 2 teeth*) *Strom*. Pl. V., f. I.

[=C. RUGOSA (*wrinkled*), *Draparnaud*.]

Fusiform, purplish brown, but varying in colour; marked with small streaks of white; closely and irregularly striated in the line of growth; *whorls* 10—13; *spire* tapering to a blunt point; *mouth* pear-shaped, expanding like a funnel, angulated above; *plications*, 2 on pillar, with 2 or 3 ribs between them, a plication behind pillar lip, near which is a spiral fold; 1 or 2 teeth inside *outer lip*; *umbilicus* narrow; *clausilium* shaped much like a ‘shoehorn.’ A. 11—13 mm. B. 3 mm.

This common shell is distributed throughout the whole of the British Isles, and is found on walls, the rough bark

of trees, under logs and stones, among moss and sometimes on sandhills. It is very variable in size, texture and intensity of striation. I have found it in Ireland on the banks of the Bann under stones which are completely covered by high tides. I possess a sub-scalariform specimen which I took in Derbyshire.*

Var. I. *crazénensis* (Taylor). [= *dubia*, Jeffr. non Drap.] larger, more ventricose. A. 1.7 mm. B. $3\frac{1}{2}$ mm. Whorls 13.

Var. II. *evéretti* (Miller). Smaller, fewer whorls than type.

Var. III. *gracilior* (Jeff.). Longer, more slender. A. 1.4 mm. B. $2\frac{1}{2}$ mm.

Var. IV. *tumídula* (Jeff.). Shorter, more ventricose.

Var. V. *súttoni* (West.). [= *schléchtii*, Jeff.] "Generally larger, more elongated, smoother and more transparent than *V. dubia*; pale brown, frequently resembling *Cl. laminata* in smoothness and transparency." Whorls 11.

Var. VI. *párvula* (Turton). Smaller, more slender.

Var. VII. *albína* (Moq.). White.

M. dextrórsum (Jeff.). Dextral, resembling a *Pupa* in shape.

2. *C. RÓLPHII* (after Rolph), Gray. Pl. V., f. 2.

Fusiform, thinner than the last species; reddish or yellowish brown, occasionally streaked with white; strongly striated; *whorls* 9—10; the first two or three upper whorls are nearly of the same breadth forming a short cylinder; *apex* blunt; *mouth* quadrangular; *plications* as in last species, but there are often two or three small teeth between

*See Q.J.C., Vol. VII., p. 422.

the columellar folds; outer lip inflected; basal crest short and curved; *umbilicus* indistinct; *clausilium* oblong, regularly curved, slightly contracted above. A. $12\frac{1}{2}$ mm. B. $3\frac{1}{2}$ mm.

This is a rare and local species, though sometimes plentiful where it occurs, found only in a few localities in some of the southern counties of England, also in Notts. and Northants; not for Wales, Scotland or Ireland.

It is found chiefly under stones and has the peculiarity of being almost subterranean in its habits.

Dr. Jeffreys says: "From *C. rugosa* and its variety *dubia* this differs in being more ventricose and of a lighter colour, as well as in having much coarser striæ, which impart to the last-mentioned shell a decussated or slightly granular appearance. The mouth of the shell in *C. rolphii* is, besides, larger and broader."

Var. *pellúcida* (Taylor). Colourless and transparent.

Sub-genus.—ALÍNDA H. & A. Adams.

3. *C. BIPLICÁTA* (having 2 folds) Montagu. Pl. V., f. 4.

Fusiform, dull, iridescent; rufous brown streaked with white; strongly striate; *whorls* 12-13; *mouth* oval, angular, contracted below, where a narrow but deep channel is formed; *teeth* as in *C. rolphii*; *umbilicus* broader than usual in the genus; *clausilium* almost oval, slightly curved. A. $16\frac{1}{4}$ mm. B. $4\frac{1}{5}$ mm.

This is one of our very local shells. It is found at the roots and on the bark of willows by the Thames at Putney and Hammersmith, in fair abundance; and also

in Wilts. It is much larger than *C. rolphii* and more slender in proportion. It is, moreover, streaked with white.

Var. *nélsoni* (*Jeff.*). More slender than type, almost devoid of striation and translucent.

Sub-genus.—MARPÉSSA *Gray.*

4. *C. LAMINÁTA* (*having plates*) *Montagu.* Pl. V., f. 3.

Very similar in shape to the last species, but relatively narrower just above the mouth; pale reddish horn-colour; smooth and glossy; microscopically striated in the line of growth; nearly transparent; *whorls* 12; *mouth* ovate; *teeth* well marked on the *columella*; there are 3 or 4 internal laminae visible through the transparent shell; *umbilicus* small; *clausilium* sub-oblong, with a deep notch near the base. A. $16\frac{1}{2}$ mm. B. 4 mm.

This handsome species is locally but widely distributed throughout England, but it has only been recorded for Perth in Scotland, and Glamorgan in Wales, and confined to a limited area in Ireland.

It has the reputation for a partiality for the beech and ash, at the roots and on the trunks of which it may be found, sometimes at a great height. It occurs in great abundance in some places on the limestone rocks in Derbyshire, and in the famous Birdlip Woods.

Var. I. *pellúcida* (*Jeff.*). Thinner, more transparent, highly glossy.

Var. II. *albina* (*Moq.*). Clear white, sometimes with a greenish tinge.

Family.—STENOGYRÍDÆ.

Genus.—AZÉCA *Leech*.

Shell oval-elliptic, polished ; *columella* dentate ; *peristome* labiate within.

A. TRÍDENS (*with 3 teeth*) *Pulleney*. Pl. V., f. 7.

Chrysalis shaped, semi-transparent, solid, glossy, yellowish horn-colour sometimes tinged with red or green ; *whorls* 7 ; *spire* pointed ; *mouth* narrow, with 3 denticles. A. $6\frac{1}{4}$ mm. B. $2\frac{1}{2}$ mm.

This species is widely distributed throughout England, but it is only recorded for Glamorganshire in Wales, and not at all for Ireland. In Scotland, in South Perthshire, the variety **nouletiana* is found, but the type has not been met with in that kingdom. It is often found in considerable numbers in moist shady spots. I have taken it in the crevices of the limestone rocks in Derbyshire.

Var. I. *crystállina* (*Dup.*). Transparent white.

Var. II. *nouletiana* (*Dup.*). Rather larger and thinner, a single denticle only on the outer lip.

Var. III. *alzenensis* (*St. Simon*). Outer lip bearing two deeply seated denticles in addition to those described in the type.

M. sinistrórum (*Taylor*). Reversed.

Genus.—COCHLICOPA *Férussac*.

Shell sub-cylindrical, smooth ; *columella* arcuated forwards at the base ; *aperture* elliptic-oblong, narrow.

*There is a question whether *V. nouletiana* is not the true type ; at any rate it is the common form in England.

C. LÚBRICA (*slippery*) Müller. Pl. V., f. 6.

Not so pointed as the last, more cylindrical; transparent, solid, greenish, inside of lip often pink; *whorls* 5—5½; *spire* rounded at the point; *mouth* pear-shaped and broader than that of last species; having no denticles. A. 6 mm. B. 2¼ mm.

This is a very common shell. It occurs in all parts of the British Isles, in moss, under stones, logs, etc. A row of these brilliant little objects mounted on a strip of card shows pleasingly in a cabinet. I employ a series of glass tubes containing cards with rows of the minute shells.

Var. I. *hyalina* (Jeff.). Clouded greenish white, mouth often reddish.

Var. II. *lubricoides* (Fér.). Smaller and more slender.

Var. III. *exigua* (Menke). Smaller. Alt. 4½ mm.

Var. IV. *fúscá* (Moq.). Smaller, thinner, reddish brown.

Var. V. *ováta* (Jeff.). Much smaller, oval, *spire* shorter.

Var. VI. *morseána* (Doherty). Much larger, slender, *whorls* somewhat flattened. Alt. 8 mm. or more.

Genus.—CÆCILIÓIDES Blainville.

Shell long, cylindrical, thin, glossy; *spire* long; *mouth* oval, notched; *animal* eyeless.

C. ACÍCULA (*a hairpin*) Müller. Pl. V., f. 8.

[=ACHATINA ACÍCULA Müller.]

Slender and tapering in shape, semi-transparent, white, thin, and very glossy; *whorls* 5½; *spire* obtuse; *apex* rounded; *suture* distinct; *mouth* long and rounded at the base, which has a deep notch. A. 5 mm. B. 1 mm.

This interesting animal is the only British member of a genus consisting of nearly one hundred and sixty species. It lives underground, and is never found on the surface of the earth in a live state. Whether its subterranean habits are the cause or the effect of its being destitute of the power of sight need not be discussed here, but it is a fact that, in common with other subterranean animals, it is eyeless, upon which peculiarity the name *cæcilioides* is founded.

Dr. Jeffreys remarks : “ In all probability the *A. acicula* lives upon animal matter ; for, in the spots where it has been found living, no underground fungus or other vegetation appears to exist, and the form of the shell would induce a belief that this snail is not only zoophagous but predaceous. The shells of all true *Glandina*, which are carnivorous, have the same kind of notch or truncature at the base as the present species of *Achatina*.”

It inhabits various parts of England, Wales, and Ireland, under stones and at the roots of grass, some inches underground. As it would be rather a tedious process to search for it by digging all over a district, it is perhaps fortunate that another means of obtaining it exists. Among the rejectamenta of rivers (Thames, Yorkshire Ouse, &c.) specimens are common, being doubtless washed away by floods from their native localities. The specimens found in this way are of course dead, but this shell fortunately does not suffer much in appearance from exposure.

Mr. J. Emmet, in an interesting paper in the *Naturalist* for 1885, points out that this shell is very abundant in the magnesian limestone district of Yorkshire; the writer says: "Dr. Gray recommends searching at a depth of six or eight inches, but my experience is that you will find it at a much greater depth, even as much as eighteen inches below the surface. It depends upon how the marl is deposited, and upon the amount of soil overlying it. The great point is to look for it carefully amongst the marl below the soil, cautiously removing each fragmentary piece of limestone that covers the rock, and intently looking in every cranny caused by the removal of the said marly and stony pieces, until the shell becomes conspicuous by its white appearance. Sometimes ten or a dozen will be taken in as many inches." The writer goes on to predict that searched for in this way it will be found in various places which have all the necessary conditions, viz: at Knottingley, Doncaster, and Pontefract. Soon after the publication of this paper I heard from Mr. R. D. Darbshire that he had taken the shell at the first of the above mentioned places.

Another method has suggested itself to collectors—placing boards rubbed with suet upon the surface of the ground where the shell is known or suspected to exist, in the hope that it may come to feed on the animal matter and adhere to the board.

At Miller's Dale, Derbyshire, living specimens have been taken under loose friable earth near the riverside.

It is found in the south of England as far west as Somerset, and as far north as Northumberland; it is recorded locally for Ireland, and I found it some years ago in Anglesea. It does not seem to have been found in Scotland.

Genus.—STENOGÝRA *Shuttleworth*.

Shell imperforate, elongately turreted; *apex* obtuse; *whorls* numerous; *aperture* oval; *columella* straight, thin.

S. GOODÁLLII *Miller*. Pl. V., f. 12.

Pyramidal, tapering; transparent white, slightly glossy, striated in line of growth; *whorls* 6. A. 6 mm. B. 2 mm.

In Gray's 'Turton' 1840, the following extract occurs: "This shell was first introduced into the Fauna and indeed first described in 1822 by Mr. Miller, who found it in some pine-beds at Bristol; it is also common in the same situations in the neighbourhood of London, especially in Kensington Palace Garden, and has been found near Manchester by Mr. Williamson. It was first observed by the late Mr. Drummond, the botanist, in 1816, who was in the habit of feeding them; and when he wanted a supply, he merely placed a flat board upon the surface of the tan and left two or three dead worms beneath it, and never failed of finding it covered with them in a few days."

It has also established itself at Preston (Lancs.),

Middlesex, Surrey, Yorks., Norfolk, Gloucester, Glamorganshire, always in gardens or pine houses.

It is generally supposed to have been imported in foreign plant mould.

Family.—SUCCINÉIDÆ.

Genus.—SUCCÍNEA *Draparnaud.*

Body gelatinous; *tentacles* 4; *shell* ovate, thin, amber-colour; *spire* short; *mouth* large.

1. *S. PÚTRIS* (*inhabiting stinking places*) *Linné.* Pl. V., f. 13.

Shell pear-shaped, thin, semi-transparent, amber-colour; *whorls* 3—4; *spire* short; *mouth* long and open. A. 16 mm. B. 7 mm.

The “Amber Snail” inhabits moist places by water. Though amphibious it is seldom seen *in* the water except in spring when on its way from its winter quarters in the mud. It should be looked for on flags and rank vegetation at the edges of ponds, canals, etc., and on hedge-banks where there is a ditch at the bottom.

It is widely distributed throughout the whole of the British Isles. The varieties seem to graduate into each other, and into the type in a most perplexing manner, and I advise the tyro to leave them severely alone.

a. shape.	{	<p>Var. I. <i>súbglobósa</i> (<i>Jeff.</i>). Shorter, broader, more solid than the type.</p> <p>Var. II. <i>stagnális</i> (<i>Gass.</i>). Smaller, with a somewhat straight front margin, sometimes inclining to a greenish-bronze colour.</p>
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- b. texture. { Var. III. *solidula* (Jeff.). Thicker and deeper coloured in consequence.
 Var. IV. *vítrea* (Moq.). Thinner and more transparent in consequence.
- c. colour. Var. V. *álbida* (Mörch). White.

2. S. ÉLEGANS (*elegant*) Risso. Pl. V., f. 14.

More slender than *putris*; usually of a deeper red; *suture* deeper; *mouth* narrower. A. 15 mm. B. $6\frac{1}{4}$ mm.

This species appears to merge into the last, and often it is extremely difficult to determine an individual by the shell alone. There is, however, a difference in the lingual dentition, and the animal of *elegans* is usually dark, while that of *putris* is light coloured. The main difference in the shells of the two species is that *elegans* has a deeper suture and a narrower mouth. Both are found in the same habitats, but *elegans* is much more local than *putris*, though both have nearly the same range of distribution.

- a. size. { Var. I. *minor* (Jeff.). Smaller.
 Var. II. *ochrácea* (Betta). Smaller, thicker, *spire* longer, *mouth* small.
 Var. III. *longiscáta* (Morel). Shell longer, mouth compressed.
- b. shape. { Var. IV. *pfeifferi* (Rossm.). Shorter—not so much drawn out.

- c. texture. { Var. V. *viréscens* (Morel). Thin, greenish-yellow.
 d. colour. { Var. VI. *albida* (Taylor). White.
- c. monstrosity. m. *sinistrórsium* (Baud.). Reversed.

3. *S. OBLÓNGA* (*oblong*) *Draparnaud*. Pl. V., f. 15.

Shaped somewhat like *L. truncatula*, rather more solid than the foregoing species, dull greenish colour; *whorls* 3—4, convex; *suture* deep. A. $6\frac{1}{4}$ mm. B. $4\frac{3}{8}$ mm.

This is a local and rare species, having been recorded for N. E. Yorks., Ayr, Linlithgow, Swansea, Cork, and Jersey. It is always found near the sea-coast. Owing to its rarity its appearance is little known, and in museums and collections the label is often prefixed to young specimens of *S. elegans*, etc. I have mistaken a dwarf *L. peregra* for it, and others have done the same. It is, however, very distinct from the rest of the genus, being very much smaller, with a longer spire in proportion to its size, having very convex whorls and a correspondingly deep suture. I would advise any fortunate finder to have a specimen authoritatively identified before placing it permanently labelled in his collection.

Sub-order.—PULMÓNOBRÁNCHIÁTA.

Family.—AURÍCULÍDÆ.

Genus.—CARÝCHÍUM *Müller*.

Shell spiral, oval-oblong; *mouth* somewhat ear-shaped, furnished with columellar folds and a tooth-like tubercle on the outer lip; *umbilicus* indistinct.

C. MÍNIMUM (*smallest*) Müller. Pl. V., f. 9.

Sub-fusiform, semi-transparent, white, rather solid, glossy, microscopically striate in the line of growth; *whorls* $5\frac{1}{2}$; *spire* pointed; *mouth* ovate, with 3 denticles. A. $1\frac{3}{4}$ mm. B. $\frac{7}{8}$ mm.

There is no mistaking this little shell when once seen. It must be examined under a lens to be fully appreciated. It is worth while to wait for the animal to come out, and travel over a moist decayed leaf, when the conspicuous black spots that constitute its eyes can be seen and their sessile position noted; indeed, these eyes may be seen *through* the shell, so dark are they and so transparent the shell.

It is very common under stones, logs, etc., in moist shady situations throughout the whole of the British Isles.

Var. *tridentata* (Risso). Denticles slightly more distinct.

Family.—LIMNÆÍDÆ.

Sub-family.—PLANORBÍNÆ.

Genus.—SEGMENTÍNA Fleming.

Shell coiled, *dextral with internal transverse septa.

S. NÍTIDA (*shining*) Müller. Pl. VI., f. 1.

[=Pl. LINEATUS, Walker].

Quoit-shaped, compressed, more convex above than below, semi-transparent, pale rufous horn-colour; *carinated*; *whorls* 4; *spire* sunk; *umbilicus* narrow but deep. Its special characteristic is the nautilus-like septa which are visible from the outside of the shell at intervals across the whorls. A. $1\frac{1}{2}$ mm. B. 5 mm.

*There is much doubt whether the shells of this genus are dextral or sinistral; pending the decision of the anatomists I have retained the old notion.

This interesting species is local. It is found in ponds, ditches and sluggish streams. Its recorded range in England extends from Yorkshire to Kent, but it has not been authenticated for Ireland, Scotland or Wales.

Var. *albina* (Taylor). Milk white and semi-transparent.

Genus.—PLANÓRBIS *Guettard*.

Quoit-shaped, dextral, circular.

Sub-genus.—HIPPEÚTIS *Hartmann*.

1. P. FONTÁNUS (*inhabiting springs*) *Lightfoot*. Pl. VI., f. 2.

[=P. NITIDUS *Jeffreys*.]

Quoit-shaped; thin, glossy, rufous horn colour; sharply keeled; *whorls* 4—5; *spire* sunk; *umbilicus* shallow. A. $1\frac{1}{2}$ mm. B. $5\frac{1}{2}$ mm.

This may be distinguished from the last species by having no septa, being more depressed; the spire not being so deeply sunk, and by having a shallower umbilicus.

It is a common species, inhabiting mud and weeds, generally on the bottom. It is very partial to watercress. The crust of mud which frequently spoils its appearance is extremely hard to remove.

Its distribution is general throughout the British Isles, though local in Scotland.

Var. *albida* (*Nelson*). White.

Sub-genus.—GYRÄÜLUS *Agassiz*.

2. P. NAUTÍLEUS (*like a nautilus*) *Linné*. Pl. VI., f. 3.

Quoit-shaped, having the upper side flat and the under-side convex; dirty white or grey; striated in the line of growth by ridges of epidermis; *whorls* 3. A. $\frac{7}{8}$ mm. B. $2\frac{1}{2}$ mm.

