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BRITISH ISLES.

John W. Taylor, M.Sc.
NOTICE.

The great depletion of our trained and experienced staff by the voluntary and forcible enlistment of our men to carry on the present unhappy war, has militated against the issue of the present Part; and it is feared that as there are still few or no apparent signs of an early peace, the calls for more and more men for war purposes will become still more severe and insistent; and business be still further injured; every effort, however, will be made to secure the publication of Part XXIII. at the earliest possible date.

At the wish of many Subscribers, the Plates will not in future be pasted in, but will be loose, so that they can be readily inserted in their proper position by the Binder, without risk of injury.

Great care should, therefore, be taken of them, as they cannot be replaced, and their presence in every Part sent out is assured by double checking.

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The term *Hygromia* (ἐγρος, moist or damp) aptly designates the present genus, which is especially characteristic of the Western Palaearctic region, and, as is clearly indicated by the character of their shells, are typically shade-loving or woodland species.

This mode of life induces a feeble calcification of the shell with a consequent diminution or even atrophy of the apertural rib and the development of a dull and thick epidermis with a tendency to become closely beset with numerous projecting hairs or bristles, all peculiarities characteristic of a moist and umbrageous environment.

Occasionally the shells bear a somewhat opaque white peripheral zone, an atavistic evidence of some former scheme of ornamentation, and that this peculiarity is vestigial is rendered probable by the retention of this calcified zone and perceptible remnants of the concomitant spiral banding by many species belonging to very diverse genera, a circumstance which indubitably points to their community of descent from some ancestral banded form, it being quite improbable that such a number of species belonging to so many distinct groups should simultaneously evolve nascent banding so exactly uniform in character and position.

A section, under the name *Leucozone*, was established by Dr. Westerlund to emphasize this character.

The group was established by Prof. Antoine Risso, of Nice, the celebrated Italian naturalist, with whom the genus is here associated.
INTERNALLY, the animal displays the same general arrangements of organic structure as the typical *Helix*, a relationship shown also by the disposition of the retractor muscle of the right tentacle, which passes in its course between the male and female organs, this entanglement being indicative of a fundamental unity of plan, probably dating far back in the history of the group, and differentiating it from the genus *Helicella* and its allies.

Characteristic features of the genus are the absence of the diverticulum or auxiliary branch of the spermatheca, the frequent doubling of the dart-sacs, or stylophores, the presence of accessory sacs, and the separation of the mucous glands from their close association with the dart sacs by their elevation on the vagina, though some members of the group have lost one or more of these organs by degeneration.

The shell is usually somewhat thin, and only slightly calcified, of an uniformly horny or dull brownish colour, and often hispid, all peculiarities distinguishing species affecting a damp and shady habitat: the aperture is slightly expanded and strengthened internally by a submarginal rib, which is most prominent basally, where denticular thickenings are sometimes developed.

The jaw is pycnognathous and crescentic in shape, with numerous slightly divergent riblets on its anterior surface, which faintly denticulate the cutting margin, and are apparently due to overfoldings of the substance of the jaw.

The radula, as customary in the *Helicide*, possesses numerous teeth, arranged in three longitudinal series, which comprise a median symmetrical tooth, an asymmetrical bidentate lateral group, and a marginal series, which may become tridentate or quadridentate by the splitting of the ectocone of the lateral series.

A close convergence of external characters, due to similarity of habit and mode of life, has led to great confusion and frequent incorrect appreciation of the status of various members referred to this group, and also a lamentable lack of uniformity in their identification between the British and Continental authors, partially ascribable to deficient knowledge of the internal organization of the animals.

I have, therefore, carefully given the names used by the authors themselves for such records as I have ventured to quote, and I hope that the present work will clear up the confusion that still exists on this subject, by giving accurate figures and descriptions of the morphology and organization of the various species found in this country.

Dr. Pilsbry states that the genus as understood by him is not well represented in the fossil state, although certain forms are known as far back as the Oligocene in Central Europe.
Hygromia striolata (C. Pfeiffer).

1742 Cochlea terrestis depressa ad umbilicato mellei coloris, habito candido expando, simus ad umbilicam exiguo circinato, Gault., Conch., pl. 3, l. m.

1778 Cochlea rufescens DaCosta, Brit. Conch., p. 80, pl. iv., f. 6.
1813 — altemana Gaeurn., Syst. d. Wett., p. 27.
1820 — montana, circinata, and celata Studer, Syst. Verz., p. 12.
1828 — striolata C. Pfeiffer, Naturg., iii., p. 28, pl. 6, f. 8.
1841 — rufina Parreys in L. Pfeiffer, Symb., i., p. 39.
1842 — perrypoisiitz in L. Pfeiffer, Symb., ii., p. 93.
1842 — tomentosa Adams in L. Pfeiffer, Symb., ii., p. 105.
1857 Funtivicol circinata Held, Isis. p. 914.
1852 Teba rufescens Leach, Syn., p. 70.
1858 Hygromia rufescens Adams, Genera of Moll., p. 215.

HISTORY.—This species was first noticed in 1674 by our famous countryman, Dr. Martin Lister, who applied to it the cumbrous polynomial designations usual at that period. In 1777 Pen- nant applied the name of Helix rufescens to what he erroneously believed was Lister’s species, and this name was universally adopted.

Though this species has been considered as identical with Helix globella of Draparnaud, I am unable, judging from the original description and figure, to accept that view, and it is certainly not the Helix globella of Moquin-Tandon if his figure and description of its organs are reliable.

Herr Clessis refers to this species Helix phra- cheata of Bougnignat and the Helix submontana of Mahille, and it is also considered to be in part the Helix bicornis of Gmelin.

Dupuy on p. 195 of his great work by oversight refers H. subrufescens Miller to this species, while at p. 180 he correctly gives it as a synonym of H. fusca.

Mr. Edgar A. Smith, L.S.O., to whom we have pleasure in dedicating this species, not only as an appreciation of his great and continuous services to conchology generally, but also because it is to him we are indebted for conclusively showing from an examination of Pennant’s type of Helix rufescens that it is not the species to which that name has been so long applied, but is an immature stage of Helicigona arbolitorum.

In 1906 I had the opportunity of myself examining Pennant’s Zoology, and then noted the improbability of his figure representing the Hygromia rufescens of authors, and remarked that the figure rather recalled an immature Helix aspera.
After careful investigation, I have adopted the name *Helix striolata* of C. Pfeiffer for this species as the oldest which can be satisfactorily determined by the original evidence. All anterior names—*altamira*, *montana*, *civica*, *globella*, etc.—are subject to the gravest objections by the various authors who have treated of the species and differently apply the names.

**Diagnosis.**—The differences of *Hygromia striolata* from the closely-allied *H. hispida* are really more testaceological than anatomical.

The shell differs in its larger size, less compact and more depressed shape, and the absence of epidermal hairs in the adult. The whorls are also usually angulate at the periphery, especially in the immature stage.

**Internally,** the reproductive system has not yet been shown to offer any constant difference from that of *H. hispida*, but the mandible in the specimens examined shows fewer ribs, while the teeth of the radula are noticeably laterally compressed and more elongate than in that species.

**Description of Animal.**—The animal, though very variable in its pigmentation, usually has the body of an ashy-grey, and is strongly and closely tuberculatate, the summits of the tubercles appearing paler owing to an aggregation of minute whitish specks; the dorsal grooves are well marked and enclose a row of closely arranged oblong tubercles; the lateral grooves are also clearly defined; mantle greyish. In the less deeply pigmented animals the tentacular retractors show through the skin as broad blackish bands, extending from the tentacles along each side of the body. Ommatophores long and not very slender, but finely granulate, with oval tips, eye specks black; lower tentacles very short. Foot whitish grey, somewhat short, blunt in front, and obtusely-pointed behind.

**Description of Shell.**—The shell is composed of 6–7 whorls, of a subglobously depressed shape, perceptibly keeled or angulate at the periphery, which is sometimes encircled by a pale peripheral zone, with an obtusely convex spire and channeled suture, especially in the earlier stages of growth; the colour is usually rufous-brown or a dusky-yellowish with darker shades or mottlings, somewhat irregularly striate, and usually destitute when adult of the peristomial hairs, which are frequently distinctly perceptible in the young stage, and may sometimes persist in the adult; the apex is glossy, with delicate spiral sculpture. Aperture obliquely lunate, and incised; lip thin, and slightly expanded, with a milk-white submarginal rib, which is most strongly developed basally, and differs from that of the true or typical *Helixes* in being comparatively distant from the mouth margin at the suture, though close to it basally. Pariquets distinct and open, but not wide.