There is no mistaking this elegant little shell, which is found on weeds and on the underside of decaying leaves in ponds and ditches throughout Great Britain.

The variety *crista* which is commonly found with the type, is an exceedingly beautiful object under a lens.

Var. I. *crista* (*Linné*). Ridges of epidermis exaggerated to points.

Var. II. *laevigata* (*Adami*). Without ridges.

3. *P. DILATATUS* (*expanded*) *Gould*. Pl. VI., f. 12.

Flattish above, extremely convex beneath; *whorls* 2 to $2\frac{1}{2}$, dull; nearly opaque; *mouth* exceedingly expanded and very large; *suture* distinct; *umbilicus* narrow, but deep. A. 1 mm. B. 2 mm.

This little shell was imported from America in cotton bales. It was first noticed by Mr. T. Rogers, of Manchester, in 1869. The only places where it has yet been observed to have made itself at home are the Bolton Canal, and the Reddish Canal (between Stockport and Manchester), where there are cotton mills, and at Burnley in a mill "lodge" or small reservoir adjoining the mill.

4. *P. ALBUS* (*white*) *Müller*. Pl. VI., f. 4.

Flattish above, with *spire* depressed; dull white, very finely striated in line of growth, but more distinctly marked with raised striae spirally; microscopically hispid; *whorls* 5. A. 2 mm. B. 7 mm.

This little shell often belies its name, being frequently found black with dirt. Under a powerful lens its delicate striations are visible, as well as rows of minute hairs

running in a spiral direction, though sometimes these hairs are absent.

It occurs throughout the British Isles as far north as Sutherlandshire.

Var. I. *draparnáldi* (Shepp.). Carinated, destitute of spiral striæ.

Var. II. *sulcáta* (Taylor). With strong curved ridges in line of growth, about 30 on last whorl, the intervening spaces being occupied by broad sulci (furrows).

Monst. *scaláriverme* (L. E. Ad.). Whorls twisted into the form of a screw, in great numbers in Scout Dam, Penistone, Yorkshire.

5. *P. PÁRVUS* (small) Say. Pl. VI., f. 5.

[= *P. GLABER* Jeff.].

Convex above with a depression in the centre, concave beneath; rather thin, glossy, horn-colour, finely striated transversely and still more faintly spirally; whorls 5; suture very deep; mouth nearly circular; umbilicus large. A. $1\frac{1}{4}$ mm. B. $3\frac{1}{2}$ mm.

This is a local shell, though it has a range extending the entire length of Great Britain, though not into Wales. It has been found in Ireland. Though resembling *P. albus* in shape (but smooth and glossy) it is more likely to be mistaken for the young of *P. umbilicatus*, as the young of that species is sometimes only very faintly keeled.

Var. *compréssa* (Lloyd). More concave below than the type, whorls rounder, making the shell more compact. (Found near Birmingham).

Sub-genus.—GYRÓRBIS *Agassiz.*6. *P. SPIRÓRBIS* (*circular coil*) *Müller.* Pl. VI., f. 6.

Very flat, rather solid, glossy, brown horn-colour; *whorls* 5 to 6; faintly carinated on the lower margin. A. 1 mm. B. 6 mm.

This is a common shell throughout the British Isles. It is abundant on pond vegetation and is often found eroded by infusoria or covered with a black coating of mud. For its association with *A. hypnorum* and *L. glabra* see the former species.

Var. I. *écarinata* (*Jeff.*). No keel.

Var. II. *álbida* (*Nelson*). Shell white.

Monst. *scaláarifórme* (*Nelson and Taylor*). Whorls coiled in the form of a screw.

7. *P. VÓRTEX* (*whirlpool*) *Linné.* Pl. VI., f. 7.

Very flat, glossy, yellowish horn-colour; *whorls* 6 to 8; sharply keeled. A. $1\frac{1}{2}$ mm. B. $7\frac{1}{2}$ mm.

Found in similar habitats to the last species, but is more local. It is very widely diffused throughout the British Isles, but is only recorded for Forfar and Caithness in Scotland. I have noticed that it is much more often found with a perfect epidermis than *P. spirorbis*, even in the same pond as that species.

It may be distinguished from *P. spirorbis* by its prominent keel; it is also flatter and thinner.

Var. *compréssa* (*Mich.*). Thinner and much flatter, and more sharply keeled.

8. *P. CARINÁTUS* (*keeled*) Müller. Pl. VI., f. 8.

Compressed, *spire* sunk, only slightly convex beneath, slightly glossy, semi-transparent, pale brown; *whorls* 5 to 6: *suture* deep; *mouth* angulated above and below; sharply keeled in the *centre* of the outer margin. A. $3\frac{1}{2}$ mm. B. 13 mm.

Found in the south and east of England, in Lancashire; south of Scotland, being confined to one locality in Edinburgh, in a pond in the Botanic Garden, where it was probably introduced; in Wales, and Ireland; but it is local, and not often plentiful.

Var. I. *discifórmis* (*Jeff.*). Flatter and thinner.

Var. II. *álbida* (*Hudson*). White.

9. *P. UMBILICÁTUS* Müller. Pl. VI., f. 9.

[=*P. COMPLANATUS* *Jeffreys*].

Concave above, flat beneath, nearly opaque; strongly keeled below; *whorls* 5—6; *mouth* rhomboidal. A. $3\frac{1}{2}$ mm. B. 15 mm.

This species is often very like the last on account of the position of the keel being higher than in type specimens; indeed there is some doubt as to the actual specific distinction between the two species. Dissection has hitherto failed to find a difference in the animals. The young shells are not always keeled and they then somewhat resemble *P. parvus*.

It has a somewhat wider distribution throughout the British Isles than the last species, and it is more common. The largest specimen I have seen, is one that I took near Maidenhead, measuring 18 mm. across.

Var. I. *rhómbea* (*Turt.*). Smaller, more solid, more convex above and more concave below.

Var. II. *albína* (*Jeff.*). Whitish.

Monst. *sinistrórsu*m (*Taylor*). Sinistral.

Sub-genus.—CÓRÉTUS *Adamson*.

10. P. CÓRNEUS (*horn-coloured*) *Linné*. Pl. VI., f. 10.

Very tumid, *spire* sunk; opaque dark horn-colour, lighter below; *mouth* nearly circular; *whorls* 5 to 6. A. $8\frac{1}{2}$ mm. B. 25 mm.

This species is unmistakable both from its size and shape. It is far the largest of our British *Planorbis*. The young are covered with spiral rows of small hairs. Its recorded range in England extends from Hampshire to the north of Yorkshire. Though found locally in Ireland, there are no records for Wales or Scotland.

I have taken specimens with four marks shewing stages of growth, which, if formed only once a season, imply that these individuals were in their fifth year.

To preserve the hispid appearance of young specimens I can recommend their preservation in a little bottle or tube of pure glycerine.

On being plunged into boiling water the animal will sometimes diffuse a crimson fluid resembling that secreted by *V. contecta*.

Var. *albína* (*Moq.*). Shell white.

Sub-genus.—BATHYÓMPHALUS *Agassiz.*

II. P. CONTÓRTUS (*twisted up*) *Linné.* Pl. VI., f. 11.

Flat above, very convex below, dull brown; *whorls* 8, compressed; *suture* deep; *mouth* crescent-shaped; *umbilicus* deep. A. 2 mm. B. 5 mm.

This is a compact-looking little shell, and when once seen is never confounded with any other. It is fairly common on weeds in ponds and ditches. Generally distributed throughout the British Isles.

An individual which I found near Manchester measures 6 mm. in diameter.

Var. I. *álbida* (*Jeff.*). Whitish.

Var. II. *minor* (*Taylor*). Diameter 3 mm.

Sub-family.—PHYSÍNÆ.*Genus.*—APLÉXA *Fleming.*

[=PHYSA *Lamarck*].

Sinistral, sub-oval, *spire* produced.

A. HYPNÓRUM (*frequenting the moss Hypnum*) *Linné.* Pl. VI., f. 13.

Sinistral, spindle-shaped, thin, highly glossy, semi-transparent, dark reddish horn-colour; *whorls* 6—7. A. 12 mm. B. 4½ mm.

This pretty little shell is found in ponds and ditches, at intervals, throughout the British Isles, as far north as Skye, but it is not a common species.

Its frequent association with *L. glabra* and *P. spirorbis* has been pointed out by Mr. W. Nelson, in an interesting note in the *Journal of Conchology*, vol. III., p. 115. The particular cause of their mutual attraction is not at

present known, but will probably be found to consist of some favourite food-plant.

This species like many of the *Limnææ* has the habit of floating on the surface of the water with its footsole uppermost and exposed to the air.

Var. I. *májor* (*Charp.*). Length 18 mm.

Var. II. *rúbra* (*Tryon*). Dark reddish.

Monst. *decollátum* (*Nelson*). Decollated.

Genus.—PHÝSA *Draparnaud.*

Mantle having lobes expanding over the shell.

P. FONTINALIS (*frequenting springs*) *Linne.* Pl. VI., f. 14.

Sinistral, oval, very thin, glossy, semi-transparent, greenish horn-colour; *whorls* 4 to 5, tumid; *spire* very short, obtusely pointed. The deeply serrated *mantle* is extended over most of the shell. A. 9 mm. B. $6\frac{1}{2}$ mm.

The "Bubble Shell" is more common than the last, and is more abundant where it occurs, and frequents running as well as still-water. It has a great partiality for the under sides of the water-lily.

Though the last species and several other members of this family spread threads of mucus in the water, *P. fontinalis* is *facile princeps* in the art. This *habit may be well watched in an aquarium, where the threads may be seen passing perpendicularly downward from the surface of the water, and upward from the bottom. The

*See an interesting paper by Mr G. Sherriff Tye, in *J.C.*, vol. 1. p. 104.

downward thread is apparently kept in position by suction; the top of the thread ending in a flat circular expansion, with a slight depression in the centre, the whole resembling the bottom and stem of a wineglass inverted. Up and down these threads the little animals delight to crawl, and when two meet, as frequently happens, a fierce combat often ensues, the antagonists striving to dislodge each other by remarkably violent jerks.

Var. I. *infláta* (*Moq.*). Much larger, more ventricose.

Var. II. *cúrta* (*Jeff.*). Spire very short.

Var. III. *oblóna* (*Jeff.*). Spire produced.

Var. IV. *albina* (*Jeff.*). Shell white.

Sub-family.—LIMNÆÍNÆ.

Genus.—AMPHIPÉPLEA *Nilsson.*

Animal not contained wholly within the shell.

A. GLUTINÓSA (*glutinous*) *Bruguère.* Pl. VII., f. I.

Oval, globular, very thin and glossy, transparent, pale amber or greyish horn-colour, here and there striated in the line of growth, and faintly, but closely striated spirally; *whorls* 3 to 4, tumid; *spire* slightly produced; *suture* deepish; *mouth* nearly oval, contracted above. The expansion of the mantle, which in young individuals covers the shell, places it in the sub-genus *Amphipeplea*. A. 14 mm. B. 11½ mm.

This is a very local species though abundant where it occurs. In England it is found at Sandwich, near Reading and Henley, Norwich, Hull and Reading, L. Windermere. In Ireland it has been met with in King's Co., Co. Down

and Westmeath, but it is found neither in Scotland nor Wales.

It has the peculiarity of suddenly disappearing and reappearing without any known reason.

Var. I. *mucronáta* (*Jeff.*). Spire more produced.

Var. II. *álbida* (*Williams*), White.

Genus.—LIMNÆA *Bruguère.*

Shell conic-oval or elongated; *spire* usually produced; dextral.

Sub-genus.—RÁDIX *Montfort.*

1. *L. INVOLÚTA* ([*spire*] *enveloped* [*by whorls*]) *Thompson.*

Pl. VII., f. 2.

Oval, very thin, glossy, transparent, pale amber; *whorls* 3 to 4, convex; *spire* sunk; *apex* distinct; *mouth* pear-shaped. A. 10 mm. B. 7 mm.

This beautifully delicate shell is probably a variety of *L. peregra*. Its only habitat is in a tarn on the Cromaglaun Mountain seven miles from Killarney on the road to Kenmare.

Mr. Taylor says: (J. C., vol. VI., p. 286), "though it is probable that *L. involuta* is, like *L. burnetti*, only an extreme variety of *L. peregra*, the fact has not yet been fully and satisfactorily demonstrated."

2. *L. PÉREGRA* (*wandering*) *Müller.* Pl. VII., f. 3.

Obliquely ovate, thin, moderately glossy, yellowish horn-colour; *whorls* $4\frac{1}{2}$ to 5, convex; *spire* produced and pointed; *suture* rather deep; *mouth* three-fourths of the total length, oval; *inner lip* folded on the columella. A. $18\frac{1}{2}$ mm. B. $14\frac{1}{2}$ mm.

This is the commonest and also the most variable of our freshwater shells, and is distributed not only over the whole of the British Isles, but over almost every other part of the Eastern Hemisphere. Mr. J. W. Taylor, in a most interesting and able article in the *Journal of Conchology*, vol. vi., p. 284, says: "It is, however, interesting and somewhat remarkable that it has not been satisfactorily shown to inhabit the continent of America." It is amphibious, being frequently found crawling on mud, and on masses of weed out of water.

Though there are a multitude of different varietal forms authenticated for the British Isles, this number by no means approaches that of the continental conchologists. But let not beginners in the science be disheartened by the formidable array of varietal names hereto appended. No notice need be taken of these names; the specific term *peregra* includes them all, and when a series of different forms has been obtained, the collector will come to the conclusion that there is something convenient in the extensive differentiation after all. Care should be taken not to confound the labiate variety with *L. auricularia*. The body of *peregra* is fuller below than that of *auricularia*; or in other words the *waist* of *peregra* is its broadest part, and of *auricularia* the *shoulder*.

Var. I. *burnétti* (Ald.). Globose, rather solid, dull, strongly striate in line of growth; spire scarcely elevated; apex intorted. Only locality Loch Skene, Dumfriesshire;

specimens connecting this var. with var. II., have been found in Lake Llyn-y-van-fach, Brecon.

Var. II. *lacustris* (Leach). Resembling v. *burnetti*, but smaller and more glossy, with strong transverse grooves; spire not so short, not intorted.

Var. III. *lutea* (Mont.). Very solid, spire very short.

Var. IV. *ovata* (Drap.). Thin, ampullaceous; whorls convex; spire short; mouth oblong.

Var. V. *acuminata* (Jeff.). Resembling v. *ovata* but has a more produced spire and a rounder mouth.

Var. VI. *intermedia* (Fér.). Thin, compressed towards front margin; spire produced; mouth expanded.

Var. VII. *vulgaris* (Moq.). Small, spire less produced; whorls and aperture less convex.

Var. VIII. *oblonga* (Jeff.). Oblong, compressed in front.

Var. IX. *labiosa* (Jeff.). Lip expanded and reflected.

Var. X. *picta* (Jeff.). Marked spirally by alternate bands of brown and white. *N.B.*—*The original v. picta of Jeff. apparently does not include specimens with white banding due to an accident to the shell.*

Var. XI. *maritima* (Jeff.). Dwarfed, solid; spire produced; suture deep. A. 10 mm. B. 6 mm.

Var. XII. *lineata* (Bean). With strong spiral ridges.

Var. XIII. *candida* (Porro.). White.

Var. XIV. *succineiformis* (Shuttl.). Shaped like a *Succinea*, very thin; whorls 4; spire small, oblique.

Var. XV. *stagnáliformis* (Taylor). Somewhat fusiform; last whorl making four-fifths of total length. A. 35 mm. B. 18 mm.

Var. XVI. *boissii* (Dup.). Small, globose; whorls convex; spire produced.

Var. XVII. *obtúsa* (Kob.). Shell large; spire very small; whorls very convex, increasing rapidly; mouth ample, almost reaching the level of the apex of the spire. *N.B.*—*This var. is very like L. auricularia.*

Var. XVIII. *pulchélla* (Roff.). Small, pale, rather pronounced lines of growth; aperture slightly margined. A. 11 mm.

Var. XIX. *diáphana* (Parr.). Very thin and transparent.

Var. XX. *infláta* (Kob.). Shell larger; spire small; whorls not very convex; aperture pyriform.

Var. XXI. *pátula* (Da Costa). Shell larger, much more inflated and globular; spire short; whorls very convex; mouth ample.

Var. XXII. *micróstoma* (Kob.). Shell more slender and elongate than the type, with spire longer than the mouth, the whole shell approaching *L. palustris* in outline.

Monst. I. *sinistrórsu*m (Jeff.). Reversed.

Monst. II. *scálarifórme* (Jeff.). Whorls disjointed.

Monst. III. *decóllatu*m (Jeff.). Spire truncate.

3. *L. AURICULARIA* (*ear-shaped*) *Linné*. Pl. VII., f. 4.

Globosely ovate, thicker than *L. peregra*, fairly glossy, semi-transparent; *whorls* 4 to 5, very tumid; *spire* very short; *apex* sharp; *mouth* very large, with outer lip widely reflected. A. 29 mm. B. 21 mm.

This interesting species named after a somewhat strained resemblance to the human ear, is found in rivers, lakes, ponds, and canals throughout Great Britain, as far north as Fife. In Ireland it has not been recorded for the south-west or north-east, but further investigation of that country will probably give it a wider range. It is very common and particularly fine in the Thames, near Maidenhead. Like all the larger members of this genus it is generally the better for the application of a soft tooth-brush.

Var. I. *acúta* (*Jeff.*). Smaller, oblong, mouth narrower.

Var. II. *álbida* (*Jeff.*). White.

Var. III. *mágná* (*Colb.*). Larger, mouth narrower, upper edge of lip as high as the apex of the spire. A. 32 mm.

Var. IV. *refléxa* (*Nelson*). Outer lip much reflected.

Var. V. *mínor* (*Moq.*). Smaller. A. 17 mm. B. 15 mm.

Var. VI. *ámpla* (*Hartm.*). Spire short, aperture extending beyond apex.

Sub-genus.—LÍMNOPHÝSA *Fitzinger.*

4. L. STAGNÁLIS (*inhabiting swamps*) *Linné.* Pl. VII., f. 5.

Elongated, rather thick, not very glossy, pale whitish horn-colour, striated in line of growth; *whorls* 6—8; the body-whorl forming most of the shell; *spire* tapering; *mouth* large. A. 50 mm. B. 25 mm.

This is the largest member of the genus. It is common in England, Scotland and Ireland, but is not found in any other part of Wales than Anglesea.

It is very variable and collectors will do well to secure series from all possible localities.

The finest specimens that I have seen are two which I took in a pond at Whitchurch, Shropshire. The largest measures 58 mm. in altitude and 30 mm. in breadth. I grieve to say the pond was drained soon after I made the capture and the locality destroyed.

Var. I. *frágilis* (*Linné*). Smaller, thinner and more slender than the type.

Var. II. *bóttnica* (*Clessin*). Dark, suture deep, much smaller than type.

Var. III. *lacústris* (*Stud.*).

Var. IV. *labiáta* (*Jeff.*). Outer lip enlarged.

Var. V. *variégáta* (*Hazay*). Whorls variegated with white markings.

Var. VI. *álbida* (*Jeff.*). White.

Monst. I. *sinistrórsum* (*Jeff.*). Reversed.

Monst. II. *scaláriförme* (*Taylor*). Whorls disconnected.

5. *L. PALÚSTRIS* (*inhabiting marshes*) Müller. Pl. VII., f. 6.

Tapering, rather solid, dull brown; *whorls* 6—7, tumid. A. 25 mm.
B. 10 mm.

This shell is common and abundant on weed in ponds, ditches and slow rivers in all parts of the British Isles as far north as Aberdeen. Its varieties are numerous and often striking. It is amphibious but not to the same extent as the next species.

I once came across a pond in Essex full of nothing but the variety *corva*, some of which measured an inch and a half in altitude.

Var. I. *córva* (*Gmel.*). Larger, more tumid, dark purple.

Var. II. *obésa* (*Taylor*). Very tumid; A. $23\frac{1}{2}$ mm.
B. $14\frac{1}{2}$ mm.

Var. III. *élongáta* (*Moq.*). Spire more produced.

Var. IV. *cónica* (*Jeff.*). Conical, whitish, suture deep, having an umbilical cleft.

Var. V. *mínor* (*Taylor*). Smaller; A. 8 mm. B. $4\frac{1}{2}$ mm.

Var. VI. *tíncta* (*Jeff.*). Shorter and broader, mouth purplish.

Var. VII. *lacunósa* (*Zgl.*). With flattenings, depressions and protruberances.

Var. VIII. *fasciáta* (*Nelson*). With 3 spiral dark bands on body whorl.

Var. IX. *róseolabiáta* (*Jeff.*). With rose coloured rib.

Var. X. *álbida* (*Nelson*). White.

Monst. *decollátum* (*Jeff.*). Spire truncated.

6. *L. TRUNCÁTULA* (*somewhat truncated*) Müller. Pl. VII., f. 7.

Somewhat resembling *L. palustris* in shape, but turreted in appearance on account of the deeper *suture*; rather glossy; *mouth* ovate; *umbilical cleft* distinct; *whorls* 5—6. A. 10 mm. B. 5 mm.

This species is much smaller and more elegant in shape than the last. It is common throughout the British Isles both in still and running water, especially in shallow pools which are often dried up in summer. It is found further from the water than any others of this genus, and may be confidently searched for on the walls and arches of culverts and on dry mud.

It is not advisable to carry this species in the mouth, as it harbours a parasitic worm, which in its after-form of *Fasciola hepatica* attacks sheep that have taken it in while drinking.

Var. I. *ventricósa* (Moq.). Tumid, spire short.

Var. II. *élegans* (Jeff.). Larger, spire tapering.

Var. III. *micróstoma* (Drouet). Mouth contracted.

Var. IV. *májor* (Moq.). Larger than type.

Var. V. *mínor* (Moq.). Smaller, thin, dark-coloured.

Var. VI. *álbida* (Nelson). White.

Monst. *scalárifórme* (Jeff.). Whorls disunited.

Sub-genus.—OMPHÍSCOLA Beck.

7. *L. GLÁBRA* (*smooth*) Müller. Pl. VII., f. 8.

Cylindrical, tapering gradually to a blunt point, thin, glossy, greyish horn-colour; striated closely and regularly in line of growth; *whorls* 7 to 8, rounded; *mouth* small for the size of the shell. A. 15 mm. B. 5 mm.

This is a local species often plentiful where it occurs, inhabiting ponds and ditches in Great Britain, as far as Lanark; in Ireland it is recorded for Cork and Belfast. For its frequent association with *A. hypnorum* and *P. spirorbis* see the former species.

It is, like the preceding species, amphibious. I have often found it crawling up the stalks of reeds several inches out of water. Some that I once kept in an aquarium persisted in crawling up the glass side and tumbled out, thus falling victims to their adventurous disposition.

Var. I. *elongáta* (*Jeff.*). Spire produced.

Var. II. *máior* (*Gass.*). Much larger. A. 23 mm.

Monst. *decollátum* (*Nelson*). Spire truncated.

Sub-family.—ANCYLÍNÆ.

Genus.—ÁNCYLUS *Geoffroy*.

Shell limpet-shaped with a rudimentary spire which is dextral; its recurved form gives the name to the genus.

A. FLUVIÁTILIS (*inhabiting rivers*) *Müller*. Pl. VII., f. 9.

Shaped like the common marine limpet; *apex* recurved. A. 7½ mm.
B. 5½ mm.

The 'Stream Limpet' is found adhering to stones or wooden piles in streams and canals,—very rarely in still water. I have found it in ponds occasionally, but these cannot be regarded as a natural habitat. It is common

throughout Great Britain and Ireland. Var. *gibbosa* is usually found in swift clear streams.

Var. I. *cápulbides* (*Jan.*). Larger, apex near the centre.

Var. II. *gibbósa* (*Bourg.*). Smaller, with the hook overhanging the posterior margin.

Var. III. *álbida* (*Jeff.*). White, more finely striated.

Var. IV *stricta* (*Morel.*). Much elevated, sides compressed.

Genus.—VELLÉTIA *Gray.*

Shell conical, compressed ; *apex* sub-central, sinistral.

V. LACÚSTRIS (*inhabiting ponds*) *Linné.* Pl. VII., f. 10.

Compressed, oblong, thin ; *apex* acute, sinistral. A. $6\frac{1}{2}$ mm. B. $2\frac{1}{2}$ mm.

The 'Pond Limpet' is found in sluggish streams, canals, ponds, and marshes, on the stalks of flags, rushes, and other water plants, especially the *Stratiotes* ; and it may often be found adhering to other shells. Though almost as widely distributed as the last species, it is more local, especially in Ireland. Its compressed oblong form marks it off distinctly from *A. fluviatilis*.

Var. I. *compréssa* (*Jeff.*). Broader and flatter.

Var. II. *álbida* (*Jeff.*). White or colourless.

Var. III. *móquiniána* (*Bourg.*). Elevated, compressed at the sides ; corresponding to var. *stricta* of *A. fluviatilis*.

Order.—OPÉRCULÁTA.

Sub-order.—PULMONÁTA.

Family.—CYCLOSTOMATÍDÆ.

Genus.—CYCLÓSTOMA.

Shell spiral ; *mouth* round ; *umbilicus* small, operculate.

C. ÉLEGANS (*elegant*) Müller. Pl. V., f. 10.

Globosely oval, solid, opaque, light pink, marked with streaks or spots of a darker colour ; very strongly striated in the line of growth, and more closely striated spirally ; *whorls* $4\frac{1}{2}$, cylindrical ; *suture* very deep ; *spire* blunt ; *mouth* nearly circular ; *umbilicus* small, but deep ; *operculum* thick, testaceous. A. 15 mm. B. 10 mm.

This interesting shell is the only British representative of an interesting genus which abounds in species in warmer latitudes.

It is common in England and Wales, always on calcareous soils especially on pure chalk formations. It has not been recorded for Scotland or Ireland. Along the banks of the Thames between Marlow and Maidenhead it occurs in great abundance on the chalk hills, and throughout the calcareous districts of Kent. I have taken it in very small areas where there is an outcrop of chalk, in the midst of other formations by no means suitable. It is also tolerably plentiful in Jersey, where there are no calcareous strata. I have observed it on tree trunks at Cooper's Hill and at Ewell.

Var. I. *mármorea* (*Brown*). Entirely free from striation.

Var. II. *fasciata* (*Picard*). Ash coloured, with two interrupted brown or violet bands.

Var. III. *pallida* (*Moq.*). Light pink or yellowish, with traces of banding on upper whorls.

Var. IV. *albescens* (*Moq.*). Whitish, without markings.

Var. V. *ochroleuca* (*Moq.*). Whitish yellow.

Family.—ACÍCULÍDÆ.

Genus.—ACÍCULA *Hartmann*.

Shell cylindrical; *spire* thin; *apex* blunt; *operculum* horny, excentric.

A. LINEÁTA (*lined*) *Draparnaud*. Pl. V., f. II.

Cylindrical, light brown, slightly transparent, glossy, striated in the line of growth; *whorls* 6—7; *spire* blunt; *suture* distinct; *mouth* pear-shaped; *umbilicus* very small; *operculum* horny. A. $2\frac{1}{8}$ mm. B. $\frac{7}{8}$ mm.

This very minute and interesting species is rare and local. It is found more in the north than in the south of England; in Merioneth in Wales; in Renfrew and Ayr in Scotland, and also in Ireland.

It is gregarious, being found sometimes in considerable numbers in woods, under stones, on decaying leaves and among wet moss. It is said to feed on decaying fungi.

Var. *alba* (*Jeff.*). White, or colourless and transparent.

Monst. *sinistrórsun* (*Jeff.*). Reversed.

Sub-order.—PÉCTINIBRANCHIÁTA.

Family.—NERITÍDÆ.

Genus.—NERITÍNA *Lamarck.*

Shell sub-oblong; *operculum* calcareous and solid.

N. FLUVIÁTILIS (*inhabiting rivers*) *Linné.* Pl. VIII., f. 4.

Ovate, solid, glossy, chequered brown, white and purple; *whorls* 3; *spire* short; *operculum* semi-lunar. A. $8\frac{1}{4}$ mm. B. $6\frac{1}{4}$ mm.

This prettily marked shell is found in many rivers, streams and canals throughout the British Isles, except in Wales and Scotland, where Mr. W. D. Roebuck considers it has been “accidentally imported with river ballast from England or abroad.” It is the most solid of our fresh-water shells and reminds us of its marine cousins the *Littorinæ* so common on seaweed. All the varietal forms are connected by gradations of colour and markings.

Var. I. *cerína* (*Colb.*). Lemon coloured.

Var. II. *trifasciáta* (*Colb.*). With 3 bands of colour.

Var. III. *unduláta* (*Colb.*). Transversely banded.

Var. IV. *nigréscens* (*Colb.*). Uniformly dark coloured.

Family.—PALÚDINÍDÆ.

Genus.—VIVÍPARA *Montfort.*

Conoid, ventricose; *operculum* concentrically striate; ovo-viviparous.

I. V. CONTÉCTA (*covered by an operculum*) *Millet.* Pl. VIII., f. 5.

Conical, diaphanous, fairly glossy, dark green, with darker bands of same colour; *whorls* 7, very convex; *suture* very deep; *mouth* almost circular, but angulated above; *umbilicus* small, but deep and distinct; *operculum* horny, thin. A. 38 mm. B. 31 mm.

This species and the next are often found coated with confervoid, which can sometimes be removed by hot water and soap applied with a soft nail-brush. Both this and the following species are viviparous.

It inhabits rivers (usually sluggish), canals, and ponds, as far north as Lancashire and Yorkshire, but it has not been hitherto recorded for Wales, Scotland, or Ireland. It is a local species, by no means so common as *V. vivipara*.

Var. *virëscens* (Jeff.). Without bands.

2. *V. VIVÍPARA* (*producing young alive*) Linné. Pl. VIII., f. 6.

Conical, but more oval than the last species, not so glossy as *V. coniecta*; lighter in colour and more solid; *whorls* $6\frac{1}{2}$; *suture* not so deep as *V. coniecta*; *umbilicus* none; *operculum* moderately thick. A. 38 mm. B. 30 mm.

This species, found within a slightly more extended range than the last, is much more common. It has not, as yet, been recorded for Wales, Scotland, or Ireland. The two species may be readily distinguished by the following characteristics:—

V. CONJECTA.	V. VIVIPARA.
Conical.	More oval.
Rather glossy.	Not so glossy.
Dark bluish green.	Light greenish yellow.
Suture very deep.	Not so deep.
Umbilicus distinct.	Umbilicus none.
Texture thin.	More solid.
Apex sharp.	Apex blunt.
Operculum thin.	Operculum slightly thicker.

Vars. I. and II., form the ends of a series of which the intermediate forms are met with in the canal at Pontypool.

Var. I. *efasciáta* (*Pickering*). Without bands.

Var. II. *átro-purpúrea* (*Lloyd*). Dark purple all over.

Var. III. *álbida* (*Nelson & Taylor*). White.

Genus.—BYTHÍNIA *Gray*.

Shell ovate, conical, perforated; *animal* with eyes sessile.

1. B. TENTÁCULÁTA (*with tentacles*) *Linné*. Pl. VIII., f. 7.

Somewhat conical, rather solid, glossy, semi-transparent, horn-colour; *whorls* 6, convex; *mouth* oval, angulated above; *umbilicus* hardly perceptible; *operculum* thick. A. 12½ mm. B. 6½ mm.

Found in slow rivers, canals, ponds, etc., distributed throughout every part of the British Isles. The finest specimens I have seen were taken in the Trent near Nottingham.

Var. I. *prodúcta* (*Menke*). More slender than type.

Var. II. *ventricósa* (*Menke*). Spire shorter, tumid.

Var. III. *excaváta* (*Jeff.*). More tumid, suture deeper.

Var. IV. *álbida* (*Rimmer*). White.

Monst. *decollátum* (*Jeff.*). Upper whorls wanting.

2. B. LEÁCHII (*after Dr. Leach*) *Sheppard*. Pl. VIII., f. 8.

Conical, thin, moderately glossy, semi-transparent, horn-colour; *whorls* 5, very convex; *mouth* almost circular, with slight angulation above; *umbilicus* small, but distinct; *operculum* as in last species. A. 6½ mm. B. 5 mm.

This species is far more local and less abundant than the last; it is found in similar situations. It occurs in many parts of England and Wales but not in Ireland, and only locally in Scotland. As it is only about half the size of *B. tentaculata*, adult specimens cannot be mistaken; but to avoid confusion with the young of that species the following table may be useful.

B. TENTACULATA.	B. LEACHII.
	Whorls much more convex, suture much deeper.
Umbilicus practically none.	Umbilicus distinct.
Mouth obliquely oval and sharply angulated above.	Mouth almost circular, very slightly angulated.

It may be noticed that *B. tentaculata* bears the same relation in its distinctive characteristics to *B. leachii* that *V. vivipara* does to *V. contecta*.

Var. I. *elongata* (Jeff.). Spire elongated.

Var. II. *albida* (Rimmer). White.

Genus.—PALÚDESTRÍNA *D'Orbigny*.

[=*HYDROBIA *Hartman*].

Eyes placed on tubercles; *operculum* horny and thin, paucispiral.

I. P. SÍMILIS (*resembling another species*) *Draparnaud*. Pl. VIII., f. II

Sub-conical, thin, semi-transparent, yellowish horn-colour; *whorls* 5—6, rounded; *suture* deep; *mouth* oval; *operculum* thin; *umbilicus* small. A. $3\frac{1}{2}$ mm. B. $2\frac{1}{2}$ mm.

*The authorities do not consider this a freshwater genus, but as one species at least lives and breeds in pure freshwater, and nearly all L. and F. water collectors are more or less interested in it, I have included it.

The habitat given by Jeffreys between Greenwich and Woolwich is now no longer correct. I learn from the Rev. J. W. Horsley that this species is nearly, if not quite extinct, as far as this country is concerned. He informs me that it has not existed for some years in the locality given for it by Jeffreys, between Greenwich and Woolwich, but that having migrated down the river, owing to the increased pollution of the Thames, it was to be found in one small shallow pond close to the river bank at Erith. In September, 1892, Mr. Horsley and I searched this spot, which was then dry mud, in vain, and my informant now tells me that he has not been able to meet with it on a subsequent occasion when he sought it.

2. *P. VENTRÓSA* (*swollen*) *Montagu*. Pl. VIII., f. 12.

Conical, tapering, thin, glossy, semi-transparent; *whorls* 6—7, rounded; *spire* pointed; *mouth* and *operculum* oval. A. 5 mm. B. $3\frac{1}{8}$ mm.

This species swarms in countless thousands in brackish marshes on the coasts of Norfolk and Suffolk among weed. It is also plentiful in estuaries in England and Wales. In Ireland it occurs in Dublin Bay and Larne Lough. It is not found in Scotland.

Var. I. *minor* (*Jeff.*). Shell much smaller, spire shorter.

Var. II. *ováta* (*Jeff.*). Spire much shorter; whorls 4, more tumid than type; the last exceeds one half the shell.

Var. III. *elongáta* (*Jeff.*). Sometimes 8 whorls, longer.

Var. IV. *pellúcida* (Jeff.). White, transparent.

Monst. *decollátum* (Jeff.). Spire truncate.

3. *P. JENKINSI* Smith. Pl. VIII., f. 13.

Conical, tapering, rather solid, pale horn-colour; finely striated in line of growth; *whorls* 5—6; *mouth* ovate, angulated above, the entire rim standing out from the shell; *operculum* horny, concentric. A. 5½ mm. B. 3½ mm.

This species was discovered by Mr. A. J. Jenkins at Plumstead in 1889, and submitted to Mr. E. A. Smith, who considered it a new species.* This however was not the first time this shell had been taken in England, for Mr. Sheriff Tye informs me that he has specimens—unnamed—collected some years previously by the late Miss Fairbrass, near Deal.

In 1891 I found it at Sandwich—perhaps in Miss Fairbrass' locality,—and in 1892 Mr. Chas. Oldham and I found a numerous colony near Exeter. Circumstances then led me to hazard the conjecture‡ that the shell had been imported in Baltic timber, and I suggested that search should be made at Newhaven and Wisbeach, where Baltic timber is still imported, and last year (1894), Mr. C. H. Morris of Lewes, found an exceedingly abundant colony near Newhaven. I have also taken it in the military canal at Hythe. It has also been found in considerable quantities in two places in a Staffordshire canal.

*See 'Journal of Conchology,' vol. vi., p. 142.

‡See 'Journal of Conchology,' vol. vii., p. 148.

Canon Norman is of opinion that this species is identical with the *Paludina crystallina* of Pfeiffer, a West Indian species, and a few specimens he kindly sent me for inspection, bear a close resemblance to our species. Mr. E. A. Smith, however, is by no means convinced of this identity, as in his opinion the thread-like keel round the whorls of our British species differs from the carination of Pfeiffer's *P. crystallina* var. *coronata*, which consists of a row of spines forming a coronation rather than a carination.

Mr. Smith also informs me that *Paludestrina candeana* D'Orbigny, and *Paludina cisternicola* and *ornata* Morelet, also belong to this species according to Von Martens. Shuttleworth and Frauenfeld also state that *Paludina jamaicensis* and *Melania spinifera*, both of C. B. Adams, are also of this species.

Microscopical examination of the radulæ of *P. crystallina* and *P. jenkinsi* by the Rev. Prof. Gwatkin, shows the two to be similar, though this in itself, according to Mr. Gwatkin, is not positive evidence of identity, as "different species may have a similar radula."

Var. *carinata* (Smith). With a thread-like keel in the centre of the whorls. Found in all cases with the type, and in about equal proportion to it.

Family.—VALVATIDÆ.

Genus.—VALVATA Müller.

Eyes nearly sessile ; *operculum* horny and thin.

1. V. PISCINÁLIS (*inhabiting fish ponds*) Müller. Pl. VIII., f. 9.

Globular, nearly opaque, brownish yellow; *whorls* 6, cylindrical; *spire* blunt; *suture* very deep; *mouth* circular; *umbilicus* deep; *operculum* concentrically spiral. A. $6\frac{1}{4}$ mm. B. $6\frac{1}{2}$ mm.