Diam. 12 mill.; alt. 7½ mill. Average weight of British adult shells, 1 grain.

The epiphragm is thin, vitreous, and nearly flush with the aperture of the shell.

**Internally,** the nerve-ring is fairly compact, the central opening small, but the fusion of the visceral ganglia is not quite complete, and the position of the pleural centres is frequently shown by faint traces of their demarcation. The paired pedal or locomotive ganglia are also compact, and show the otocony on the posterior out-side corners; the liver or digestive gland is of a dark olive-brown colour, and the hepatic artery is of an inconspicuous greyish-white, while the kidney or renal organ is of the usual elongately triangular shape, and of a buff colour with dusky streaks.
The muscular system shows a broad undivided muscle to the buccal bulb; the tentacular retractor divides near the common base of attachment to the columnella into two broad muscular straps, the retractors of the right and left tentacles, each of which a little beyond the half-way divide into slips for the upper and lower tentacles of their respective sides, and also each give off a broad slip, which becomes split up into strands to the anterior part of the foot.

The reproductive organs display an elongate ovotestis, with a much convoluted duct; the vesicula seminalis or claw is unusually well developed, and shows clearly as a doubled channel, it is lanceolate, and sometimes bilobed at its extremity; the albumen gland narrowly ligniform and amber coloured, palest on the concave face; the prostate or sperm-duct is thick and creamy-buff in colour; and the oviduct has the usual sacculations; the free oviduct or vagina gives off the thick, white, and very elongate spermatheca duct, the oval terminal vesicle being of a pinkish-cream or ochreous tint, with anastomosing brown streaks, and attached to the middle of oviduct. The stout and rigid mucous-glands are usually eight in number, and arranged in pairs; they are about 3 mill. long, somewhat irregularly digitate, with usually a noticeable constriction near the centre; they are occasionally banded and even tribut at the extremities, and show
opaque white or buff cores, while each digitation is joined to the oviduct by a short slender stalk. The penis sheath is very stout and white in colour, but distinctly constricted at its junction with the atrium, where it is smeared and spotted with brown; the distal end is continued as a tapering and twisted epiphallus, to which is affixed a broad retractor muscle, and the terminal flagellum is also well developed.

The stylophores or true dart-sacs are two in number, of a semi-transparent white or yellowish-white colour, finely spotted with brown, and are placed on opposite sides of the vagina, each associated with a smaller, more opaque, and empty superimposed auxiliary sac or lobe of similar external aspect.

The Gysopela or twin love-darts are more than a millimetre in length, and usually slightly curved, but sometimes are perfectly straight, with a tapering, round and smooth hollow shaft, and a relatively large and expanded base of attachment, which shows obscure traces of an annulus, and also a noticeable tendency to develop a pair of longitudinal blades at the apex.

The alimentary system is on the general Heliothian plan; the salivary glands are long and narrow, of a slaty-grey colour, with darker ducts, but in comparison with Helix aspera, differ in surrounding the middle of the oesophagus, and not clasping the crop; the oesophagus also is longer in proportion, and leads to the voluminous light brown or buff coloured crop, which, as is usual, merges into the stomach, whose position is often displayed by a more pronounced distension, and by the place of entry of the bile ducts; the cut is of the ordinary tridromous character, but the yellowish-white intestinal flexures contrast strongly with the dark coloured liver, and are more distant from the posterior end of the stomach than in that species.

The jaw or mandible is crescentic in shape and of the anchacognathous or pycno-gnathous type, and amber in colour, bearing on its anterior surface a broad and flat central and vertical rib, which perceptibly projects beyond the general outline, and numerous delicate lateral ribbings which only slightly encumber the cutting margin; the line of attachment of the mandible to the buccal cavity is shown by the stronger and thicker medial region, which appears as a darker area extending across the mandible parallel to the cutting margin and as a posterior extension.

The radula is of the usual oblong form, and in the specimen figured possesses about 104 longitudinal rows of teeth, with a maximum of 67 teeth in a transverse row, each row being constituted by a somewhat long, narrow, and tricuspidate central tooth bearing a long and powerful median cutting-point or mesocone and two insignificant subintestinal cutting-points or ectocones placed far back at the shoulder of the tooth; the laterals are uniformly bidentate and conspicuously larger than the median row; the mesocone also is larger and stronger, the ectocone or

inner cutting point becomes entirely lost or suppressed, but the ectocone or outer cutting point is retained and gradually increases in size and strength as the teeth recede from the centre; about the twentieth row the splitting of the ectocone
HYGROMIA STRIOLATA.

signalizes the commencement of the marginal series, the teeth diminishing rapidly in size and more or less generally becoming tricuspidate or even occasionally show four cutting points.

The formula of a specimen from Wexford, prepared by Mr. J. W. Neville, is
\[ \frac{1}{5} + \frac{2}{9} + \frac{1}{6} + \frac{2}{2} + \frac{1}{3} \times 104 = 6,968 \text{ teeth.} \]

Reproduction and Development.—No observations have been made of the anatory preludes or the conjugation of this species, but the season probably begins in the early spring, and is continued throughout the summer months, while egg deposition has been actually noted to take place from July to October. The eggs have been described as opalescent-white, and globular in form, about \( \frac{1}{12} \) mill, in diameter, and 40 to 50 in number; they usually hatch in from 20 to 25 days, and attain full growth during the following season.

In July, 1883, the late Mr. Chas. Ashford dissected a specimen in which the oviduct was crowded with eggs, seventeen being counted, occupying the ducts from the albumen gland downwards. The eggs traversing the oviduct were all transparent and colourless, but after passing between the openings of the mucous glands and dart sacs, each egg became enclosed in a white calcareous shell, demonstrating that these organs, so rich in calcic substances, function in forming the hard enveloping shell.

The young of this species, as stated by Montagu, is frequently covered with short hairs, which are seldom spread over the whole shell. In this hispid immature state it is, according to L. Pfeiffer, the *Helix tomentosa* of Adams. This hispid character, however, becomes lost before the shells are half grown, but their sockets are often perceptible with a good lens, while the nucleus is said to show delicate spiral striation, and Dr. Jeffreys has noted that at Clifden, Galway, shells have been found in which this spiral sculpture is continued on the shells to maturity.

In the autumn months the young shells are more sensorial than in later life, and may often be brought down in showers by beating ivy, etc., growing on old walls and other places.

Before maturity, the animal may construct, from time to time, one or more calcareous submarginal ribs to the aperture, and these premature ribs or thickenings, due to interruptions of growth, frequently persist and are visible through the substance of the shell as broad transverse whitish streaks.

Food and Habits.—The food of this species has not yet been thoroughly and systematically noted, but it is well known as one of the pests of a garden, and its fondness for *Arabis albidula*, violet leaves, primroses, and the petals of the cultivated poppies has been recorded, while its predilection for strawberry beds has led to its being called the "strawberry snail"; the underside of the leaves of buttercups (*Ranunculus*) is also a favourite resort and probably of food in certain districts.

Though stated to be especially characteristic of the nettles and brambles on the outskirts of somewhat damp oak-birch woods, it displays by its
abundance a decided preference for chalk or limestone ground, where it is generally plentiful; it is less so on sand, and especially on clay. It is very fond of damp places, osier-beds, and ivy-covered walls or hedges, and is also found plentifully in gardens and in hedge-rows, amongst nettles, etc. On the sea-coast the largest shells often live or are found on bramble and sea-cabbage.

Though usually geophilions in habit, it has been known to ascend trees and hedgerows to a good height, and to remain for hours adherent to the upper twigs, and even to astivate on the boughs of trees fully exposed to the sun's rays. It also tends to inhabit more open country than, judging by its hirsute immature shells, was apparently the case at some former period, and is undergoing modification in adaptation thereto.

It is nocturnal or crepuscular in habit, seldom stirring from its place of concealment during the day, unless in very moist and showery weather, but hiding in the crevices, or crawling beneath stones, heaps of rubbish, etc.

It is a fairly active species, carrying its shell inclined to the right side and towards the front when crawling, and ranges to an altitude of about 4,000 feet in the Alps.

Like Helix contigua, it voids when irritated or roughly handled a quantity of limpid tasteless fluid, but this feature is not so marked a characteristic as in Helix virgata and its allies.