This species is found in lakes, canals, and rivers, throughout the British Isles, as far north as Perth. It is nearly always covered with a green confervoid crust which is very difficult to remove. The largest specimen I have seen is one that I took at Norwich, measuring $7\frac{3}{4}$ mm. I have some from Doxey Brook near Stafford, with the whorls disconnected.

Var. I. *depréssa* (C. Pfr.). Flatter, umbilicus larger.

Var. II. *antiqua* (Sow.). [= var. *subcylindrica* (Jeff).] Spire more raised.

Var. III. *pusilla* (Müll.). Smaller, striæ stronger, whorls $4\frac{1}{2}$.

Var. IV. *albina* (Taylor). White.

Monst. *sinistrórsu*m (Jeff.). Reversed.

2. V. CRISTÁTA (*crested, i.e. with branchial plume*) Müller.

Pl. VIII., f. 10.

In shape a circular coil; glossy, light horn-colour; *whorls* 5; *mouth* circular; *operculum* concentrically spiral. A. $\frac{5}{8}$ mm. B. $3\frac{1}{3}$ mm.

This pretty little shell frequents canals, lakes, and ponds, especially among the roots of flags. It is rather local, but is distributed from Orkney to the south of England. In Ireland it is still more local, and has not been recorded for the south-west.

Var. *álba* (Rowe). White.

CLASS.—ACÉPHALA.

SUB-CLASS.—PELECÝPODA.

Order.—LAMÉLLIBRANCHIÁTA.

Sub-order.—ISÓMYA.

Family.—UNIONÍDÆ.

Genus.—ÚNIO *Philippsson*.

Elongated, solid; *lateral teeth* strong; *lunule* distinct.

1. U. TÚMIDUS (*swollen*). *Philippsson*. Pl. IX., f. 10.

Ovate, very solid, dark brown; *epidermis* smooth. L. 1·5 inches.
B. 3 inches.

Common in many rivers, ponds and canals in England and Wales, but not found in Scotland or Ireland.

Jeffreys gives the average length and breadth of this shell as 1·5 in. and 3 in. respectively, but much larger measurements are not uncommon. Mr. G. S. Tye (*Sc. Gossip*, April, 1885,) gives the length of one in his possession as 2·25 in. and the breadth 5 in. This and other large specimens were taken “in a pool near Birmingham.” I have taken specimens in Copmere, Staffordshire, of equal length and over 4 inches in breadth, but Jeffreys’ measurements are correct for the average size.

Var. I. *miilleri* (*Rossm.*). More oval in shape.

Var. II. *ovális* (*Mont.*). Wedge shaped, dark coloured.

Var. III. *ponderósa* (*Pasc.*). Larger, very solid, dark coloured.

Var. IV. *radiata* (Colb.). Thinner, with yellow and green radiations.

2. U. PICTÓRUM (*painters'*) Linné. Pl. IX., f. 11.

Oblong, solid, usually narrower than *U. tumidus*. The *ligament* is parallel with the lower margin, whereas the *ligament* of the last species, if produced, would meet the line of the lower margin and form an angle. Its colour is usually a much brighter green, and it is more glossy than the last species; it is also narrower in proportion to its size, and is less solid. L. 1·33 ins. B. 3 ins.

The "Painters' Mussel" is found in similar localities to *U. tumidus*, and often approaches it in appearance, so much so that there has been great doubt of its being a distinct species. Mr. Rogers informs me that specimens found in canals near Manchester are lined with a beautiful salmon-coloured nacre, due perhaps to the refuse at the bottom of the canals, and I have taken specimens similarly coloured at Castle Ashby ponds, Northants.

In the same article quoted under the last species, there is mention of a specimen the length of which is $2\frac{3}{16}$ inches and the breadth $5\frac{1}{4}$ inches; this shell was taken in the same pond as the large *U. tumidus* mentioned above, and here again I may mention that from the same spot where I took the large *tumidus* I have specimens of *pictorum* $2\frac{1}{4}$ inches in length and $4\frac{1}{2}$ in breadth. The most beautiful specimens I have seen have come from a muddy bottom; a sandy bottom alters the character in a wonderful manner.

Var. I. *radiata* (Moq.). Having greenish-coloured rays.

Var. II. *curviróstris* (Norm.). Smaller, shorter, flatter.

Var. III. *látior* (Jeff.). Broader, shorter, yellow-brown.

Var. IV. *comprensa* (Jeff.). Very broad and flat.

Sub-genus.—MÁRGARITÁNA Schum.

3. U. MARGARÍTIFER (*pearl bearing*) Linné. Pl. IX., f. 12.

Oblong, compressed, very solid, dull black; *beaks* always eroded, lower margin nearly straight. The inside is pearl-white, sometimes pinkish. Occasionally pearls are found inside—white, green or brown. L. 2 in. B. 5 in.

This interesting species known as the ‘pearl mussel’ is to be found in rivers in mountain districts in several parts of Great Britain from Shetland to Cornwall, but only to the west of a line drawn from Scarborough to Exeter; and also in Ireland and the I. of Man. The pearls for which this shell was once eagerly gathered in the Tay, the Irt and the Conway, are small and worthless compared with those from the East.

Suetonius says that Cæsar was partly attracted to Britain by the reports of pearls found there, and Pliny states that he covered a buckler with them, which he dedicated to Venus Genetrix.

Forbes and Hanley think that “Cæsar’s buckler was more probably covered with the pearls from *Mytilus*

edulis" (the common sea mussel). This, however, is not likely, as the pearls from this shell are exceedingly few and poor. Tacitus writes that they were of marine origin.

Pennant states that as many as sixteen pearls have been found in a single *Unio*, and he gives an account of pearls of value having been found in Donegal and in the Conway.

The ancient writers agree in disparaging the British pearls, justly considering those from the East finer in size and quality.

Tacitus mentions a theory current in his time that the dull reddish colour of our pearls was due to their being collected from cast-up shells instead of being gathered from living shells from the bottom of the sea ; but he adds, with characteristic dry humour, that the fault probably lay in the pearls themselves, as otherwise his avaricious countrymen would have been sure to discover the best method of obtaining them.

I understand that at Waterford this species goes by the name of the 'Sugar loom.'

Var. I. *sinuata* (Lam.). Broader than the type, yellowish; lower margin incurved.

Var. II. *roissyi* (Mich.). Longer than the type, lower margin rounded outwards.

Genus.—ANODONTA *Lamarck.*

The members of this genus are almost toothless, as the name implies.

I. A. CÝGNEA ([*eaten by*] *swans*) *Linné.* Pl. VIII., f. 1.

Oblong, swollen, thin, brown or greenish; well marked by lines of growth; *ligament* long and parallel to the lower margin. L. 2·75 ins. B. 5·55 in.

The ‘Swan Mussel’ is found in great abundance in slow rivers, ponds, lakes, and canals, as far north as Elgin; in Wales and locally in Ireland.

It is the largest of our freshwater mussels, attaining an average breadth of over five inches. Again quoting Mr. Tye’s article mentioned under *U. tumidus* and *U. pictorum*, we find “two fine specimens of *A. cygnea*, taken at Worthing, of the following dimensions: length $4\frac{1}{2}$ in., breadth $7\frac{1}{2}$ in.; length 5 in., breadth 8 in.” But the largest British specimens known, were taken by Mr. W. H. Heathcote, near Preston, the largest measured 9 in. in breadth, $4\frac{1}{2}$ in. in length, and $3\frac{1}{4}$ in. in thickness; the greater number found on that occasion were more than 8 in. in breadth.

Should the scoop be too small, or the water too deep for the length of the stick, or in the absence of both, it will be found a good plan to get a withy and cut one end in the shape of a pointed knife blade; this may be pushed into the open mouth of the mussel, which will close

tightly on it, when it can easily be drawn out of the mud. If the stick be not flattened the closing force of the animal will often break the shell.

Var. I. *arenária* (*Schröter*). Broader, the upper and lower margins nearly parallel, the inferior more or less straight.

Var. II. *rostráta* (*Rossm.*). Ovate, upper margin forming a crest.

Var. III. *stagnális* (*Sozw.*). Thin, inflated, anterior end rounded; hinge line arcuate; beak sub-acute; basal line much rounded; olive green.

Var. IV. *incrassáta* (*Shepp.*). More swollen and solid.

Var. V. *radiáta* (*Müll.*). Larger, yellowish-green, streaked; beaks placed at a distance of only one-third from the anterior side.

Var. VI. *pállida* (*Jeff.*). Light yellow, wedge shaped.

2. A. ANATÍNA ([*eaten by*] *ducks*) *Linné*. Pl. VIII., f. 2.

Oval, compressed, glossy, green or brown; *ligament* short, prominent, straight, forming an angle with the lower margin; *scars* deeper than those of the last species. L. 2 in. B. 3·5 in.

Found in Britain as far north as the Forth, but not in Ireland. It may be distinguished from the last species by its smaller size and the angle which its hinge makes with the lower margin. It is considered a variety of *A. cygnea* by some, and by others as the young of that species.

The latter theory may be put aside when it is remembered that the two species are often found separately, though the young of *cygnea* do resemble adult *anatinæ* and the animals of the two species cannot be distinguished by dissection.

Var. I. *ventricósa* (*C. Pfr.*). Larger, more solid.

Var. II. *complanáta* (*Rossm.*). Oval, compressed, beaks close to anterior margin.

Var. III. *radiáta* (*Jeff.*). With green and yellow radiations.

Family.—SPHÆRIÍDÆ.

Genus.—SPHÆRIUM *Scop.*

Shell nearly equilateral; *animal* with two siphons.

I. S. CÓRNEUM (*horn coloured*) *Linné.* Pl. IX., f. I.

Somewhat globular; thin, glossy, opaque, yellowish horn-colour with paler bands indicating the lines of growth, finely and evenly striated in the same direction and also faintly striated from beak to margin; *ligament* short; *hinge* furnished with a double cardinal tooth in each valve, 2 lateral teeth in the right and 4 in the left valve; *muscular scars* faint. L. $8\frac{1}{2}$ mm. B. $11\frac{1}{4}$ mm.

This common shell is found at the roots of flags and weeds and in the mud in ponds, ditches, canals and rivers in every part of the British Isles. It has the power of suspending itself in the water by threads of mucus.

Var. I. *flavéscens* (*McGill*). Pale yellow.

Var. II. *núcleus* (*Stud.*). Smaller, nearly spherical.

Var. III. *scaldiána* (*Norm.*). Ovate, paler than the type.

Var. IV. *pisidioides* (Gray). Somewhat triangular, striæ coarser than in the type.

2. *S. RÍVICOLA* (*inhabitant of streams*) Leach. Pl. IX., f. 2.

Oval, solid, opaque, glossy, greenish or yellow when young, darker when adult; *striæ* evenly concentric; *ligament* short but conspicuous; *scars* distinct; *teeth* as in the last species but larger. L. $17\frac{1}{2}$ mm. B. $22\frac{1}{2}$ mm.

This is the largest species of the genus. It is much flatter than *S. corneum*, especially when young; more solid and more strongly striated.

It inhabits canals and slow rivers in various parts of England. It is said to have been taken in Dublin, but it has not been recorded for Wales or Scotland.

Var. *flavescens* (Moq.).

3. *S. PÁLLIDUM* (*pale*) Gray. Pl. IX., f. 3.

[=*S. OVALE* Jeffreys.]

Oblong; shoulders sharp; thin, semi-transparent, dull, pale grey; *striæ* faint, concentric; *beaks* nearly central; *ligament* long; *hinge* straight on posterior, incurved on anterior side; *teeth* small; *scars* distinct. L. 10 mm. B. 15 mm.

This is a local species, found in canals and ponds in Lancashire, Yorkshire, Warwickshire, Staffordshire, Surrey, and Middlesex, but not in Ireland, Wales, or Scotland.

It is probably of recent introduction, and was only noticed about 1824, though a single valve has been found in the fossiliferous alluvial deposit near London.

4. *S. LACÚSTRE* (*inhabiting lakes*) Müller. Pl. IX., f. 4.

Round; shoulders sharp; more compressed than *S. corneum*; thin, glossy, semi-transparent, grey; regularly striate concentrically; *beaks* tipped with a small protuberance (*caliculation*); *ligament* narrow; *hinge* strong. L. $7\frac{1}{2}$ mm. B. 10 mm.

Found in similar habitats to *S. corneum* but is more local, though widely distributed. In Ireland it “appears to be absent in the north, and in the south and east it is decidedly rare.” Glasgow and the neighbourhood of Edinburgh is the extent of its range in Scotland. With regard to the capping of the umbones—the special character of this species—Mr. Taylor (‘Monograph of the L. and F. W. Moll. of the B. Isles,’ part I., p. 43) says: “Caliculation is apt to take place to a noticeable extent, only in those species in which the embryonic shell is of comparatively large size and somewhat globular shape, and the succeeding shell growth does not continue on the same plane.” It is thinner and more compressed than *S. corneum*, and its round outline differentiate it from the oblong *S. pallidum*. The valves close very perfectly which enables it to survive a drought. My finest specimens were taken alive from the surface of the mud of a small pond which had been dried up for two months.

Var. I. *brochoniána* (Bourg.). Much larger and flatter.

Var. II. *rotúnda* (Jeff.). Rounder and flatter.

Var. III. *ryckhóltii* (Norm.). Small, shoulders rounded off, beaks prominent.

Var. IV. *ovális* (Fér.). Somewhat oval, with indistinct caliculation.

SYNOPTICAL TABLE OF THE SMALLER *PISIDIA*.

<i>Name of Species</i>	1. <i>P. fontinalis</i> .	2. <i>P. pusillum</i> .	3. <i>P. nitidum</i> .	4. <i>P. nitium</i> .
<i>Animal</i>	—	—	Siphon funnel-shaped, indented round edge.	Reddish-coloured.
<i>General Shape</i>	Triangular.	Oval.	Round.	Oblong.
<i>Appearance of Beaks</i>	Prominent and acute.	Not prominent and blunt.	Prominent and obtuse.	Rather prominent and obtuse.
<i>Position of Beaks</i>	On one side.	On one side.	Nearly central.	Considerably on one side.
<i>General characteristics</i>	Beaks very much on one side.	Size when adult, and oval outline.	Round outline.	Oblong or rhomboidal form; nearly straight outline of lower margin.

N.B.—Jeffreys says ('B.C.', vol. I., p. 18: "Size, substance, sculpture, and texture are not of much account.")

Genus.—PISIDIUM C. Pfeiffer.

Shell inequilateral ; *beaks* near the shorter or posterior end ; *animal* with only one siphon.

These little shells are usually a great trouble to the collector on account of their variability and similarity, and conchologists have differed greatly as to the number of species. The thanks of all collectors, therefore, are due to Dr. Jeffreys, who has reduced the number to five fairly well-marked species, distinguishing them as follows:—

- a. Triangular. (*P. amnicum*, *P. fontinale*).
- b. Oval. (*P. pusillum*).
- c. Round. (*P. nitidum*).
- d. Oblong. (*P. milium*).

The table on the opposite page may be a help to identification.

I. P. AMNICUM (*inhabiting rivers*) Müller. Pl. IX., f. 5.

Triangular, tumid, solid, glossy, quite opaque when adult, having deep concentric ridges, greyish horn-colour ; *teeth* (as those of all the *Pisidia*) the same as those of the last genus, but proportionately more strongly developed. L. $7\frac{1}{2}$ mm. B. $9\frac{1}{2}$ mm.

P. amnicum is found in ponds, canals, rivers, and lakes in all parts of Great Britain as far north as the Forth, and in Ireland rarely in the south and east.

There is no mistaking it when adult for any others of the genus on account of its much greater size, and its triangular shape distinguishes it from the members of the genus *Sphærium*. Young specimens need not be mis-

taken for *P. fontinale*, as the latter shell is not so deeply grooved and is far more ventricose.

Var. I. *læviúscula* (*Moq.*). Larger, striæ faint.

Var. II. *flavéscens* (*Moq.*). Uniform pale yellow.

2. *P. FONTINALE* (*inhabiting springs*) *Draparnaud.*

Pl. IX., f. 6, and Pl. X., f. 1.

Triangular, tumid, thin, greyish horn-colour; more transparent than *P. amnicum*; *beaks* prominent; *scars* deep. L. $3\frac{3}{4}$ mm. B. 4—5 mm.

Found in sluggish streams, canals, ponds, and ditches throughout the British Isles. *Henslowiana* is a common and very distinct form.

Var. I. *henslowiana* (*Shepp.*). The valves have a ridge near the beaks.

Var. II. *pulchella* (*Jen.*). Glossy, strongly grooved.

Var. III. *cinérea* (*Ald.*). Larger and flatter.

Var. IV. *pállida* (*Gas.*). More ventricose; irregularly striate; paler with a few darker rays which diverge from beaks to margin.

3. *P. PUSÍLLUM* (*small*) *Gmelin.* Pl. IX., f. 7, and Pl. X., f. 4.

Oval, thin, moderately glossy, finely striate concentrically, yellowish white; *beaks* nearly central; *ligament* inconspicuous. L. $4\frac{3}{8}$ mm. B. 5 mm.

This is far the commonest species. It is found in ditches and swamps, ponds, etc., throughout the British Isles. Its oval form as well as its more central and

flatter beaks, distinguish it from the last species. The variety *grandis* was found by Mr. T. Rogers near Manchester, and was named for him by Mr. W. W. Walpole. Some specimens that Mr. Rogers kindly gave me measure 6 mm. in breadth, but he informs me that he has taken even larger examples.

Var. I. *obtusdlis* (Lam.). Smaller and more tumid.

Var. II. *grandis* (L. E. Ad.). Much larger. L. 5 mm. B. 6 mm.

4. P. NÍTIDUM (*shining*) Jenyns. Pl. IX., f. 8, and Pl. X., f. 2.

Round, tumid above, compressed below, very glossy; *scars* distinct. L. $3\frac{3}{4}$ mm. B. $3\frac{3}{4}$ mm.

Though this species is recorded as having a wide distribution, it is rare. Very few collectors seem able to identify it. Typical specimens of this and other members of the genus are easily distinguished, but the many variations of form so commonly met with render identification extremely difficult, especially as many collectors of experience call the same thing by different names. I think it is most apt to be confounded with *pusillum* and its var. *obtusale*.

It is recorded for most parts of Great Britain and Ireland. The variety *globosa* was named so by Jeffreys in a letter to Mr. T. Rogers. Some specimens of this var. on being subjected to a continental authority were considered to be *P. obtusale*.

Var. I. *spléndens* (Moq.). Lemon-coloured, larger.

Var. II. *globósa* (L. E. Ad.). Sphæroidal.

5. P. MÍLIUM (*grain of millet*) Held. Pl. IX., f. 9, & Pl. X., f. 3.,
[=P. ROSEUM Jeff.]

Somewhat oblong, tumid, glossy, regularly striated concentrically; *ligament* almost invisible. L. $2\frac{1}{2}$ mm. B. $3\frac{3}{4}$ mm.