Though H. striolata begins to retire for hibernation when the temperature sinks to about 38 deg. Fahrenheit, often as early as October, yet it breaks its hibernation in the damp and milder days of winter, and wanders about and feeds when the temperature reaches 40 deg. Fahrenheit.

The circulation of this species shows considerable power, as at 31 deg. Fahrenheit it shows five or six heart contractions per minute, all very full and deliberate and not weak and feeble as in certain other species.

\[\text{The vertical lines connect the corresponding points of temperature and pulse rate.}\]

**Fig. 21.** Diagram illustrating the influence of temperature upon the pulsations of the heart of Hygromia striolata Linne.

**Enemies.** The enemies of this species are those of the land mollusca generally. It is known to be devoured by rats. The thrushes are very fond of it, as is shown by the frequent presence of the broken shells at the thrush-stones; and the crops of the nestlings of the missel thrush (Turdus viscivorus), wood pigeon (Columba palumbus), and stockdove (Columba oenas) have been found to contain or be filled with the shells, while even well fed fowls pick up and eat those creatures with evident pleasure.
HYGROMIA AND HELICODONTA.

Hygromia striolata (C. Pfeiffer) × 1½.

Boston Spa, Yorkshire.

H. striolata var. rubens (Moq.) × 1½.

Boston Spa, Yorkshire.

H. striolata var. alba (Moq.) × 1½.

Bristol, Miss F. M. Hele.

H. striolata var. albocincta (Ckl.) × 1½.

Saundersfoot, Pembrooke, F. M. Burton.

Hygromia hispida (Linné) × 2.

Port Bannatyne, Bute, T. Scott.

H. hispida var. fusca (Moq.) × 2.


H. hispida var. sericea (Drap.) × 2.

Bavaria, S. Clessin.

Hygromia revelata (Michaud) × 1½.

The Lizard, Cornwall, Miss F. M. Hele.

Hygromia fusca (Montagu) × 1½.

Bassenthwaite, Cumberland, Capt. W. J. Farrer.

Helicodontia obsolenta (Müller) × 1½.

Ditcham Wood, Hampshire, L. Dawes.
Geological Distribution.—*H. striolata* has not been found as yet below the deposits of Pleistocene age, either in the British Isles or elsewhere.

**Pleistocene.**—In Wiltshire it has been recorded from the brick-earth, Fisherton, by Mr. Blackmore.

In Dorset, it has been recorded from the tufa at Blashenwell, by Mr. J. C. Mansel-Pleydell, and by the Rev. R. A. Bullen from Portland Bill.

In Essex, it has been recorded from the Mammaliferous beds of Grays, as well as from Clacton and Copford by Prof. Morris; from the Palaeolithic sand of the Lea Valley by Mr. Worthington G. Smith; and from Harwich on the authority of the late Dr. S. P. Woodward.

In Suffolk, it has been recorded by Prof. Morris from the Mammaliferous beds of Stotton.

In Lancashire, from the upper layers of "cave-earth" at the "Dog-holes," Warton Crag, by Mr. J. Wilfrid Jackson.

In Germany, Herr Clessin records *Helix rufescens* var. *montana* from the Lower and Middle Pleistocene deposits at Grötzingen, Baden, and as the var. *montana* from the Lower and Middle Pleistocene sands at Mosbach and Mauer, also the deposits at Oos, Altmark, Mülhausen, Heidelberg and Neckarelz, Baden; in tufa of Lower and Middle Pleistocene age at Cannstatt, Wurttemburg; in the Lower and Middle Pleistocene deposits of Oppenheim, and the Erbenheimer valley, near Wiesbaden in Hesse-Darmstadt, and at Bad Enns, Nussau.

In the Upper Pleistocene, Prof. Sandberger records it from Weimar in Thuringia, the tufa of Cannstadt, Wurttenburg, and in the valley loess at Lommatzsch and Röschutz, Saxony.

In Holland, as *Helix rufescens* var. *montana* it is recorded by Prof. Sandberger from the Lower and Middle Pleistocene of Bommeln near Maestricht.

In Austria, Sandberger also quotes the typical form of *Helix rufescens* from the valley loess of both Lower and Middle Pleistocene age at Nussdorf near Vienna.

**Holocene.**—It has been found in numerous Holocene deposits in this country, but there are few continental records.

In Somersetshire, it is recorded by Kennard and Woodward from an alluvial deposit at Castle Cary.

In Wiltz, it was found in the surface deposits at the great circle at Avebury by Mr. Harold St. George Gray.

In Kent, it was recorded by the Rev. R. Ashington Bullen from a road section under the South Downs, Folkestone, and in a deposit at Barton Court, Dover; Mr. Spurrell found it in a section exposed at the sewer-outfall at Crossness; Kennard and Woodward quote it from the base of an early Romano-British tumulus at Stanley's Quarry, Ightham; and Prof. Morris notes it from loamy sand and pebbles exposed in the excavation for new reservoir at Maidstone.

In Hampshire, it has been found in friable calcealaceous tufa at Twyford by Mr. Chas. Ashford; and recorded by Mr. J. T. Kemp from tufa near the Southampton Waterworks, in mole-hills in the Anton Valley, and in the valley of the Test.

In Middlesex, Mr. J. E. Cooper detected it in excavations by the Gasworks, Staines; Mr. Loydell in a section by the Thames a mile west of the town; Mr. Greenhill found it in a sandy deposit of probable "Bronze age" at Clapton; and Mr. Davies in the excavations at the Houses of Parliament, Westminster.

In Surrey, it was found by the Rev. R. Ashington Bullen to a depth of four feet from the surface in Colley Pit, Reigate.

In Essex, it was found in alluvium at Felstead by Mr. French; in the deposits on the banks of the river Cumm, Chignall St. James, by Mr. Miller Christy; from alluvium at Roxwell, and in a drain-section at Shalford, by the Rev. A. J. Law; from excavations at the Victoria Docks by Mr. Blanford; and from Witham, Braintree, Rainham and Tilbury, by Messrs. Kennard, Woodward, Webb and others.

In Gloucestershire, it is recorded by Messrs. Hinton and Kennard from several of the layers in the King's Beeches Gravel Quarry, Cleve Hill.

In Yorkshire, it was found abundantly in the alluvium of the Ribble at Mitton Bridge by Mr. J. Wilfrid Jackson.

In Galway, it was discovered by Mr. R. D. Darbishire in the "black earth" band, Dog's Bay, Roundstone.
Variation.—The variation in *H. striolata* is somewhat perplexing owing to its intergrading with *H. hispida* and other closely-allied forms and such intermediate links have in many cases been proposed as distinct species. Dr. Westerlund accepted three British species: *H. striolata*, *H. rufescens*, and *H. abluenda*.

The *Helix abluenda* Locard, recorded hitherto only from Dublin, Jersey, and Boulogne, and which Dr. Scharff found commonly in his garden at Leeson Park, Dublin, and regarded as a flattened form of *H. striolata* perhaps produced by unhealthy animals.

A large and thick-shelled form from the alluvium of the Danube is recognized by Herr Clessin under the name of var. *allucianus*, but I know of no other description.

In the North-east of Ireland, where it is local and rare, it is said by Irish conchologists to merge almost insensibly into *H. hispida*, which is quite a common species there.

The Rev. Canon Norman has observed that in shady umbrageous places the shells are usually large and horn coloured, while in drier places the shells are smaller, deeper in colour, and with a more elevated spire.

A study of the characters of the shell from the earliest stages would seem to indicate that this species is probably in process of quitting the more shady sheltered and moist stations amongst which—judging by its hirsute juvenile stage—its immediate ancestors lived, and is now gradually assuming the occupancy of more open and drier ground, its food and habits probably not directly conflicting with those of the more dominant true *Helixes*.

This change of habit is indicated and attested by the attenuation of the epidermis, the usually total loss of the epidermal hairs in the adult stage, and the greater development of the calcareous basis of the shell.

The white and more calcified peripheral zone is most distinctly and most frequently shown towards the limits of its geographical range, thus implying it to be an ancient characteristic, which is probably on the road to extinction.

The var. *clessini*, in which the hairy investment persists to adult life, shows that the life of this form is still spent within the leafy shades, as in such situations the thicker epidermis and epidermal outgrowths are developed and fostered.

The undescribed varieties *cornua* and *subcornua* of Bouchard-Chantereaux appear to be but very slight subvariations of the typical shells.

Var. *danubialis* Clessin.


*Pisticiola rufescens* var. *montana* Clessin, Deutsche Exk. Moll., 1884, p. 158.