Its habitats are similar to those of the last species. Its distribution is more restricted than any of the others, it having been found in Sligo only, in Ireland; in Wales only in Anglesea. I have taken it in the northern, southern, and western and midland counties of England, but it is more common in Scotland than south of the Tweed.

Its oblong shape and straight lower margin serve to distinguish it from its brethren.

Var. *alpéstris* (Clessin). Very strongly striated, very globose, somewhat produced; lower margin towards posterior extremity more bent up and more arched.

Sub-order.—HÉTÉROMÝA.

Family.—MYTILIDÆ.

Genus.—DREISSÉNSIA Van Beneden.

Boat-shaped, furnished with a byssus; *beaks* placed at the extreme end; *ligament* internal.

D. POLYMÓRPHA (*many shaped*) Pallas. Pl. VIII., f. 3.

Shell triangular, sharply keeled, lower margin incurved; solid; *ligament* long and narrow; *animal* furnished with a *byssus*. L. 35 mm. B. 15 mm.

There is no mistaking this shell. Its triangular boat-shape is sufficient to identify it at once.

It inhabits rivers, lakes, and canals in England and Scotland, but it has not yet been found in Ireland. It is supposed to have been introduced from Russia about 1824.

This, and indeed all mussels are much appreciated by rats.

Var. I. *dilatata* (Colb.). Broad and flat, beaks protruding beyond the hinge.

Var. II. *angusta* (Colb.). Narrower than type.



GLOSSARY.

A.

acéphalous, headless.

achátina, agate.

acícula, a hair-pin.

ácme, a point.

aculeáta, prickly.

acumináta, pointed.

acútus } pointed.
acúta }

agréstis, inhabiting fields.

Agriolimax, field slug.

álbicans, whitish.

álbida, whitish.

albína, } white.
albá, }

álbocíncta, with a white band.

ábolaterális, white sided.

allíaria, smelling of garlic.

alpéstris, inhabiting heights.

ámnicum, inhabiting rivers.

amphíbious, inhabiting both land and water.

Amphipéplea, enfolded around with a mantle.

ámpulláceous, shaped like a flask or bottle.

ánatina, belonging to ducks.

Ancylus, a hook.

ánglica, English.

angústa, narrow.

angústior, narrower.

Anodónta, toothless.

antérior, the front; applied in bivalves to the end where the mouth of the mollusk is situated; the large or blunt end. (The *Pisidia* have the anterior pointed.)

antíqua, ancient.

ántivertígo, not reversed.

ápex, the extreme point of the spire of a univalve.

aquátic, inhabiting water.

arenícola, inhabitant of sandy places.

árborum, inhabiting trees.

arbustórum, inhabiting copses.

Arion, a fabled musician.

articuláta, jointed.

aspérsa, spotted, sprinkled.

áter, black.

átro-purpúrea, dark purple.

áurantiaca, golden hued.

auriculária, ear-shaped.

áxis, applied to univalve shells, the centre column formed by the junction of the whorls.

B.

Bálea, bay coloured.

beak, see *umbo*.

bicolor, with two colours.

bidentáta, with two teeth.

bigranáta, with two small teeth.

bimargináta, with two lines of different colours round the margin.

biplicáta, having two folds.

bivalve, a shell composed of two plates.

bizóna,
bizonális, } with two bands.

bránchial, pertaining to the gills.

brévis, short.

byssus, a collection of strands by which *D. polymorpha*, etc., attach themselves to stones.

Bythínia, an ancient province of Asia Minor (Bithynia).

C.

Cæcilióides, blind.

calcáreous, chalky.

cándida, white.

Cantiana, Kentish.

caperáta, wrinkled.

capulóides, resembling a knob or handle.

cardinal, pertaining to the hinge of a bivalve.

carinátus, keeled.

carnívorous, eating flesh.

Cartúsiána, after a Carthusian monastery.

castánea, chestnut-coloured.

cellária, inhabiting cellars.

Céphala, the class of mollusks with heads.

cerína, wax-coloured (*i.e.* yellow).

cincta, girdled.

cinérea, ash-coloured.

cinéreo-niger, dark ash-colour.

circumscriptus, trimmed round.

Clausília, the name of the genus with an appendage called
a *clausilium* or door.

Cochlicopa, a shell with a notch.

colubrína, resembling an adder.

columélla, a small column ; the technical term for the *axis*
of a univalve.

compácta, compact.

complanátus, flattened.

compréssa, compressed.

cóncave, hollow.

concéntric, having the same centre.

Conchólogy. "Conchology treats of the mollusca, or that
great division of invertebrate animals which have soft
bodies and an organization superior to that of insects
and only inferior to that of fishes."

concíinna, neat.

cónica, conical.

conóidea, cone-like.

contécta, covered.

contórtus, twisted together.

contráctile, able to become shorter.

cónvex, bulging out.

córneus, }
cornea, }horny.

córvus, a crow; applied to a very dark variety of *L. palustris*.

costáta, ribbed.

crísta, }
crístáta, }crested.

crystállina, crystalline.

cúrta, short.

curviróstris, with curved beaks.

Cyclóstoma, round mouth.

cýgnea, pertaining to swans.

cylindrácea, cylindrical.

D.

decíduous, liable to fall off.

decollátum, truncated.

decússated, intersected by cross lines.

dénticle, a small tooth.

dentítion arrangement of teeth.

depiláta, denuded of hairs.

depréssa, flattened.

depressiúscula, somewhat flattened.

déxtral. A univalve is said to be dextral when the mouth is on the observer's right as he holds it facing him, with the spire upwards.

dextrórsa, turned to the right.

diáphana, transparent.

dilatátus,
dilatáta, } expanded.

discifórmis, circular, quoit-shaped.

dórsal, pertaining to the back.

dúbia, doubtful.

E.

ecárinata, with no keel.

edéntula, toothless.

efasciáta, having no band or stripe.

élegans, elegant.

elongáta, lengthened.

epidérmis, the thin skin covering shells.

épiphragm, a film secreted by the animal to cover the
 mouth of the shell.

epizóna, marked above (the periphery).

equiláteral, having equal sides.

ericétorum, inhabiting heaths.

exálbida, whitish.

excaváta, hollowed out.

exígua, small.

F.

fasciáta, banded.

filament, thread.

flámmea, with flame-shaped markings.

flavéscens, yellowish.

flāvus, yellow.

fluviátilis, inhabiting rivers.

fontánus } inhabiting springs.
fontinalis }

foot, a flexible muscular process by which mollusks travel.

frágilis, frail.

fúlva, tawny.

fúscá, dark brown.

fúscolabiáta, dark mouthed.

fúscéscens, dusky.

fúsisiform, spindle-shaped.

G.

gagátes, jet.

gálloprovinciális, of the Gallic province (Provence).

Gastrópoda, a class of univalve mollusks, the lower surface of whose belly forms the foot.

Genus. In Natural History a sub-division of an *Order*.

A *genus* is sub-divided into *species*.

Geómálacus, earth mollusk.

gibbósa, swollen.

gibbous, protruberant.

gláber, } smooth.
glábra, }

globósa, globose.

glutinósa, sticky, slimy.

grácilis, slender.

gracilior, rather slender.

grándis, large.

granuláta, granulated, with small grain-like markings.

gregárious, living in colonies.

grísea, grey.

H.

hábitat, dwelling place.

Háliotídea, ear-shaped ; from *Haliotis* the ' Venus ' ear shell.

Hélix, a screw, coil.

herbívorous, feeding on vegetable matter.

hispid,
hispida, } hairy.
hispidósa, }

hýaline, glassy.

Hyalínia, the name of a genus of glassy shells.

hýalozonáta, with a translucent band.

hýbrida, a cross between two species.

Hydróbia, living in water.

hypnórum, living among the moss (*Hypnum*).

hýpozóna, banded below.

I.

incarnáta, flesh-coloured.

inconspícua, not easily observed.

incrassáta, thickened, coarse.

indígenous, born in the country ; native.

infláta, blown out, swollen.

instábilis, fluctuating ; not adhering to the typical form.

intermédia, varying between two distinct forms.

invólúta, folding inwards.

iridéscent, coloured like a rainbow.

Isómya, a sub-order of mollusks with equal adductor muscles.

L.

labiáta,
labiósá, } with an enlarged lip.

lacunósa, with hollows on the surface.

lactéscens, milky white.

lacústris, inhabiting lakes or ponds.

lævigáta, smoothed.

lævis (properly spelt *levis*), smooth.

læviúscula, somewhat smooth.

**lamelláta*, furnished with plaits or folds.

Lamellibráncchiáta, an order of mollusks with leaf-like gills.

**lámína*, a plate.

**lamináta*, furnished with plaits.

lapicída, stone-cutter.

látior, broader.

lentígínoza, freckled with markings like those on some beans.

leúcolóma, bordered with white.

leúcozóna, banded with white.

libéllula, named after a dragon-fly (*Libellula*).

ligament, the elastic substance connecting the valves of a bivalve shell.

lilacína, lilac.

Límax, a slug.

Limnæa, inhabiting stagnant water.

lineáta,
lineoláta, } marked with lines.

lingual dentition, the arrangement of teeth on the tongue of a mollusk.

lip, the lip of a shell is the edge of the mouth.

longiscáta, lengthened.

lubricóides, somewhat smooth.

luctuósa, of a sad (*i.e.* dingy) colour.

límule, the oval depressed space in front of the umbones, and opposite the ligament of some bivalves.

lútea, yellowish.

lúteofasciáta, banded with yellow.

lúteolabiáta, yellow lipped.

M.

maculáta,
maculósa, } spotted.

máгна, large.

májor, larger.

mantle, a flexible outgrowth of the body, resembling a cloak or hood, which contains glands that secrete the colouring matter of the shell.

- márgaritócea*, pearly.
margarítifer, pearl-bearing.
margináta, having a rim or border.
marmórea, with marble-like markings.
maúra, dark like a Moor.
máximus, largest.
membranáceous, composed of fine-spun fibres.
micróstoma, having a small mouth.
mílium, a grain of Millet.
mínimus, smallest.
minor, smaller.
minútissima, very minute.
mollúsc, } a soft-bodied animal.
mollúsk, }
montánus, inhabiting mountains.
múcus, slime.
mucronáta, pointed.
muscórum, inhabiting moss.

N.

- nácreous*, pearly.
nána, dwarf.
Nautiléus, like a nautilus in shape.
nemorális, } inhabiting groves.
nemorosa, }
nígra, black.
nigréscens, blackish.
nítens, shining.

nítidulus, rather shiny.

nítidus, shiny.

núcleus, the tip of a spire of a univalve.

O.

obésa, swollen.

obliteráta, markings absent ; (refers to colour).

oblónga, oblong.

obscúrus, hidden.

obtusális, blunt.

obvolúta, wrapped up.

ochroleúca, whitish-yellow.

ochrácea, yellow.

óctodentáta, with eight teeth.

olivácea, olive-colour.

opérculáta, furnished with an operculum.

opérculum, a covering or lid. A hardened plate attached to the foot of the animals of many univalves, which closes like a door when the animal withdraws into the shell.

Order. In natural history the sub-division of a Class.

órifice, a hole.

ornáta, ornamented.

ovális,
ováta, } oval.

ovíparous, producing eggs.

óvovivíparous, producing eggs which are hatched internally.

P.

pállens, }
pállida, } pale.

pállido-dorsális, pale on the back.

Paludestrina, inhabiting marshes.

palústris, living in marshes.

páronula, small.

pátula, extended,

pédicle, a foot-stalk.

Pelecypoda, axe-footed ; another term for bivalves.

pellúcida, transparent.

penúltimate, last but one.

péregra, traveller.

periphery, the circumference of the body-whorl of a univalve shell.

péristome, the rim of the mouth of a univalve.

perórsa, turned the wrong way.

Phýsa, a bubble.

pícta, painted, ornamented.

pictórum, belonging to painters.

Pisána, named after the town of Pisa.

pisidióides, resembling a *Pisidium*.

Pisídium, resembling a pea.

Planórbis, a flat coil.

plícation, a fold ; the thickened process which resembles a tooth in the mouth of a univalve.

plúmbea, leaden coloured.

pomátia, having a lid or covering.

ponderosa, thick and heavy.

polymorpha, many shaped.

producta, lengthened.

pulchella, minutely beautiful.

Pilmonobranchiata, an Order of mollusks with lungs.

punctata, marked with minute spots.

Pupa, a chrysalis.

pura, clear.

pusillum, small.

putris, stinking.

pygmæa, minute.

pyramidalis, } shaped like a pyramid.
pyramidata, }

pyriform, pear-shaped.

Q.

quadridentata, with four teeth.

R.

radiata, rayed.

radiatula, slightly rayed.

rava, tawny.

reflexa, bent back.

reticulata, marked like network with cross striations.

revelata, revealed, discovered.

rhombea, four-sided; referring to a section of the last whorl.

ringens, grinning like a dog, *i.e.*, showing the teeth.

rivericola, an inhabitant of streams.

róseolabiáta, pink lipped.

róseozonáta, with pink bands.

róseum, pink.

rostráta beaked.

rotúnda, round.

rotundáta, rounded.

rubélla, }
rubra, } reddish.

rubéscens, reddish.

ráfá, red.

ruféscens, reddish.

rufilábris, red-lipped.

rufúla, reddish.

rugósa, wrinkled.

rupéstris, inhabiting rocks.

rupícola, an inhabitant of rocks.

S.

scalárisfórmis, shaped like a *Scalaria* (a spiral marine shell)
 applied to monstrosities with the whorls disunited.

scar, "muscular scars" are the depressions formed by the
 attachment of the muscles holding the parts of a
 bivalve together.

scítulum, a small shield.

secále, a grain of rye.

Segmentína, having the whorls divided by partitions.

séptum (plural *septa*) a division.

seríceá, silky.

séssile, situated on a flat surface, not raised on a stalk.

shagréened, covered with small granules.

sexdentáta, with six teeth.

símilis, resembling (another species).

símplex, with a single fold.

sinístral, opposed to *dextral* (q.v.).

sinistrórsa, turned to the left.

sínuate, curved.

síphon, a tube.

sólida, solid.

solídula, somewhat solid.

spécies, the sub-division of a genus.

specífic, belonging to a species.

sphærium, shaped like a globe.

spire, all the whorls of a univalve except the lowest.

spirórbis, having a circular spire.

spléndens, shining.

stagnálistiformis, shaped like *L. stagnalis*.

stagnális, inhabiting marshes.

stenogýra, having compressed whorls.

stríæ, fine lines.

striated, marked with fine lines.

strícta, compressed.

strigáta, streaked.

sub-álbida, whitish.

sub-anguláta, with a somewhat sharp angle.

sub-apérta, somewhat open.

sub-cylíndrica, somewhat cylindrical.

sub-fúscá, somewhat tawny.

sub-globósa, somewhat rounded.

sub-marítima, living almost on the sea-coast.

sub-rúfa, somewhat red.

sub-scaláris, somewhat scalariform (q.v.).

sub-striáta, somewhat striated.

succínea, amber-coloured.

succíneæfórmis, shaped like a *Succinea*.

suffúsa, suffused.

súture, the furrow between the whorls of a univalve.

sylvática, inhabiting woods.

sýnonym, a name that has the same meaning as another name.

T.

tentaculáta, furnished with tentacles.

tenúior, more slender.

ténuis, slender.

ter·éstris, } inhabiting the land.
terréstríal, }

Testacélla, a small shell.

testáceous, having a hard shell.

tíncta, dyed.

trídens, } furnished with three teeth.
tridentáta, }

trifasciáta, with three bands.

trístis, sad-coloured.

trochóides, shaped like the marine shell *Trochus*, i.e., pyramidal.

trúncate, ending abruptly.

truncátula, slightly truncate.

tubérculate, furnished with pimples.

tumídula, somewhat swollen.

túmidus, swollen.

týpe, a standard of comparison.

týpical, resembling the type.

U.

umbilicus, the navel ; applied to univalve shells, the cavity formed by the whorls when they do not form a solid *axis* or *columella*.

úmbo, the knob or boss in the centre of a shield ; applied to bivalves, the *umbones* (or *beaks*) are the protruberances by the hinge, which constituted the infant shell.

unidentáta, having one tooth.

unduláta, marked with wavy lines.

unícólor, of one color.

Únio, a pearl.

univalve (a shell), consisting of one piece.

V.

Valváta, having a valve (i.e., *operculum*).

válve, a complete part of a shell.

variegáta, variegated.

variety. Varieties are members of a species that deviate constantly from the type in form, size, colour, or markings.

ventricósa, } swollen.
ventrósá, }

Vértigo, a twist.

viréscens, } greenish.
viridans, }

viridescénti-alba, greenish white.

virídula, greenish.

vitrea, glassy.

vitrína, transparent like glass.

Vivípara, producing young alive.

vórtex, a whirlpool.

vulgáris, common.

W.

whorl, a twist of a spiral shell.

Z.

zonáta, banded.

Zonites, like a girdle, i.e., circular.



AUTHENTICATED RECORDS
OF
THE DISTRIBUTION
OF THE
BRITISH LAND AND FRESHWATER
MOLLUSCA.

I AM indebted to Mr. W. Denison Roebuck, F.L.S., recorder to the Conchological Society for many years, for the following tables showing the counties and vice-counties of the British Islands from which specimens have been submitted to the society's referees for authentication.

The great merit of the system of authentication is the uniformity of value which it gives to the records; and the fact that the vast majority of the species whose distribution is indicated in the following tables have been submitted to, and verified by, so high an authority as Mr. John W. Taylor, F.L.S., renders this table of great value. The few that have not been seen by Mr. Taylor rest upon the authority of the late Mr. Charles Ashford, whose great reliability and accuracy as a

referee are well known ; or they are slugs, for the determination of which Mr. Roebuck himself, who has made a special study of the naked species, is responsible.

It does not follow that other records are not equally reliable, but for the sake of uniformity of value it is—as will be at once obvious—necessary to confine the tables to such records as have been submitted to and passed by the society's referees. Otherwise a wide door would have been opened to errors of determination, the avoidance of which is the object aimed at in instituting the authentication system.

The areas adopted are those proposed by Mr. H. C. Watson, and used by him in working out the distribution of the British Flora.

It is deemed sufficient to confine the tables to the distribution of species, that of varieties being for many reasons impracticable at the present time.

Readers who can furnish specimens for completing these tables will do well to send them to Mr. W. Denison Roebuck, F.L.S., Sunny Bank, Leeds, as he will for the present continue to keep the records and submit the specimens sent to the referees.

EXPLANATION OF "VICE-COUNTIES."

THE areas here adopted are those defined and promulgated by Mr. Hewett Cottrell Watson, for the purpose of recording the distribution of British plants, and correspond with the counties of Great Britain and Ireland, with the important modifications that the larger counties are sub-divided, that a few of the smaller are united to adjoining counties, and that all detached or outlying portions of counties are considered as forming part of the counties by which they are surrounded.

The following are the sub-divisions of the larger counties :

1 and 2.—Cornwall W. and E., divided by the high road from Truro through St. Columb to the inland extremity of Padstow Creek.