**SHILL** more compact and with a more elevated spire. **Diam.**, 10-11½ mill.; **alt.**, 6-5-7 mill.

The sub-var. *montana* seems to differ only in its usually darker colour.

This variety, which is perhaps the mountain variety mentioned by Reeve, is practically synonymous with the *Helix montana* Clessin, etc., is a noticeably tall and compact shell, which Clessin describes as brown, transparent, and finely striate, with a slightly angled and paler periphery. Clessin’s illustrative figure is not satisfactory. **Diam.**, 11 mill.; **alt.**, 6½ mill.

York S.W.—Breton West, Barnsley, April 1910; W. E. Brady.

York Mid W.—One specimen with a remarkably raised spire found at Skipton by Dr. R. F. Scharff, which may be probably allocated here.
HYGROMIA STRIOLATA. 11

CONTINENTAL DISTRIBUTION.

Germany—Abundant in meadows by the river at Ulm, and in the woods of the Danubian valley, Bavaria. The sub-var. montana is recorded from Nassau.

France—The sub-var. montana is recorded from the Ardennes, Côte d'Or, Hautes Alpes, and Jura.

Switzerland—The sub-var. montana is recorded from Neuchâtel and Berne.

Var. depressa Taylor.

Shell with the spire only slightly elevated above the body-whorl. Diam., 10 mill.; alt., 4 mill.

This variety was named but I understand not described by Locard, as stated by Mr. Stubbs to especially frequent heaps of loose stones at Tenby.

ENGLAND AND WALES.


Isle of Wight—Ventnor! C. Ashford.


Surrey—Graywood, E. W. Swanton.


Oxford—Aldbury near Banbury, Rev. S. Spencer Pearce.


Waterford—Near Waterford, April 1911! A. W. Stelfox.


Shell much depressed, with a sharply angulated periphery.

This variety is, according to Clessin, probably the Helix parvus of Fitzinger, which is described by L. Pfeiffer as possessing a more distinct keel.

CONTINENTAL DISTRIBUTION.

Baden—Only known as yet from the original locality at Eberbach on Neckar.

VARIATIONS IN SIZE OF SHELL.

Fig. 23.—Helix parvus var. subcarinata Clessin X\textsuperscript{1}/\textsuperscript{4} (after Clessin).

Var. major Taylor.

Shell larger than the type form, reaching almost 15 mill. in diameter.

Dorset—Mr. J. C. Mansel Pleydell recorded some extremely large specimens, double the ordinary size, from Puncknowle (Moll. Dorset, 1899, p. 10).


Ireland.

Kerry—Specimens 14 mill. in diameter from roadside-walls, Muckna Wood, Kenmare, July 1898, B. Standen.

CONTINENTAL DISTRIBUTION.

Germany—Stuttgart, Wurtemburg! Prof. E. von Martens. The large var. allertiis Clessin is recorded from the valley of the Danube, Bavaria.


Helix rufescens var. montana-minor Westerland, Fama Extram., 1875, p. 45.

Shell smaller with usually a more elevated spire.

According to Dr. Jeffreys, it is not uncommon, and its occurrence has been verified in many parts of the country; perhaps the most characteristic shell I have seen was found by Mr. W. E. Brady at Breton West, near Barnsley, Yorkshire.

This variety probably embraces the var. montana-minor Westl., which is characterized by a lofty, globosely-conoid spire, and has a diameter of 8 mill. and an alt. of 5 mill. and is only recorded from Switzerland and Mariabrunn, Bavaria, and is considered by Clessin to also embrace the Trichter ereta of Hartmann, a compact and regularly conical shell, found at Neuwied in Rheinish Prussia.

The var. montana-minor is recorded from Alsace, Baden, and Rheinish Prussia in Germany; and also from Switzerland, France, and Austria.
HYGROMIA STRIOLATA.

VARIATIONS OF COLOUR OF SHELL.


SHELL of a dark reddish-brown.

The var. rubens is described as shell more or less reddish.

This variety was first distinguished but not described by Boucharl-Chantre who in 1838, and was evidently intended to distinguish the deeper red brown forms; but the brightness and richness of the tint gradually fades with time.

Judging by the specimens in my collection, it is the var. purpurascens of Cockerell, his var. rubens being a paler form than that considered here as typical, though this may be due to fading.

This variety is widely distributed in the British Isles, and is also known abroad, although few precise records are available. Moquin-Tandon, however, reports it from Boulogne, France.


Helix rufulescens var. albida Jeffreys, Brit. Conch., 1862, i., p. 165.

SHELL entirely white.

The sub-var. albida Jeffreys is described as shell white or colourless.

This variety was named var. alba, but not described by Boucharl-Chantre in 1836. It is also in part the var. albida of Jeffreys.

The Helix rufescens var. manchestercenoides Locard, judging from Bristol specimens in the Westerland Collection at the Dublin National Museum, are merely the albino form of the species.

Prof. A. E. Boycott remarked that the albino form was the only one found on horse-radish at Ross, Hereford; and Mr. Swanton has recorded its preference for the leaves of Arum maculatum in Somerset.

This variety is fairly common and widely distributed in these islands, and is known on the continent, but few precise records exist. Moquin-Tandon reports it from Boulogne, France; and Mr. G. H. Clapp from Quebec, Canada.

A specimen found at Matlock, Derbyshire, by Mr. Hurlstone-Jones, had the last whorl only albino, the rest of the shell being normal in character.

Var. albocincta Cockerell.


Helix rufulescens var. alboeincta Cockerell, Nat. World, Sept. 1856, p. 179.

SHELL showing a distinct white zone at the periphery.

The var. alboeincta Kuhl., s.s., is described as "purplish-brown with a white band at the periphery."

This variety is probably an atavistic one, the pale zone representing the area intervening between the colouring of the upper and lower surface of the shell. It is apparently most commonly found in a distinctly characterized form in unfavourable localities or in areas vying on the limits of the geographical range of the species.

According to Dumont and Mortillet, this form is the Helix circinata of Studer, but in view of the present uncertainty of the nomenclature and identification, Prof. Cockerell's name is here used. Moquin-Tandon, who alludes to this form as H. rufescens var. circinata, by some oversight describes the band as dark coloured.

This variety is probably the Helix (Triohton) montana var. obscura Wattebled, which is distinguished by its dark horn-yellow colour and whitish peripheral zone. It is known from the Jura and Vaucluse, France.

In the British Isles, the var. alboeincta is more especially found in Ireland, but has been found in several comital districts in England.

On the continent, it is recorded as Helix circinata from the Jura Mountains by Dumont and Mortillet; and as H. rufescens var. alboeincta from Goat Island, Niagara, United States, by Rev. C. E. Y. Kendall.


SHELL retaining in adult life the hairy epidermis proper to its very youthful stage.

This variety, which has been as yet found only in the original locality, the damp forest drains on the Vottelwiese, Wurttemburg, but will probably be eventually also found in moist shady surroundings in this country.
HYGROMIA STRIOLATA.

MONSTROSITIES.


Helix rufescens monst. scalariforme Swanton, Journ. of Conch., April 1905.

"Whorls partly disjionted."

Dr. Jeffreys mentions a scalariform distortion of this species, but gives no indication of the locality.

Surrey — A peculiar dislocated shell found at Haslemere by Mr. E. W. Swanton.

Norfolk E. — A single specimen found by Mr. A. Mayfield at Eaton near Norwich, is the type of the monst. subscalare.

Westmorland and Lake Lancashire. — Eggerslack Wood, Grange-over-Sands, 1903, J. Wilfrid Jackson.

Queen's Co. — Maryborough, a very fine example, Oct. 1910 ? R. A. Phillips.

Monst. sinistrorsum Taylor.

Shell reversed in its coiling.

This species, though so abundant, was quite unknown in the sinistral state until discovered by the Rev. W. A. Shaw in 1905. It is very remarkable that the only other known specimen should have been found in the same county.

Northampton — A single almost full-grown shell amongst nettles at East Haddon, May 1905, Rev. W. A. Shaw. A full-grown and perfect, though dead shell, in a nettle-bed, about a mile from Peterborough Railway Station, Aug. 1909, W. Gyngell.

Geographical Distribution. — This species is fairly well diffused throughout its range in the British Isles, and not nearly so partial in its distribution as believed by Dr. Jeffreys.

Fig. 24.—Geographical Distribution of Hygromia striolata.

Probable Range. — Recorded Distribution.