3 and 4.—Devon N. and S., divided by the watershed line which commences at the Tamar, about midway between Tavistock and Launceston, passes over the ridge of Dartmoor, and joins the Western Canal at Tiverton.

5 and 6.—Somerset N. and S., divided by the river Parret from Bridgwater to Ilchester, the line thence curving round to the north extremity of Dorsetshire.

7 and 8.—Wilts N. and S., separated by the Kennett and Avon Canal.

10, 11, and 12.—Isle of Wight, and Hants N. and S., the latter divided by the high roads running W. and E. from Winchester to the borders of Wilts. and Sussex respectively, through Stockbridge and Petersfield.

13 and 14.—Sussex W. and E., divided by the high road from Brighton to Cuckfield, thence through Crawley to the border of Surrey.

18 and 19.—Essex S. and N., divided by the high road from Waltham and Epping to Chelmsford, thence along the river Blackwater to its mouth.

25 and 26.—Suffolk E. and W., divided by the first meridian East of Greenwich.

27 and 28.—Norfolk E. and W., also divided by the first meridian East of Greenwich.

29.—Cambridge, includes the Newmarket detached portion of Suffolk.

30.—Bedford, includes a detached portion of Hunts.

33 and 34.—Gloucester E. and W., separated by the Thames and Severn Canal, thence by the River Severn from the point of confluence of the canal up to Tewkesbury : 33 includes five detached portions of Worcestershire and one of Warwickshire.

36. — Herefordshire, includes detached portions of Monmouthshire and Worcestershire (detached portions of Herefordshire are on the other hand included in Brecknockshire, Radnorshire, Shropshire, and Worcestershire).

37.—Worcestershire, includes detached portions of Herefordshire, Shropshire, Staffordshire, and Warwickshire (detached portions of this county are on the other hand included with Gloucestershire, Herefordshire, and Staffordshire).

38.—Warwickshire, includes detached portions of Gloucestershire and Worcestershire.

39.—Staffordshire, includes a detached portion of Worcestershire, which in its turn includes an outlier of Staffordshire.

40.—Shropshire, includes an outlier of Herefordshire (a detached portion of Shropshire is included with Worcestershire).

42 and 43.—Brecknockshire and Radnorshire, each includes a detached portion of Herefordshire.

50.—Denbighshire, includes the Llandudno peninsula and other portions of Carnarvonshire lying E. of the river Conway, and also the detached portion of Flintshire.

53 and 54.—Lincolnshire S. and N., divided by the Witham from its mouth at Boston to Lincoln, thence by the Foss Dyke to the border of Nottinghamshire.

55.—Leicester and Rutland, includes a detached portion of Derbyshire.

59 and 60.—Lancashire S. and W., separated by the River Ribble (the Furness district is included with Westmorland).

61.—York S.E. is the East Riding.

62.—York N.E. is the eastern half of the North Riding, the part lying east of the Rivers Wiske and Swale.

63.—York S.W. is the southern half of the West Riding, bounded on the north by the Leeds and Liverpool Canal, and below Leeds by the River Aire.

64.—York Mid W. is the northern half of the West Riding, minus the Dent and Sedbergh district.

65.—York N.W. is the western half of the North Riding, to which is added the Dent and Sedbergh district of the West Riding.

67 and 68.—Northumberland S. and Cheviotland, divided by the River Coquet, and a line continued to Carter Fell from the Linn Bridge.

86.—Stirlingshire, includes the detached portion of Dumbartonshire.

87 and 88.—Perth West with Clackmannan, and Perth Mid, divided by the line of watershed which separates the tributaries of the Tay from those of the Forth.

88 and 89.—Perth Mid, and Perth E., separated by the Rivers Garry and Tay.

92 and 93.—Aberdeen S. and N., separated by the watershed line which runs E. and W. from Inverury.

95.—Elginshire, includes the detached portion of Inverness-shire which separates the two portions of Elginshire.

96 and 97.—Easternness and Westernness are constituted thus :—Inverness-shire is first divided by the line of watershed between the East and West of Scotland, continued along Loch Erricht to the Perthshire border, the eastern portion—with Nairnshire added—being called Easternness, and the western portion—with the detached portion of Argyleshire situated N. W. of Loch Linnhe—is called Westernness.

98. —Main Argyle is what is left of Argyleshire after the separation of Cantire, the Islands, and the portion N.W. of Loch Linnhe.

100.—Clyde Islands, include Bute, Arran, Cumbrae, and Ailsa Craig.

101. —Cantire, separated from Argyleshire by the Crinan Canal.

102.—Ebudes S., includes the Islands of Jura, Colonsay, and Islay.

103.—Ebudes Mid, includes the Islands of Mull, Coll, Tiree, Staffa, Iona, etc.

104.—Ebudes N., includes the Islands of Skye, Canna, Rum, Muck, Eig, etc.

105 and 106.—Ross W. and E., divided by the watershed parting East and West Scotland, and including some of the fragments of Cromarty county.

107 and 108.—Sutherland S.E. and N.W., divided by

the watershed line parting the East and West sides of Scotland.

119.—Donegal county, includes Londonderry city.

137 and 138.—Mayo E. and W., separated by the railway from Ballina to the head of Lough Mask.

139 and 140.—Galway W. and E., separated by Lough Corrib.

143 and 144.—Tipperary N. and S., divided by the line of watershed.

146 and 147.—Cork N. and S., divided by the River Lee.

In applying these definitions, it should be remembered that they are based on old maps, and on the political divisions of counties which existed at the time of Mr. Watson's work commencing. Modern maps do not show all the out-lying detached portions of counties here described.

<i>P. muscorum</i> ..	c	1	3	4	6	9	10	11	12	13	14	15	16	17	19	21	23	25	27	28	30	32									
<i>Vertigo antivertigo</i> ..				4		10	11					15	17			22	23	25	27	28	30	32									
<i>V. mouliniana</i> ..							11					15	17		20		23	25	27	28	30	32									
<i>V. pygmaea</i> ..			4	6		9	10	11	12	13	14	15	17			21	23	25	27	28	30	32									
<i>V. alpestris</i> ..														18			23														
<i>V. substrata</i> ..				1													23														
<i>V. pusilla</i> ..																	23														
<i>V. angustior</i> ..									11	12					18	19	20			28		32									
<i>V. edentula</i> ..				4	5												23														
<i>V. minutissima</i> ..						10											23														
<i>Balea perversa</i> ..			3	4	6	7	10	11	12	13	14	15	16	17	19	22		25	27	28		32									
<i>Clausilia bidentata</i> ..	c	1	2	3	4	5	6	7	8	9	10	11	12	13	14	21	22	23	24	27	28	29	30	32							
<i>C. rolphii</i> ..				4								15	16	17		22		25	27	28	29	30	32								
<i>C. biplicata</i> ..												15	16	17	20	21		25	26	27	28	29	30	32							
<i>C. laminata</i> ..					5	6	9	10	11	12	13	14	15	16	17	19	20	22	23												
<i>Azeca tridens</i> ..			1	2	3	4	5	6		12	14	15	17		19	21	23	25	27	28	29	30	32								
<i>Cochlicopa lubrica</i> ..	c	1	2	3	4	5	6	7	8	9	10	11	12	13	14	22	23	25	27	28	29	30	32								
<i>Cacilioides acicula</i> ..					6							15	17		19		23	25	27	28	29	30	32								
<i>Succinea putris</i> ..	c	1	3	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21	23	24	28	29	30	31	32					
<i>S. elegans</i> ..	c	1			6	7	10	11	13			15	16	17	18	20	21	22	23	27	28	29	30	31	32						
<i>S. oblonga</i> ..	c				6							17					23	25	27	28	29	30	31	32							
<i>Caryclitum minimum</i> ..					6				10	11	13	14	15	16	17	18	19	20	21	22	23										
<i>Segmentina nitida</i> ..											14	15	16	17		21	23	25	27	28	29										
<i>Planorbis fontanus</i> ..					6	7	9	11	13				16	17	19	21	23	25	27	28	29	30	31								
<i>P. nautileus</i> ..			1	3	6	7	9	11	12	13			16		19	21	23	25	27	28	29	30	31								
<i>P. dilatatus</i> ..					6	7	9	10	11	12	13	15	16	17	18	19	21	22	23	27	28	29	30	32							
<i>P. albus</i> ..			1	3	6	7	9	10	11	12	13	15	16	17	18	19	21	22	23	27	28	29	30	32							
<i>P. parvus</i> ..			3		6	7	9	10	11	12	13	15	16	17	18	19	21	22	23	27	28	29	30	31	32						
<i>P. spirorbis</i> ..	c	1			5	6	7	10	11	12	13	15	16	17	18	19	20	21	22	23	24	25	27	28	29	30	31	32			
<i>P. vortex</i> ..	c		3		6	7	9	10	11			15	16	17	18	19	20	21	22	23	24	25	27	28	29	30	31	32			
<i>P. carinatus</i> ..				3	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
<i>P. umbilicatus</i> ..					6	7	9	10	11	13		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
<i>P. cornuus</i> ..					6	7	9	10	11	13		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
<i>P. contortus</i> ..				3		6	7	9	10	11	13	15	16	17	18	19	20	21	22	23	27	28	29	30	31	32					
<i>Aplexa hypnorum</i> ..	c				6	7	9	10	11	13		15	16	17	19	21	22	23	24	27	28	29	30	31	32						
<i>Physa fontinalis</i> ..					6	7	9	11	13			15	16	17	19	21	22	23	24	27	28	29	30	31	32						
<i>Amphipeplea glutinosa</i> ..					6	7	9	11	13			15	16	17	19	21	22	23	24	27	28	29	30	31	32						
<i>Limnaea involuta</i> ..					6	7	9	11	13			15	16	17	19	21	22	23	24	27	28	29	30	31	32						

L. peregrina	c	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32						
L. auricularia	..	..	..	..	..	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
L. stagnalis	..	..	..	..	5	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32				
L. palustris	c	1	..	..	..	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	..	..	..	..	..	..	..	..	..	..
L. truncatula	..	1	..	3	4	..	6	..	..	..	..	..	..	..	..	15	16	17	18	19	..	21	22	23	..	..	..	..	..	..	..	..	..	..
L. glabra	c	1	..	..	..	6	6	..	..	..	..	..	..	..	..	15	16	17	18	19	..	21	22	23	..	..	..	..	..	..	..	..	..	..	..
Ancylus fluviatilis	..	1	2	3	4	..	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	..	22	23	..	..	..	..	..	..	..	..	..	..	..	..
Velletia lacustris	..	..	..	..	..	6	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..
Cyclostoma elegans	..	1	..	3	4	..	6	..	..	..	..	..	..	..	..	15	16	17	18	19	20	..	22	23	24	..	..	..	..	..	..	..	..	..	..
Acicula lineata	..	..	..	..	..	6	6	..	..	..	..	..	..	..	..	15	16	17	18	19	..	21	22	23	..	..	..	..	..	..	..	..	..	..	..
Neritina fluviatilis	..	1	..	3	..	..	6	..	..	..	..	..	..	..	..	15	16	17	18	19	..	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..
Vivipara conlecta	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	17	18	19	20	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..
V. vivipara	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	17	18	19	20	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..
Bythinia tentaculata	..	1	..	..	4	5	..	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..	..
B. leachii	..	..	..	..	..	6	6	..	..	..	..	..	..	..	..	15	16	17	18	19	20	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..	..
Valvata piscinalis	..	1	..	..	..	6	6	..	..	..	..	..	..	..	..	15	16	17	18	19	20	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..	..
V. cristata	..	..	..	..	..	6	6	..	..	..	..	..	..	..	..	15	16	17	18	19	..	21	22	23	..	..	..	..	..	..	..	..	..	..	..	..	..
Unio tumidus	..	..	..	..	..	6	6	8	9	..	..	..	..	..	..	..	17	..	..	..	..	21	22	23	..	..	..	..	..	..	..	..	..	..	..	..	..
U. pictorum	..	..	..	..	..	6	6	8	9	..	..	..	..	..	..	..	17	..	..	..	..	20	21	22	..	..	..	..	..	..	..	..	..	..	..	..	..
U. margaritifera	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Anodonta cygnea	..	..	..	..	..	..	..	8	..	..	..	..	..	..	..	..	17	18	19	20	21	22	23	24	..	..	..	..	..	..	..	..	..	..	..	..	..
A. anatina	6	6	15	16	17	18	19	20	21	22	23	24	
Sphaerium corneum	6	6	7	..	9	11	12	13	14	..	15	16	17	18	19	20	21	22	23	24	
S. rivicola	6	6	17	21	22	23	
S. pallidum	6	6	7	..	9	11	12	13	15	16	17	18	19	..	21	
S. lacustre	6	6	7	..	9	10	11	12	13	17	18	19	20	21	22	23	24
Pisidium amnicum	6	6	7	..	9	10	11	12	13	17	18	19	20	21	22	23	24
P. fontinale	c	1	6	6	7	..	9	10	11	12	13	14	15	16	17	18	19	20	21	..	23
P. pusillum	c	1	4	..	6	7	..	9	10	11	12	13	14	15	16	17	18	19	20	21	..	23
P. nitidum	6	6	15	16	17	18	19	20	21	..	23
P. nilivum	c	6	15	16	17	18	19	20	21	..	23	
Dreissensia polymorpha	6	15	16	17	18	19	20	21	22	23	

DISTRIBUTION TABLES.

NAME OF SPECIES.	ENGLAND AND WALES.																											
	Severn.				South Wales.				North Wales.				Trent.		Mersey.													
	33	31	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
<i>Arion ater</i>
<i>A. subfuscus</i>
<i>A. minimus</i>
<i>A. hortensis</i>
<i>A. circumscriptus</i>
<i>Geomacrus maculosus</i>
<i>Amala gagates</i>
<i>A. sowerbyi</i>
<i>Limax maximus</i>
<i>L. cinereo-niger</i>
<i>L. flavus</i>
<i>L. marginatus</i>
<i>Agriolimax agrestis</i>
<i>A. laevis</i>
<i>Testacella haliotidea</i>
<i>T. scutulium</i>
<i>T. maugii</i>
<i>Vitrima pellucida</i>
<i>Hyalina draparnaldi</i>
<i>H. cellaria</i>
<i>H. helvetica</i>
<i>H. alliarum</i>

<i>L. peregra</i>	33 31	36 37	38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60
<i>L. auricularia</i>	33 31	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>L. stagnalis</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>L. palustris</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>L. truncatula</i>	33 34	36 37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>L. glabra</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Ancylus fluviatilis</i>	33 34	36 37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Velletia lacustris</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Cyclostoma elegans</i>	33 34	35 36	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Acicula lineata</i>	33 34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Neritina fluviatilis</i>	33 34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Vivipara contecta</i>	33 34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>V. vivipara</i>	33 34	35	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60
<i>Rythmia tentaculata</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>B. leachi</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Valvata piscinalis</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>V. cristata</i>	34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Unio tumidus</i>	34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>U. pictorum</i>	34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>U. margaritifer</i>	34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Anodonta cygnea</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>A. anatina</i>	34	38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Sphaerium corneum</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>S. rivicola</i>	33 34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>S. pallidum</i>	34	38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>S. lacustre</i>	34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>Pisidium amnicum</i>	33 34	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>P. fontinale</i>	33 31	37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>P. pusillum</i>	33	36 37 38 39 40	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>P. midium</i>	33	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
<i>P. milium</i>	33 34	37 38 39	41 42	44 45 46	47 48 49 50	52	53 54 55 56 57	58 59 60	
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A. subfuscus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
A. minimus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
A. hortensis	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
A. circumscriptus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Geomalactis maculosus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Anabia gagates	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
A. sowerlyi	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Limax maximus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
L. cinereo-niger	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
L. flavus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
L. marginatus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Agrotimax agrestis	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
A. levis	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
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T. scutulium	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
T. mauret	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Virina pellucida	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Hyalina draparnaldi	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
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H. helvetica	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. alliaris	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

H. nitidula	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. radiatula	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. pura	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. crystallina	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. fulva	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. nitida	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. excavata	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
Helix rotundata	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. rupestris	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. pygmaea	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. lamellata	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. aculeata	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. pulchella	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. lapicida	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. obvolvata	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. pomatia	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. aspersa	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. nemoralis	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. hortensis	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. arbutorum	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. cantiana	61	62	63	64	65	66	67	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
H. cartusiana	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. rufescens	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. hispida	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. granulata	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. revelata	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. fusca	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. pisana	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. itala	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. caperata	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. virgata	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. terrestris	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
H. acuta	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Buliminus montanus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
B. obscurus	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Pupa secale	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
P. anglica	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
P. cylindracea	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

H. nitidula	85	86	87	88	89	90	91	92	94	95	96	104	105	106	109		
H. radiatula	85	86	87	88	89	90	91	92	94	95	96	104	105	106	109		
H. pura	85	86	87	88	89	90	91	92	94	95	96	104	105	107	109		
H. crystallina	85	86	87	88	89	90	91	92	94	95	96	104	105	107	109		
H. fulva	85	86	87	88	89	90	91	92	94	95	96	104	105	107	108	109	
H. nitida	85	86	87	88	89	90	91	92	94	95	96	104	105	106	107	108	109
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Helix rotundata	85	86	87	88	89	90	91	92	94	95	96	104	105	106	107	108	109
H. rupestris	85	86	87	88	89	90	91	92	93	94	95	104	105	107	108	109	
H. pygmaea	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. lamellata	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. aculeata	85	86	87	88	89	90	91	92	93	94	95	104	105	107	108	109	
H. pulchella	85	86	87	88	89	90	91	92	93	94	95	104	105	107	108	109	
H. lapicida	85	86	87	88	89	90	91	92	93	94	95	104	105	107	108	109	
H. obvolvata	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. pomatia	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. aspersa	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. nemoralis	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. hortensis	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. arbustorum	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. cantiana	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. cartusiana	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. rufescens	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. hispida	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. granulata	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. revelata	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. fusca	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
H. pisana	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
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B. obscurus	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
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P. anglica	85	86	87	88	89	90	91	92	93	94	95	104	105	106	107	108	109
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 bidentata, 105, v, 1.
 biplicata, 107, v, 4.
 laminata, 108, v, 3.
 rolphii, 106, v, 2.</p> <p>COCHLICOPA
 lubrica, 110, v, 6.</p> |
|--|--|

CYCLOSTOMA elegans, 137, v, 10

DREISSENSIA

polymorpha, 160, viii, 3.

GEOMALACUS maculosus,

30, 1, f. 5.

HELIX aculeata, 57, ii, 15.

acuta, 91, iv, 7.

arbustorum, 73, ii, 18.

aspersa, 62, iii, 2.

cantiana, 75, iii, 3.

caperata, 85, iii, 13.

cartusiana, 76, iii, 4.

fusca, 81, iii, 10.

granulata, 80, iii, 8.

hispida, 78, iii, 6, 7.

hortensis, 71, ii, 19.

itala, 83, iii, 14.

lamellata, 56, ii, 16.

lapidica, 58, iv, 4.

nemoralis, 64, ii, 17.

obvoluta, 59, iv, 5.

pisana, 82, iii, 11.

pomatia, 59, iii, 1.

pulchella, 57, iv, 3.

pygmæa, 56, iv, 2.

revelata, 81, iii, 9.

rotundata, 54, iii, 15.