In England and Wales it has been found and verified for every comital or vice-comital district except from Nottingham and Montgomery; the apparent and totally unexpected absence of this species from Nottinghamshire and excessive rarity in Leicestershire are as yet quite inexplicable.
Though frequently recorded as a striking absentee from the Channel Islands, it is stated by Mr. C. E. Wright to be common all over the Island of Guernsey.

In Scotland, *H. striolata*, though thought by Dr. Jeffreys to be absent from that country, ranges as far north as Kinnoull in North Perthshire, but apparently has not yet succeeded in crossing the great rift valley now occupied by the Caledonian Canal.

About a quarter of a century ago English specimens were introduced at Brora, East Sutherland, by Mr. W. Baillie, and have prospered amazingly in their new surroundings.

In Ireland, it is diffused throughout the whole country, and its occurrence has been verified for every district. It is, however, rare in the North-east, its place being taken by *H. hispida*, with which it is said by Irish conchologists to insensibly blend.

Its Continental range is clouded with considerable uncertainty, due to the conflicting opinions of foreign conchologists as to the correlation of the British and continental *Hygromia*, for, as remarked by the late Dr. Gray, the *Helix concinna* "is the Helix rufescens of the Swiss conchologists," and the views of authors still so greatly diverge regarding the status and intimate relationship of *H. colutia*, *H. concinna*, *H. plebeia*, *H. sylvestris*, *H. glabella*, and other *Hygromia*, which are allocated almost indifferently to *H. montana*, *H. concinna*, *H. strielha*, *H. striolata*, *H. attenuata*, etc., or even given distinct specific status.

Its distribution is given by Dr. H. Jordan as England, South Ireland, South Scandinavia, Holland, Belgium, North and East France, the Mid-Rhine Valley, Switzerland, Jura Mountains, South-west Germany, Saxony, Silesia, Bohemia, Moravia, Upper and Lower Hungary, Lower Danubian Valley, North and Central Carpathians, and Eastern and Western Alps, at from 1,500–4,000 feet.

The natural occurrence of this species in Asia does not seem as yet to be satisfactorily verified.

GERMANY.

As *Helix striolata* it is recorded by C. Pfeiffer as plentiful in gardens about Heidelberg, Baden.

As *Helix rufescens* it has been recorded from Nassau by Dr. Scharff; from Zwickau, Saxony, by Mr. G. K. Gude; from Baden, Franconia, Rhenish Prussia, and Bavaria by Herr Clessin; from Saubia and Wurttemburg by Dr. Weihland; from Holstein by Beck; and from Fulda by Kügler.

As *Helix montana* from Rhenish Prussia by Schmidt; and from the Castle Hill, Heidelberg, Baden, by C. Pfeiffer.

As *Helix sylvestris* it has, according to Dr. Jeffreys, been noted from North Germany by von Alten.

As *Helix concinna* it is reported from the Taunus by Dr. Heynemann; from Thuringia by Prof. von Martens; from Wurttemburg by Seekendorff; from Franconia by Küster; and from Rhenish Prussia by Busch.

As *Helix glabella* it is recorded from Cassel by C. Pfeiffer; and from Alsace by Dr. Mühlenbeck.

It lives in the whole range of the Austrian and Bavarian Alps; in Moravia and the Isergebirge in Silesia; in Bohemia and Saxon Elbe region, and Transylvania.

NETHERLANDS.

In Belgium it is recorded as *Helix rufescens* from Namur by Malzine; as *Helix rufescens* (= *H. attenuata* var. Ben.) from Mechlin in the province of Antwerp by Colbeau; and as *H. rufescens var. montana* by Mr. Gude from Grand Dnehy of Luxemburg.

As *H. attenuata* M. Colbeau records it from Brabant, on the authority of Kickx; and doubtfully from Namur on the authority of Nyst.

In Holland it is recorded as *Helix glabella* from Oudwyk by Maitland.
HYGROMIA STRIOLATA.

FRANCE.

Its distribution is little known in France, but Dupuy and Grateloup record it under the name of Helix vaferescens from North and East France; and Morequin-Tandon reports it as inhabiting the departments of the Ain, Nord, and Pas-de-Calais, yet Reeve states that "it is not found in the north of France." Mr. F. H. Sikes found it in Loir-et-Cher and Indre-et-Loire; Rev. S. Spencer Pearse in Isere; M. Bourguignat notes it from Finistère and Côtes-du-Nord; Captain Wattebled found it commonly in the Jura; Locard records it from the Rhône; M. Picard from the Somme; M. Cardot from the Ardennes; and Abbe Dupuy from the Vosges.

As Helix glabella it is reported by Dr. Jeffreys on the authority of Barbie from Burgundy; Grateloup gives the distribution as North and South France, Dauphiny, Seine, Côte-d'Or, and Rhône; M. Margier quotes it as common about Beauvezer, Basses Alpes; Puton records it from the Vosges; and Fagot and Malafosse from Champagne Meridionale.

As Helix montana it is quoted from Hautes Alpes, Jura, and Alpine France, by Grateloup; and from the Drôme by Sayn.

As Helix attenuata Grateloup gives it as found in Northern and Eastern France.

ITALY.

Sicily—Quoted as Helix glabella by Dr. Gwyn Jeffreys on the authority of Calcara.

BALKAN PENINSULA.

Servia—Prof. Sandberger records it from the valley of the Danube.

AUSTRO-HUNGARY.

As H. vaferescens it is recorded for Austria by Schröckinger; Prof. Brusina has noted its occurrence in Bosnia; Jachno has recorded fine specimens from near Cracow, Galicia; Sandberger quotes Galicia; and Dr. H. Jordan tabulates it as inhabiting North and South Hungary, Silesia, Bohemia, and Moravia.

As H. montana it is recorded from the woods about Vienna, Austria, by Herr Carl Piculler.

As H. cirrinita it is quoted from Carniola by Dr. F. J. Schmidt.

SWITZERLAND.

As Helix vaferescens it is represented in the Manchester Museum from Switzerland; Mr. J. R. le B. Tomlin has found our species at Lucerne; and Mr. Hugh Watson near Solothurn; and Dr. G. Bollinger cites its occurrence at Basle, Berne, and St. Gallen.

As H. montana it is quoted by Prof. von Martens from Neuchâtel, and gives Bremi, Zurich.

As H. glabella it is recorded from the Grisons by Am Stein; Hartmann gives H. cocynata and H. clandestina from Zurich; and Herr Studer quotes H. ovata and H. montana from Neuchâtel.

SPAIN.

As H. vaferescens it is recorded by Salvana from Valvidrera near Gerona, Catalonia.

SCANDINAVIA.

Sweden—Dr. Westerlund records its occurrence near Kalmar.

Denmark—Reported from Holsteinborg, Zealand, by March; and Westerlund cites var. submontana from the Island of Møen.

RUSSIA.

South Russia—The var. norvegiskjödell is recorded by Dr. Westerlund.

Poland—Recorded by Slosarski from Ojcow, Putawy, and Kazimierz.

ATLANTIC ISLANDS.

Madeira—Found in 1890 at Funchal by Dr. W. H. Rush (Nautilus, Sept. 1891, p. 49). Erroneously quoted by Dr. Gwyn Jeffreys on the authority of Mr. Lowe.

NORTH AFRICA.

Algeria—M. Morelet in 1853 recorded this species from Génois near Bône, but the correctness of his identification has been doubted by M. Bourguignat.
HYGROMIA STRIOLATA.

SI BERIAN SUB-REGION.

Recorded by Dr. Gwyn Jeffreys as inhabiting Siberia, on the authority of Krynicky; and by Mr. G. K. Gode as Funiculus rufescens - striella Gerstfeldt from Irkutsk, the Amur valley, and the Altai region.

The var. nordeuskjeldii Westf. is cited by its author for East and West Siberia and the Altai-Baikal region.

NEARCTIC REGION.

United States—Recorded by Mr. J. H. Thomson as living in 1859 and 1860 near the "French watering place" on the south side of Nausion Island, Buzzard's Bay, Massachusetts; also on Goat Island, Niagara, New York, May 1912, Rev. C. E. Y. Kendall.

Canada—Very abundant throughout Quebec, especially on the city-walls, the cliffs, and extending some distance up the St. Lawrence; there is a large colony at St. Sauveur; a few on the banks of River St. Charles, and on the Isle d'Orleans close to the ferry landing. It is also recorded from Levis by Abbe Begin, and appears to be spreading rapidly (A. W. Haman, Nautilus, Jan. 1897).

Portrait and Autograph of Thos. Pennant, the author of British Zoology, with whose name this species has been for so long incorrectly associated.
Distribution of Hygromia striolata (C. Pfr.)

In the Counties and Vice-Counties of the British Isles.

ENGLAND AND WALES.

Channel Isles
Peninsula
1 Cornwall W.
2 Cornwall E.
3 Devon.
4 Devon N.
5 Somerset S.
6 Somerset N.
Channel
7 Wilt N.
8 Wilt S.
9 Dorset.
10 Isle of Wight.
11 Hants S.
12 Hants N.
13 Sussex W.
14 Sussex E.
15 Kent E.
16 Kent W.
17 Surrey.
18 Essex S.
19 Essex N.
20 Herts.
21 Middlesex.
22 Bucks.
23 Oxford.
24 Bucks.
25 Suffolk E.
26 Suffolk W.
27 Norfolk E.
28 Norfolk W.
29 Cambridge.
30 Bedford.
31 Hunts.
32 Northampton.
33 Shirts.
34 Gloucester.
35 Gloucester W.
36 Monmouth.
37 Hereford.
38 Worcestershire.
39 Warwick.
40 Salop.

SOUTH WALES
41 Glamorgan.
42 Brecon.
43 Radnor.
44 Carmarthenshire.
45 Pembroke.
46 Cardigan.
47 Montgomery.
48 Merioneth.
49 Carnarvon.
50 Denbigh.
51 Flint.
52 Anglesey.
53 Lincoln S.
54 Lincoln N.
55 Lincoln.
56 Leic.
57 Rutland.
58 Notts.
59 Derby.
60 Cheshire.
61 Lancashire.
62 Lancashire Mid.
63 Humberside.
64 South.
65 Mid W. York.
66 N. W. York.
67 Tyneside.
68 Durham.
69 Northumberland.
70 Chester.
71 Cumberland.
72 Isle of Man.

SCOTLAND.

W. LOWLANDS
72 Strathearn.
73 Kirkcudbright.
74 Wigton.
75 Ayr.
76 Linlithgow.
77 Lanark.
78 Peebles.
79 Selkirk.
80 Roxburgh.
81 Berwick.
82 Haddington.
83 Edinburgh.
84 Linlithgow.
85 Lothian.
86 Fife & Kinross.
87 Fife.
88 Stirling.
89 Midlothian.
90 Perth.
91 Forfar.
92 Kinross.
93 Aberdeen S.

E. HIGHLANDS
94 Aberdeenshire.
95 Aberdeen N.
96 Banff.
97 Elgin.
98 Easter.
99 Wester.
100 Main.
101 Kinross.
102 Fife.
103 Stirling.
104 Dunbarton.
105 Clyde.
106 Renfrew.
107 West.
108 Sutherland.
109 Caithness.
110 Orkney.
111 Shetlands.

IRELAND.

Ulster
112 County Antrim.
113 County Down.
114 County Armagh.
115 County Monaghan.
116 County Tyrone.
117 County Donegal.
118 County Fermanagh.
119 County Cavan.

Munster
141 County Clare.
142 County Limerick.
143 County Tipperary N.
144 County Tipperary S.
145 County Waterford.
146 County Cork.
147 County Cork.
148 County Kerry.

Leinster
126 County Wexford.
127 County Waterford.
128 County Waterford.
129 County Wexford.
130 County Kilkenny.
131 County Carlow.
132 County Kilkenny.
133 County Carlow.
134 County Wexford.
135 County Wexford.
136 County Wexford.
137 County Wexford.
138 County Wexford.
139 County Wexford.
140 County Wexford.

Probable Range.
Recorded Distribution.
Distribution verified by the Author.
Geological Distribution.
Hygromia hispida (Linné).

1702 Coehlea terrestris latafio, Petiver, Gaz., tab. 93, ff. 12, 14.

1746 Coehlea testa utrufque convexa hispida, spiris quinque rotundatis, subs perforata, Linneæus, Fauna Suec., i., p. 371.

1758 Lo Voleontè Geoffroy, Coquilles de Paris, p. 44, no. 11.

1830 — (Zenobius) hispida Slavik, Moll. Bôhmi, p. 98.
1871 — liberta Westerlund, Moll. Svéde et Norv., p. 54.
1837 Bradyboma hispida Beck, Index Moll., p. 29.
1837 Fruticicola hispida Held, Isis, p. 014.
1836 Tega hispida Leach, Syn., p. 71.
1838 Hygromia hispida Adams, Genera of Recent Moll., p. 214.
1865 — (Monacha) hispida Mörch, Journ. de Conch., xiii., p. 383.

HISTORY.—Hygromia hispida (hispida, hairy) was first noticed by our famous countryman Dr. Martin Lister, if his Coehlea subfusc a clariculorum productis be really this species, as surmised by Morton in 1712; but the publication by Petiver is, however, the generally accepted record of its first discovery in this country.

It is the Helix hispida of Linné, and the type specimen existed in the Linnean Collection, and may still be in existence, and have escaped the search made for it by Mr. Roebuck and myself when we examined and isolated all the British land and freshwater shells in the Linnean cabinets.

Mr. Hanley recorded its presence in the Linnean collection, and I saw it there when I looked over the specimens about thirty years ago. As stated by Mr. Hanley it was clearly the somewhat flat, widely umbilicated form described as Helix concina by Dr. Gwyn Jeffreys.

The present species is dedicated with profound respect to the late Dr. Carl Agardh Westerlund, the distinguished conchologist, of Ronneby, Sweden, who has rendered such immense services to the investigation of the Palæarctic terrestrial mollusca.

There has been considerable divergence of opinion amongst conchologists in reference to the group of species or varieties clustering around H. hispida.

The H. hispida of Moquin-Tandon must be a different species to our own if his description of the reproductive organs is to be relied upon, as he describes his species as possessing only one dart-sac, whereas our species is always provided with two, each furnished with a love-dart, and also an accessory superimposed glandular sac; while Dr. Paetel regarded the
H. hispida of Jeffreys as identical with Helix conspurcata of Draparnand, a calcareous xerophilous species allied to H. operata.

The H. concinna of Moquin-Tandon, Dupuy, and other French authors is not the shell to which that name is correctly applied, but is a form with a minute umbilicus, and bearing long stiff, whitish hairs, which are not stated to be hooked or incurved.

The Helix vendeana Letourneaux, an openly umbilicated form, from the Vendée, France, is described by its author as intermediate between H. hispida and H. concinna.

Helix azoniana, H. goossensis, and H. matronica of Mabille, the H. choconomphala, H. culbensis, H. duboisiana, H. microgyra, H. vendoperanseis, and H. vocontiana of Bourguignat are all regarded by Dr. Kobelt as more or less unimportant forms of Hygromia hispida; as are Helix locariana Fagot, H. neyronensis Fagot, H. steneligna Bourguignat, and H. elaverana Mabille, according to Dr. P. Fischer; while Dr. Pillsby includes as varieties beaudonini and laticensia of Locard; and Dr. Germain considers that the Helix elisula Locard is only a widely umbilicated form of this species, and the H. praevata a form of what he regards as H. concinna, both being found in the quaternary beds at Buisse, Isère, France. He also regards as strictly synonymous, or as ill-defined varieties, Helix falsani, H. calcica, H. locardi, and H. neyronensis, all fossils found in the vicinity of Lyons.

Diagnosis. — Hygromia hispida when mature chiefly differs from H. striolata in the smaller size and more or less hispid shell, and may be distinguished from the immature stages of H. striolata of a similar size, by the fewer and more rapidly enlarging whorls and the prominence and more elevated position of the peripheral angularity in the latter species.

H. granulata is a more globose shell, with a much more minute umbilicus, and the epidermal hairs with which the shell is clothed are longer and nearly or quite straight, not hooked and incurved as in the present species.

Internally, H. hispida differs chiefly from H. striolata in the short and stout teeth of the radula, differing markedly from the more elongate denticles of H. striolata; the mucous glands are also comparatively longer and scarcely so flexuous.

The structural differences of H. granulata are very striking, shown by the total absence of darts, dart-sacs, digitate mucus glands, etc., in H. granulata, all of which are so strongly developed in H. hispida.