HELIX rufescens, 77, iii, 5.

rupestris, 55, iv, 1.

terrestris, 90, iv, 6.

virgata, 86, iii, 12.

HYALINIA alliaria, 49, ii, 6.

cellaria, 46, ii, 5.

crystallina, 52, ii, 13.

excavata, 54, ii, 12.

fulva, 52, ii., 14.

helvetica, 47, ii, 7.

lucida, 45.

nitida, 53, ii, 11.

nitidula, 49, ii, 8.

pura, 51, ii, 9.

radiatula, 50, ii, 10.

HYDROBIA (*see Paludestrina*).

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flavus, 35, i, 7.

marginatus, 36, 1, 8.

maximus, 33, i, 6.

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glabra, 134, vii, 8.

involuta, 127, vii, 2.

palustris, 133, vii, 6.

peregra, 127, vii, 3.

stagnalis, 132, vii, 5.

LIMNÆA

truncatula, 134, vii, 7.

NERITINA

fluviatilis, 139, viii, 4.

PALUDESTRINA

jenkinsi, 144, viii, 13.

similis, 142, viii, 11.

ventrosa, 143, viii, 12.

PALUDINA (*see Vivipara*).

PHYSA fontinalis, 125, vi, 14.

PISIDIUM amnicum, 157, ix, 5.

fontinale, 158, ix, 6, & x, 1.

miliun, 160, ix, 9, & x, 3.

nitidum, 159, ix, 8, & x, 2.

pusillum, 158, ix, 7, & x, 4.

PLANORBIS albus, 119, vi, 4

carinatus, 122, vi, 8.

contortus, 124, vi, 11.

corneus, 123, vi, 10.

dilatatus, 119, vi, 12.

fontanus, 118, vi, 2.

nautileus, 118, vi, 3.

parvus, 120, vi, 5.

spirorbis, 121, vi, 6.

umbilicatus, 122, vi, 9.

vortex, 121, vi, 7.

PUPA anglica, 95, iv, 11.

cylindræa, 95, iv, 12.

muscorum, 96, iv, 13.

secale, 94, iv, 10.

SEGMENTINA

nitida, 117, vi, 1.

SPHÆRIUM

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lacustre, 155, ix, 4.

pallidum, 154, ix, 3.

rivicola, 154, ix, 2.

STENOGYRA

goodallii, 113, v, 12.

SUCCINEA

elegans, 115, v, 14.

oblonga, 116, v, 15.

putris, 114, v, 13.

TESTACELLA

haliotidea, 40, ii, 1, & vii, 11.

maugei, 41, ii, 3, & vii, 12.

scutulum, 41, ii, 2.

UNIO margaritifer, 149, ix, 12.

pictorum, 148, ix, 11.

tumidus, 147, ix, 10.

VALVATA

cristata, 146, viii, 10.

piscinalis, 146, viii, 9.

VELLETTIA

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VERTIGO

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angustior, 101, iv, 20.

antivertigo, 97, iv, 14.

edentula, 101, iv, 21.

minutissima, 102, iv, 22.

moulinsiana, 98, iv, 15.

VERTIGO pusilla, 100, iv, 19.

pygmæa, 98, iv, 16.

substriata, 99, iv, 18.

VITRINA pellucida, 42, ii, 4.

VIVIPARA

contecta, 139, viii, 5.

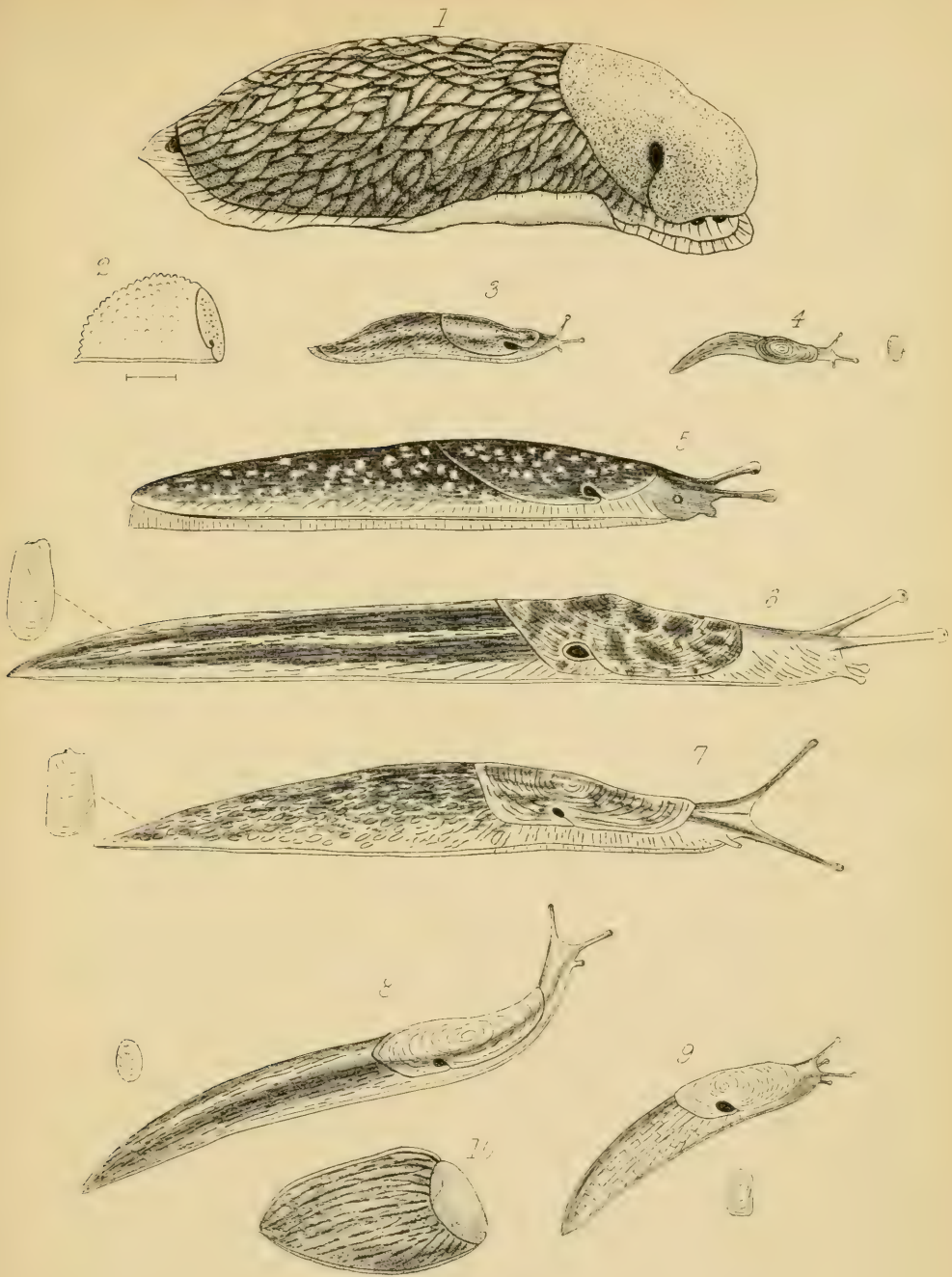
vivipara, 140, viii, 6.



PLATE I.

- Fig. 1. *Arion ater*.
,, 2. ,, *minimus*.
,, 3. ,, *hortensis*.
,, 4. *Agriolimax lævis*.
,, 5. *Geomalacus maculosus*.
,, 6. *Limax maximus*.
,, 7. ,, *flavus*.
,, 8. ,, *marginatus*.
,, 9. *Agriolimax agrestis*.
,, 10. *Amalia sowerbyi*.

Plate I



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S.Law Sc.

PLATE II.

- Fig. 1. *Testacella haliotidea*.
,, 2. ,, *scutulum*.
,, 3. ,, *maugei*.
,, 4. *Vitrina pellucida*.
,, 5. *Hyalinia cellaria*.
,, 6. ,, *alliarum*.
,, 7. ,, *helvetica*.
,, 8. ,, *nitidula*.
,, 9. ,, *pura*.
,, 10. ,, *radiatula*.
,, 11. ,, *nitida*.
,, 12. ,, *excavata*.
,, 13. ,, *crystallina*.
,, 14. ,, *fulva*.
,, 15. *Helix aculeata*.
,, 16. ,, *lamellata*.
,, 17. ,, *nemoralis*.
,, 18. ,, *arbustorum*.
,, 19. ,, *hortensis*.

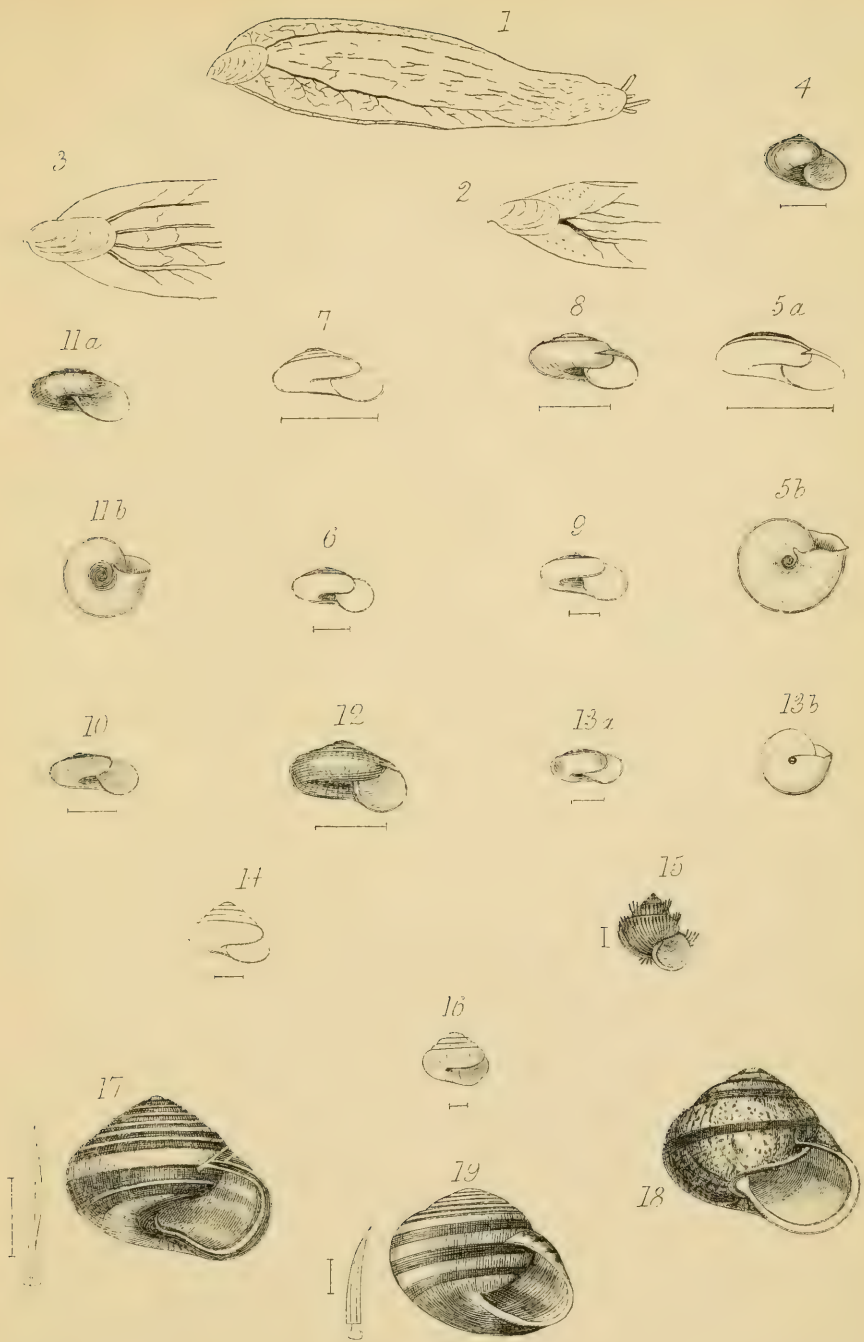
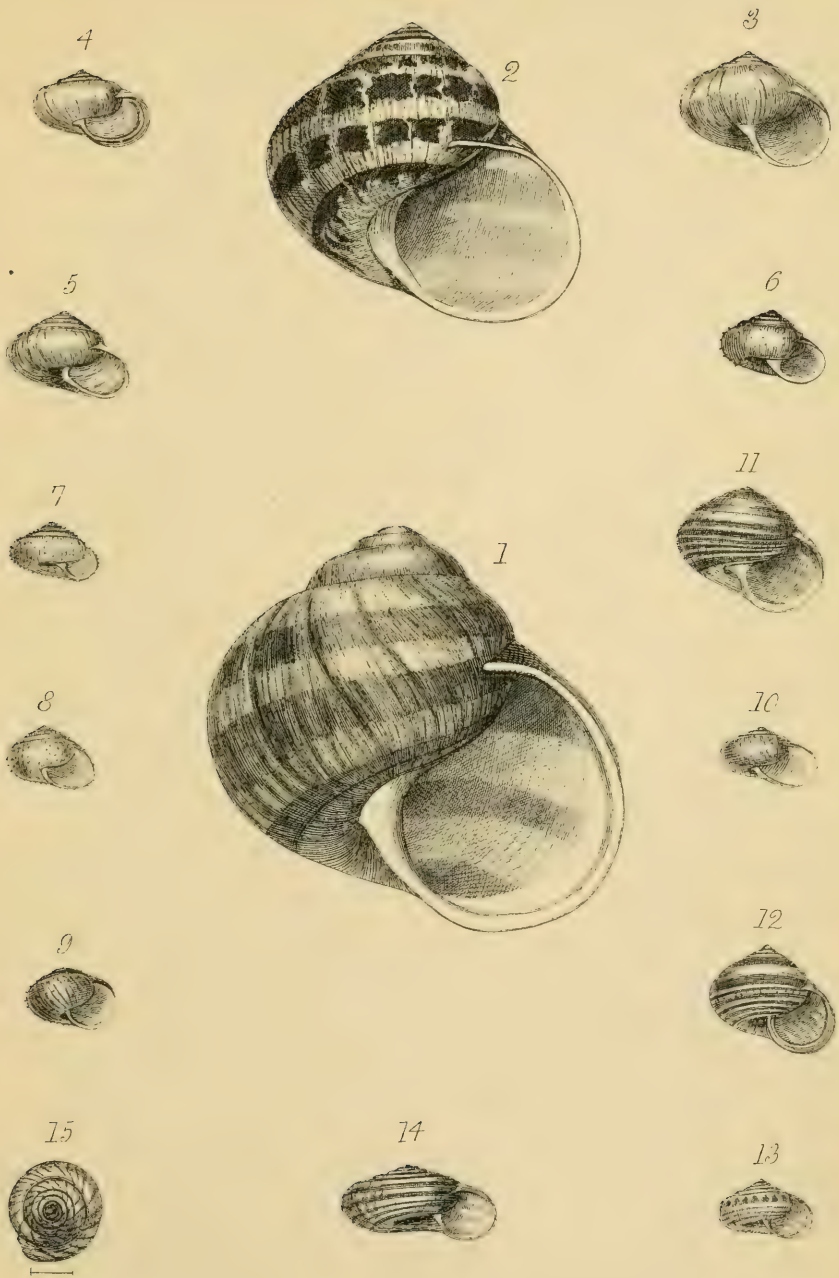


PLATE III.

- Fig. 1. *Helix pomatia*.
,, 2. ,, *aspersa*.
,, 3. ,, *cantiana*.
,, 4. ,, *cartusiana*.
,, 5. ,, *rufescens*.
,, 6. ,, *hispida*.
,, 7. ,, *hispida* v. *hispidoša*.
,, 8. ,, *granulata*.
,, 9. ,, *revelata*.
,, 10. ,, *fusca*.
,, 11. ,, *pisana*.
,, 12. ,, *virgata*.
,, 13. ,, *caperata*.
,, 14. ,, *itala*.
,, 15. ,, *rotundata*.

Plate III



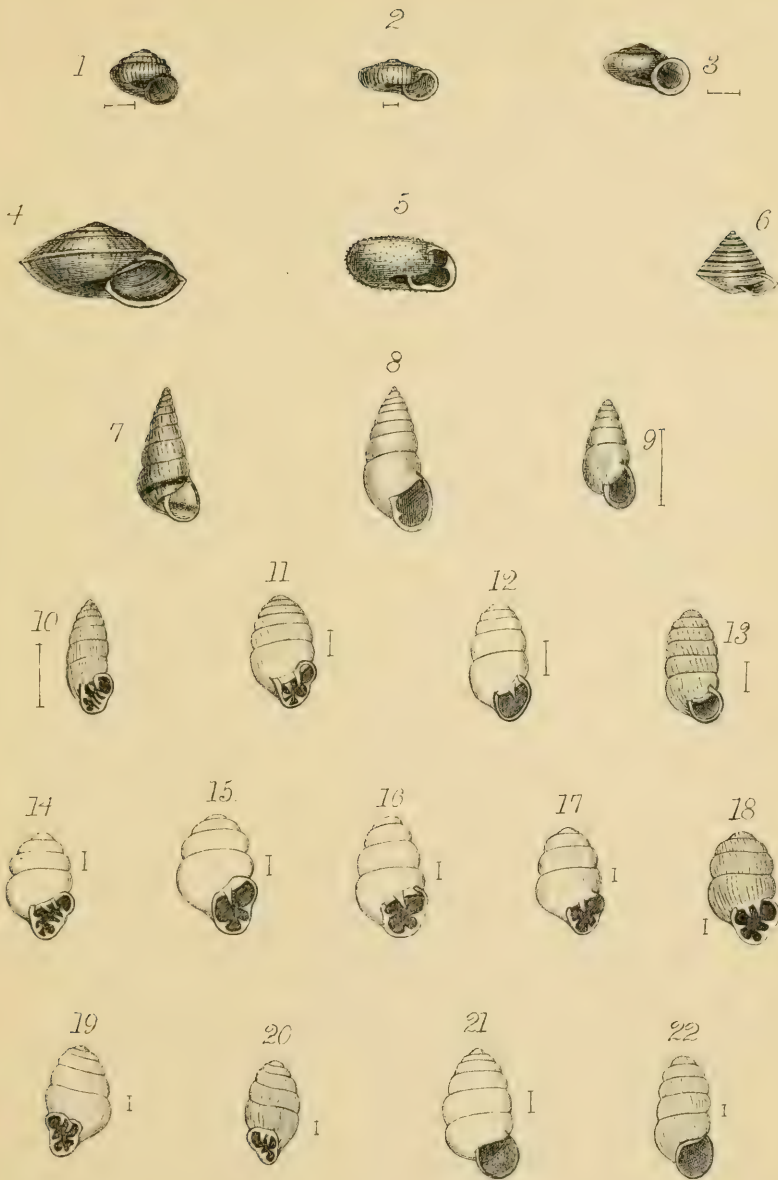
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G.Jarman sc.

PLATE IV.