Description. — Shell subconical, rather solid, somewhat glossy, usually of a greyish or yellowish-brown colour, and distinctly striate transversely; periphery rounded, and sometimes showing a paler zone; epidermis rather thick, with a number of short and incurved whitish hairs, which are somewhat caduceous, and directed forwards towards the mouth of the shell; whorls 6-7, compact, and increasing slowly and gradually in size; suture deep; mouth obliquely lunate, with a distinct white submarginal rib, most strongly developed basally; the umbilicus is rather broad, open, and deep; and the lip slightly reflected. Diam., 8 mill.; alt. 5 mill. The average weight of the shell is about 0.6 of a grain.

The animal is elongate when crawling, and usually of a black or dark grey colour, but much paler posteriorly, with a coarsely granulate surface, the granules being densely besprinkled with numerous minute whitish specks;
the somewhat indistinct dorsal grooves enclose a row of elongate tubercles, and there is no perceptible trace of facial or lateral furrows; the slightly darker subdorsal lines are due to the tentacular retractors being visible through the skin, and are most perceptible by transmitted light. The mantle is grey, with darker grey and white mottlings, which are sometimes visible through the shell. The nuzzle is somewhat elongated, the upper and lower tentacles being well separated; ommatophores long, slender, and divergent; lower tentacles short; foot-sole long and narrow, of an almost uniform pale slate colour, but darker in front, marginally paler, but occasionally showing a darker submarginal line, and a distinctly crenulate margin. The epiphragm is thin and crinkled, beset with calcareous particles, and is affixed slightly within the aperture.

Internal Organization—The heart is small and white, the renal organ buff or cream-coloured at the margins with dark brown spots or blotches, the central vein with lateral ramifications. The digestive gland is whitish, light buff or reddish-brown, the hepatic artery tinged blue, the intestinal folds olive-brown or greyish-white, perhaps in correspondence with the colour of their contents.

The tentacular retractors, according to a dissection by Miss Marie V. Lebour, show the unusual feature of a trifid basal division of the tentacular muscles, the left ommatophore possessing a special muscular strip emanating from or near its origin or base; the two main muscles divide somewhat deeply; that serving the left side bears only the retractor of the left lower tentacle and the broad sheath of muscles for the anterior part of the foot; the tentacular muscle of the right side gives off slips to the right ommatophore and lower tentacle and also a powerful trifid muscle to the foot.

The reproductive organs show a fairly long and much convoluted hermaphrodite duct; the albumen gland is of the usual shape, of a yellowish-white, pale lavender, or grey; the oviduct is pale and transparent and tinged with lavender; the prostate or sperm-duct is opaque white or buff, well defined, and widest in the middle of its course; the free oviduct is usually whitish-grey; the spermatheca and its duct are whitish tinged with buff, the spermatheca has a yellowish-white core, and the whole organ is sometimes minutely spotted with yellowish-white; the mucous glands are somewhat rigid, and eight in number, disposed in four pairs around the vagina above the dart-sacs, they are about three mill. long, digitiform or tubular in shape, usually of a transparent azure white, with opaque creamy or buff cores, especially noticeable towards the slightly swollen extremities, and are joined to the vagina by a constricted neck; the penis-sheath is whitish-grey, tinged with azure, and minutely spotted, very swollen in shape and distinctly constricted at its junction with the atrium; the epiphallus is equal in length to the penis-sheath, of similar colouring, and boldly twisted towards its distal end, which would indicate that the spermatophore when discovered will show a corresponding peculiarity; the flagellum is comparatively short and stout and also partakes of the same pigmentation as the related organs.

The stylophores or dart-sacs are bilobed and laterally paired clavate structures of a yellowish or whitish colour, finely spotted with brown, and placed on opposite sides of the vagina; they are each composed of a larger functional outer sac, each of which secretes and contains a dart, and also possesses a smaller or inner sac or lobe which is usually somewhat more opaque than the outer lobe and is always empty, showing no signs of having ever possessed a dart, so that it is not improb-
able that those auxiliary and empty sacs in the present and certain other species represent the coronal glands present in *Zonitoides*.

![Figure 31](image1.png)

**Fig. 31.** Dart sacs and mucus glands of *Hygromia hispida*, greatly enlarged (after Ashford).

**Fig. 32.** Diagram showing the paired arrangement of the vaginal mucus glands (after Ashford).

**Fig. 33.** Darts of *Hygromia hispida*, showing the curved and straight form of dart, × 24.

The *GysoBELA* or love-darts are two in number, about 0.55 mill. in length, of a crystal-like white, and usually curved or awl-shaped, though occasionally straight, with a slender, smooth, and tapering shaft, and a comparatively bulky base, with only occasionally slight indications of an annulus.

The jaw strongly aruncate, with an indistinct blunt median rostrum or beak, and showing numerous flatish ribs on the anterior surface, which are rendered strikingly perceptible by the distinct and apparently grooved lines of demarcation; there are also several subsidiary intermediate lines; the jaw is of a deep amber colour, darker along the lower or cutting margin, but deepest in the central area, indicating the line of attachment of the buccal tissues. The concave margin is broadly crenulate, the indentations marking the limits of the plates of which the jaw is composed.

The radula is of the usual oblong shape, and about 24 mill. long, and 1 mill. wide, with about 100 crenate transverse rows of teeth, each row containing on the average about 61 teeth, composed of a short, almost quadrilateral marginal tooth, about 10 more or less obliquely quadrilateral bisinuate laterals, of which the reflection gradually becomes more slender and elongate as the teeth recede from

![Figure 34](image2.png)

**Fig. 34.** Jaw of *H. hispida* L. (the *H. concinna* of Jeffreys) × 20 (after micro-photograph by Mr. W. Bagshaw).

**Fig. 35.** Jaw of *H. hispida* var. *hispida*, (the *H. hispida* of Jeffreys) × 20 (after micro-photograph by Mr. W. Bagshaw).

![Figure 36](image3.png)

**Fig. 36.** Representative denticles from the radula of *Hygromia hispida*, collected by Major Barrett-Hamilton at Kilmanock, Wexford, and photographed by Mr. Walter Bagshaw, from a preparation by Mr. J. W. Neville (highly magnified).

The centre and approximating somewhat to the marginals, which are about twenty in number, distinguished by their diminished basal plates and relatively enormous cutting points; the marginals, though at first bidental and not greatly different in size, become rapidly reduced in their dimensions, and trilateral or even quadrilateral as they approach the outer margin of the radula.

The formula of a Kilmanock specimen, collected by Major Barrett-Hamilton, is

\[
\frac{2}{5} \cdot \frac{2}{5} + \frac{1}{2} + \frac{1}{2} + \frac{2}{5} \times 100 = 6,100 \text{ teeth.}
\]

**Reproduction and Development.**—Nothing has been hitherto noted in reference to the details of sexual congress in this species, but it is known that this may take place during mild weather throughout the season and may occur even before the maturity of the shell.
The eggs are from 30–40 in number; they are globose, opaque, and white, about 1 mill. in diameter. They are laid from April to September, and hatch in from 20–25 days, and become adult during the second season; the young shell when hatched is flat and has then but a single whorl, which is said to be more than half covered with short and straight red hairs, which become stronger as they approach the lip.

**Food.**—In captivity, *Hygromia hispida* is, according to Dr. Gain, very fastidious in the choice of foods, for out of 192 different kinds offered, they left 124 absolutely untouched, and though only two—beans and the roots of carrot—were voraciously devoured, yet 36 others were eaten quite freely, amongst them being cabbage, turnip, clover, the fruits of gooseberry, strawberry, and raspberries, and the fungi, *Armillaria mellea* and *Russula heterophylla*.

*H. hispida* is one of the pests of moist gardens, and though said to feed on dead plants, also attacks living ones. It has been noticed in Scotland feeding upon reeds, and Dr. Baudon says they are very fond of the gum which exudes from certain trees.

**Habits and Habitat.**—Like most other species, *Hygromia hispida* is naturally nocturnal or crepuscular in its habits, only venturing forth during the day in damp, cloudy, or showery weather, hiding in dry weather amongst moss or beneath stones, logs, dead leaves, rubbish, etc., on roadsides, in shady woods, hedgerows, gardens, and other places, and though chiefly inhabiting the lower grounds, is known to ascend to an altitude of 6,000 feet in the Alps and elsewhere, and the var. *sericea* reaches beyond 8,000 feet in the Valais.

It is very partial to a moist and shady environment, and congregates in nettle-beds, and ivy-covered walls, trees, or hedges, as well as on herbage generally, from which specimens can sometimes be obtained in great numbers by sweeping with an entomological net.

The animal is somewhat sensitive, yet not very active, carrying its shell sometimes almost horizontally, while at other times it may be held nearly vertically or sloping strongly towards the front or the right side.