- Fig. 1. *Helix rupestris*.
" 2. " *pygmæa*.
" 3. " *pulchella*.
" 4. " *lapicida*.
" 5. " *obvoluta*.
" 6. " *terrestris*.
" 7. " *acuta*.
" 8. *Buliminus montanus*.
" 9. " *obscurus*.
" 10. *Pupa secale*.
" 11. " *anglica*.
" 12. " *cylindræa*.
" 13. " *muscorum*.
" 14. *Vertigo antivertigo*.
" 15. " *moulinsiana*.
" 16. " *pygmæa*.
" 17. " *alpestris*.
" 18. " *substriata*.
" 19. " *pusilla*.
" 20. " *angustior*.
" 21. " *edentula*.
" 22. " *minutissima*.

Plate IV



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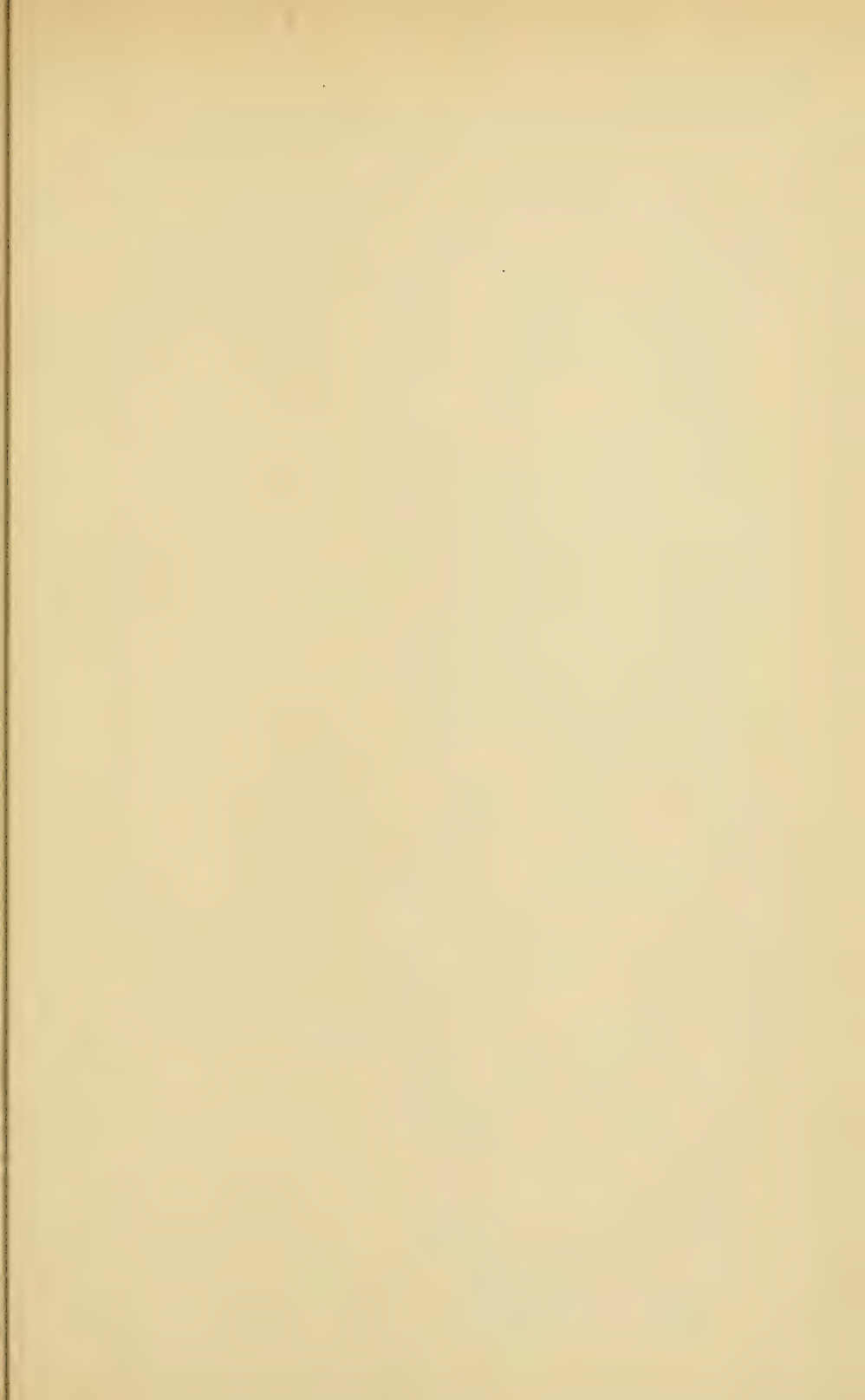


PLATE V.

- Fig. 1. *Clausilia bidentata*.
„ 2. „ *rolphii*.
„ 3. „ *laminata*.
„ 4. „ *biplicata*.
„ 5. *Balea perversa*.
„ 6. *Cochlicopa lubrica*.
„ 7. *Azeca tridens*.
„ 8. *Cæcilioides acicula*.
„ 9. *Carychium minimum*.
„ 10. *Cyclostoma elegans*.
„ 11. *Acicula lineata*.
„ 12. *Stenogyra goodalli*.
„ 13. *Succinea putris*.
„ 14. „ *elegans*.
„ 15. „ *oblonga*.

Plate V

1a



2a



3a



4a



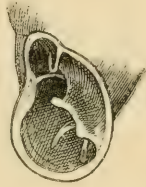
1b



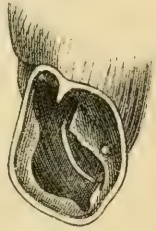
2b



3b



4b



3c



5



6



7a



7b



8



9



10



11a



11b



12



13



14



15



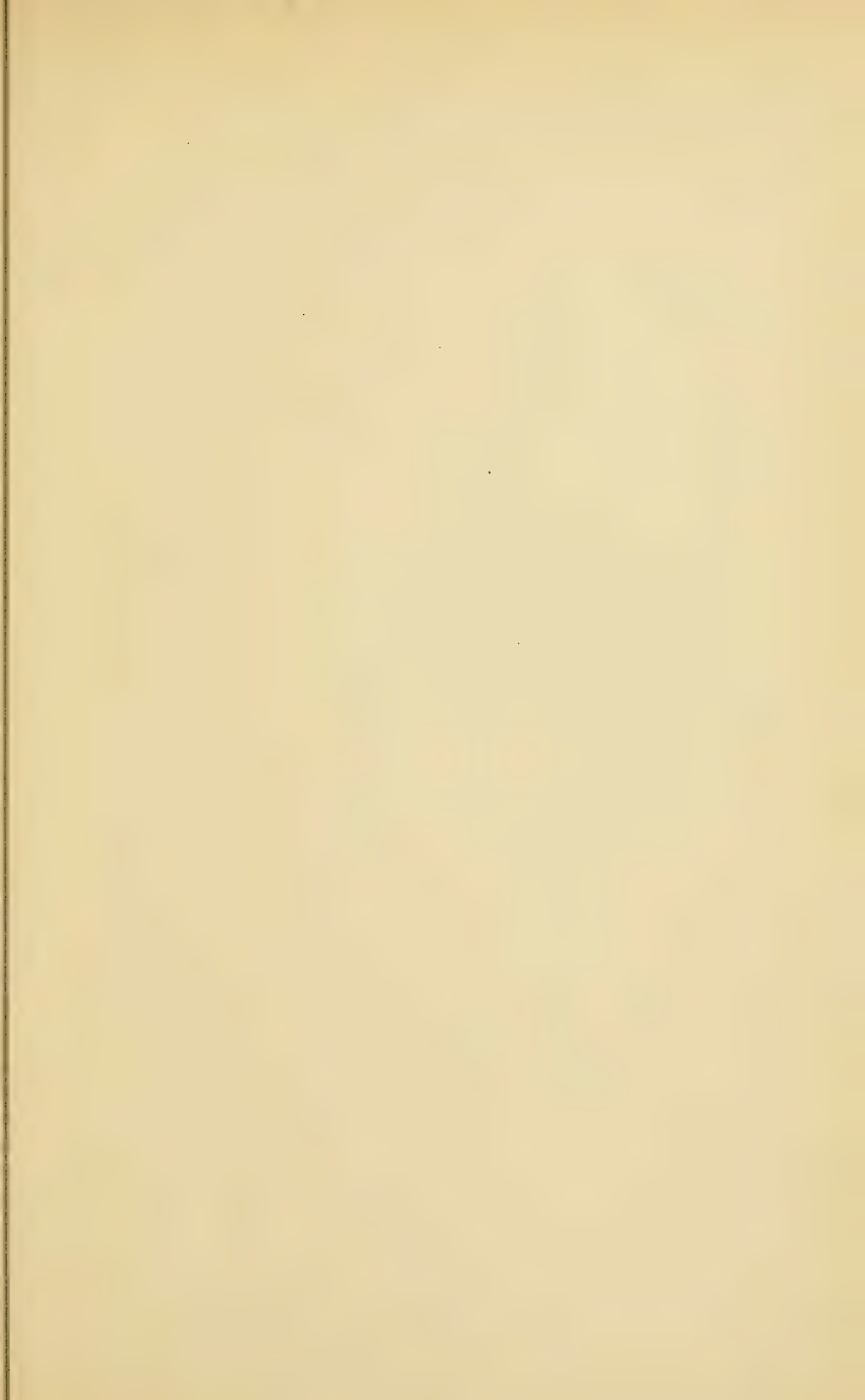


PLATE VI.

- Fig. 1. *Segmentina nitida*.
„ 2. *Planorbis fontanus*.
„ 3. „ *nautilus*.
„ 4. „ *albus*.
„ 5. „ *parvus*.
„ 6. „ *spirorbis*.
„ 7. „ *vortex*.
„ 8. „ *carinatus*.
„ 9. „ *umbilicatus*.
„ 10. „ *corneus*.
„ 11. „ *contortus*.
„ 12. „ *dilatatus*.
„ 13. *Aplexa hypnorum*.
„ 14. *Physa fontinalis*.

Plate VI



5



1



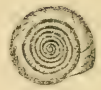
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3



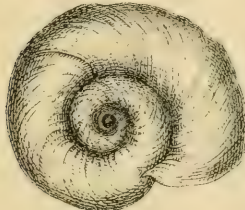
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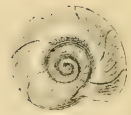
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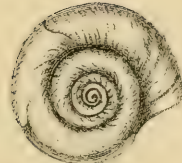
10



8



11



9



13



12



14

PLATE VII.

- Fig. 1. *Limnæa glutinosa*.
,, 2. ,, *involuta*.
,, 3a, 3e. ,, *peregra* v. *ovata*.
,, 3b. ,, *peregra*.
,, 3c. ,, *peregra* v. *obtusa*.
,, 3d. ,, ,, *m. sinistrorsum*.
,, 4. ,, *auricularia*.
,, 5. ,, *stagnalis*.
,, 6. ,, *palustris*.
,, 7. ,, *truncatula*.
,, 8. ,, *glabra*.
,, 9. *Ancylus fluviatilis*.
,, 10. *Velletia lacustris*.
,, 11. *Testacella haliotidea*.
,, 12. ,, *maugei*.

Plate VII

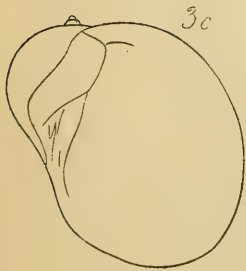
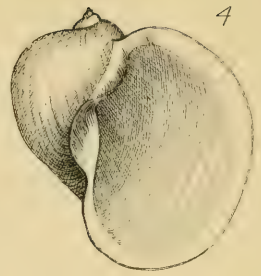
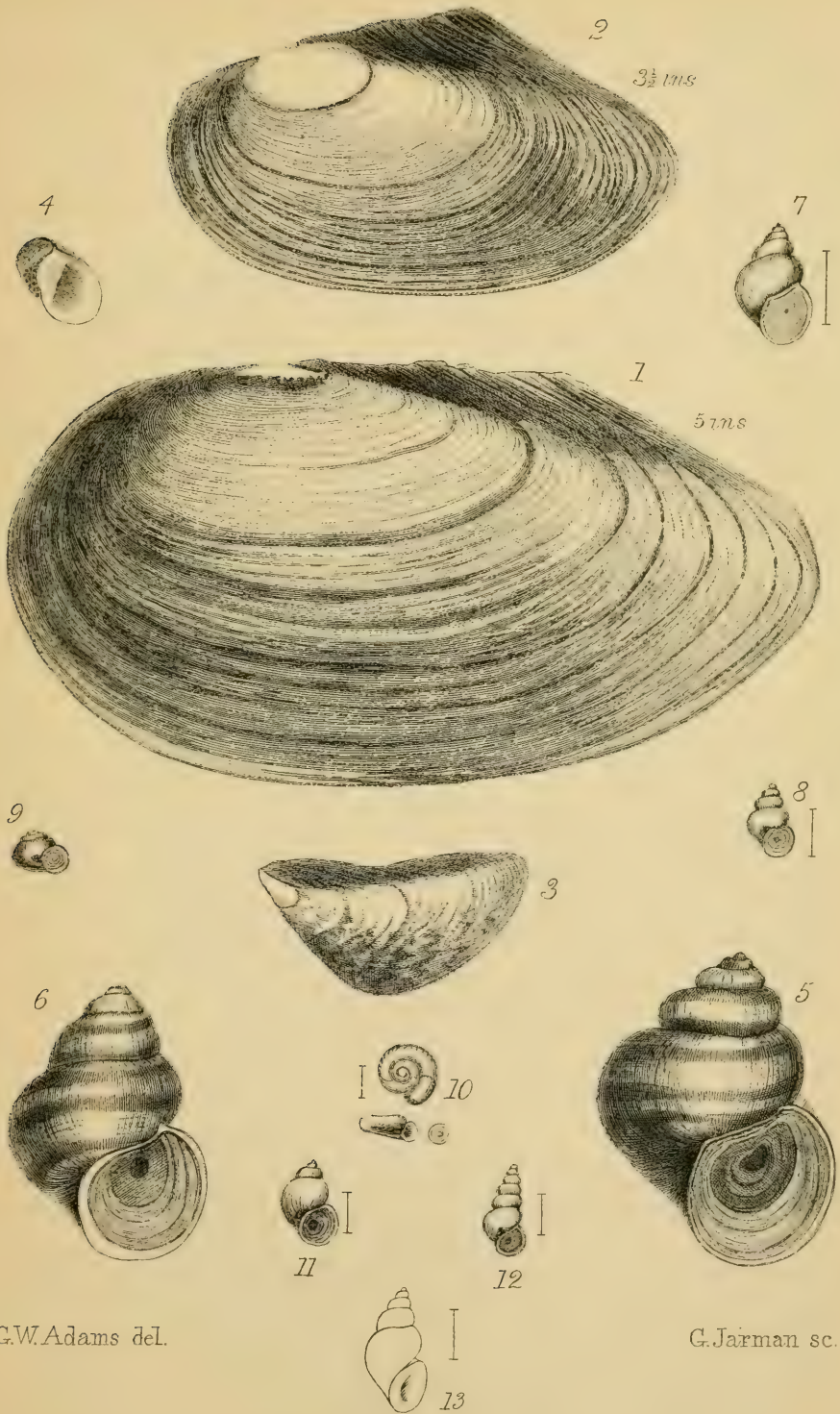


PLATE VIII.

- Fig. 1. *Anodonta cygnea*.
,, 2. ,, *anatina*.
,, 3. *Dreissensia polymorpha*.
,, 4. *Neritina fluviatilis*.
,, 5. *Vivipara contecta*.
,, 6. ,, *vivipara*.
,, 7. *Bythinia tentaculata*.
,, 8. ,, *leachii*.
,, 9. *Valvata piscinalis*.
,, 10. ,, *cristata*.
,, 11. *Hydrobia similis*.
,, 12. ,, *ventrosa*.
,, 13. ,, *jenkinsi*.

Plate VIII



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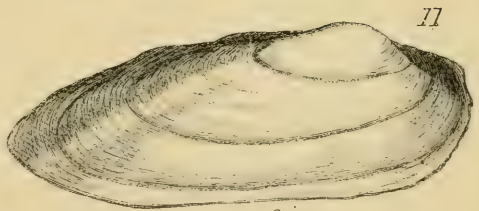
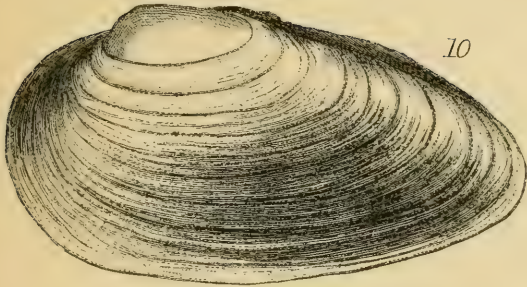
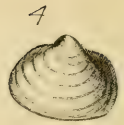
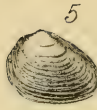
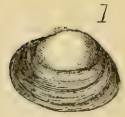
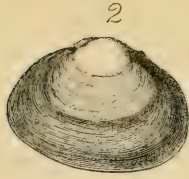
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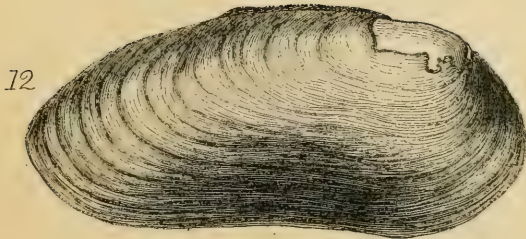
PLATE IX.

- Fig. 1. Sphærium corneum.
,, 2. ,, rivicola.
,, 3. ,, pallidum.
,, 4. ,, lacustre.
,, 5. Pisidium amnicum.
,, 6. ,, fontinale.
,, 7. ,, pusillum.
,, 8. ,, nitidum.
,, 9. ,, milium.
,, 10. Unio tumidus.
,, 11. ,, pictorum.
,, 12. ,, margaritifer.

Plate IX.



3ms.



5ms.



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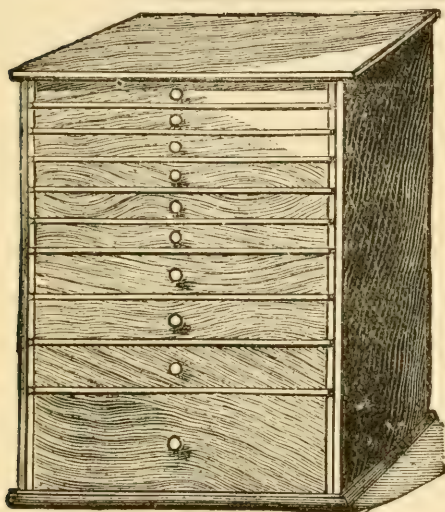
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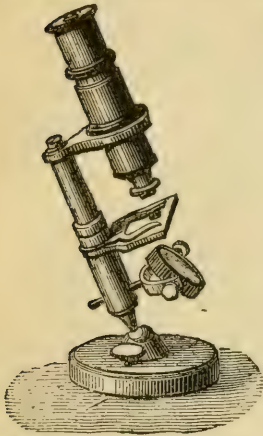
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