The degree of hairiness of the shell is also very variable, but the investment is always most dense in immature shells and on those found living amongst nettles and other vegetation in moist places; it has also been remarked that the very hispid form is especially characteristic of beech woods, their dense shade being apparently favourable to the development of the hispid investment, which is correlated with the aspect of the shell, this being always duller in the densely hispid specimens, becoming smoother and brighter in proportion as the hairs are less numerous.

The hairs with which this species is often so richly furnished are frequently covered with muddy particles, and the shell is then easily passed over as a piece of dirt, and Dr. Pilsbry is of opinion that the concealment of the shell by this means is the function of the hispid epidermis.

The adaptive character of *H. hispida* is demonstrated by its ability to exist in the driest as well as in the moistest places, for it has been found abundantly on the North Yorkshire sandhills, and also occurs in very humid situations. Its plasticity of organization enables it to follow on occasion a subhalophilous life; to inhabit dry and sunny calcareous pastures on *Thymus serpyllum* in association with *Helicella itala*; to live amongst *Tanacetum vulgare* on Millstone Grit in company with *Helix*
Hortensis; to share with H. hortensis, H. striolata, and H. granulata the marginal portions of ash and hazel copses; and may even live upon wet rocks on the sea shore, close by high water mark.

It is an almost amphibious species, and resists prolonged immersion, Mr. E. J. Lowe recording that he retained five specimens under water for a fortnight, and only one of the animals succumbed; and Rev. Revett Sheppard states that he frequently found this species some feet below the surface of the water on stakes and piles upon which it ascends and descends at pleasure.

It is a hardy species, one of the very last to retire in winter, and one of the first to reappear in spring, frequently also breaking its hibernation, and wandering about during the milder days in the depth of winter. It is only during severe cold that it burrows in the ground; ordinarily it is content to ensonce among vegetable refuse or within suitable sheltered crevices.

The heart of a Kilmanock specimen, collected by Major Barrett-Hamilton, was observed to contract 24 times per minute at a temperature of 54° Fahr. in April. The average pulse rate of the species may vary from 10 to 15 pulsations per minute in the average temperature of our winter months and reach 70 or 80 in the hot harvest days of August.

Parasites and Enemies.—This species is especially utilised by sparrows as food for their young, and also probably for their own sustenance; and landrails have been found with their crops full of the shells of the species. It is also preyed upon by thrushes, their shells being often found at thrush-stones.

Geological Distribution.—Though the present species is, according to Dr. Fischer, known from deposits of the Miocene period in France and Belgium, yet in this country it has not been discovered below strata of Pliocene age, and has been described as the commonest Helicoid of our Pliocene and Pleistocene deposits, as well as those of Holocene age.

Miocene.—In France, it is recorded by the Abbé Dupuy from the deposits of Sansan, department of Gers.

In Belgium, it is reported by Messrs. Cornet and Rutot from deposits at Mesvin and Mons, Hainault, and by M. Vincent from Veeweyde near Duyssburg.

Pliocene.—Mr. E. W. Harmer, the most recent authority, cites it as found in the Butleyan or Red Crag, Butley, Suffolk.

In the Iceniian Crag it is known from the Norwich zone at Bramerton, Thorpe, Horstead, and Coltishall, Norfolk; as well as at Dunwich, Bulchaamp, and the Old Crag Pit at Yarn Hill, Wrentham, near Southwold, Suffolk.

In the Weybourne zone it is cited for East Runton, North Walsham, and from the freshwater bed at West Runton, Norfolk.

Pleistocene.—In Wiltshire, it is recorded by Dr. Blackmore from the gravels of Milford Hill and the loess of Fisherton-Anger, near Salisbury.

In Sussex, it is recorded from Selsey by Mr. Alfred Bell; and from West Wittering by Mr. J. P. Johnson.

In Kent, it is recorded by Prof. Morris from the freshwater Pleistocene deposits of Charing and Maidstone; by Dr. Sandberger from Crayford; by Rev. R. A. Bullen from a pre-Neolithic stratum at Barton Court, Dover; by Dr. Gwyn Jeffreys from Folkestone; Mr. A. S. Kennard from Haling; Mr. R. B. Woodward from Erith; and by Kennard and Woodward from the Ightham fissure and Swanseomb.

In Essex, Prof. Morris records it from the freshwater marls of Clacton and Grays; and Mr. J. P. Johnson has found it in the Uphall brick-yard, Ilford.

In Middlesex, Mr. W. G. Smith records it from the "Palæolithie floor," Stoke Newington, near Clapton Railway Station; Mr. B. B. Woodward from Brentford; and Kennard and Woodward from a sandy section exposed in the excavation in St. James Square, London.

In Suffolk, Prof. Morris recorded it from the freshwater marls of Stutton.
HYGROMIA HISPIDA.

In Cambridge, Mrs. McKenny Hughes records it from the gravels of Barnwell, Barrington, and Grantchester near Cambridge; and Rev. E. S. Dewick found a fossil specimen of the sinistral form at Barnwell.

In Bedford, it was found by Prof. Prestwich at Biddenham.

In Huntingdon, a large, robust and compact form with a wide umbilicus was found abundantly in the alluvial deposit at Woodston by the Rev. C. E. Y. Kendall who regarded them as undoubtedly the ancestral type of the species.

In Northampton, Kennard and Woodward report it from Apethorpe.

In Penzance, Dr. Falconer found it in Minchin Hole Cave.

In Lincoln South, it is reported by Mr. H. E. Quilter as rare in a pre-glacial deposit at Casewick cutting.

In Derby, Rev. E. H. Mullen has found it in Langwith Cave.

In Lancashire, H. hispida and var. servica Drap. have been found in the "cave earth," Dog Holes, Warton, near Carnforth, by Mr. J. Wilfrid Jackson.

In Yorkshire, Mr. T. Sheppard records it from Bielbecks, near Hornsea.

In Germany, it is recorded by Prof. Hering from the tufts of Streitberg and Ober Zainsbach, Franconia; and by Herr P. Hesse from calcareous tufts and peat at Pyrmont.

Herr Cessin also reports from Bavaria H. hispida var. minor from the Danubian valley; H. hispida and var. minuta var. furcii; and H. hispida, H. concinna, and var. concina var. Jeffr. from the tufts of Regensburg.

In the Lower Pleistocene, Prof. Sandberger records it from Mosbach, Baden; also from Burgtonna, Grafentonna, Mulhausen, and Weimar, Thuringia.

From Lower and Middle Pleistocene, Prof. Sandberger cites it from Achern, Bretten, Bruschal, Durlach, Heidelberg, Maner, Oos, Oberweiler, Steinbach, and Sulzbach, Baden; from Cannstadt and Neckarelz in the Neckar Valley; from Bad Enns, Garbenheim, Limburg, Oppenheim, Weilburg and Wiesbaden in Hesse-Nassau; from Frankenhausen and Sondershausen, Thuringia; from Dresden, Meissen, and Piesa in Saxony; from Passau, Bavaria, as well as from Nidda and Geisnidda in the Niddatal.

In the Upper Pleistocene tuft-beds, Prof. Sandberger reports it from Burgtonna, Grafentonna, Mulhausen, and Weimar, Thuringia.

The Helix terrena of Cessin, which is so very common in the loess of South Germany, is only a slight modification from the type.

In France, according to Dr. Germain, it is one of the most characteristic species of the loess of the Rhône valley and elsewhere, and he cites it from the post-tertiary deposits of Pau-de-Calais; of Menecourt, Somme; of Presle, Ain; of Dauphine; of Toulouse, Haute Garonne; the tuft of Celle, Seine-et-Marne; and St. Pierre-lès-Elbeuf, Seine Inférieure.

M. Laville records it from the Pleistocene gravels of Champigny, Perreux, and Joinville-le-Pont, Seine.

It is also known from the loess of the department of the Rhône at St. Fons, St. Rambert l'Ille Barbe, Chartreux, Collonges, and St. Martin de Fontaines. In Isère in the loess of Bégude, Feyzin; in the Ain, near Tramoyes; and in the lacustrine marls of Gerland near Lyons.

Mr. F. W. Harmer records it from the Limous grès à Succinites of Normandy. The Helix elianta and H. pravus var. Locard are from the quaternary beds of Buisse, Isère, and according to Dr. P. Fischer Helix locatiana and neyronensis of Pagot, H. stenogyna, of Bourg.; and H. clavicornis of Malille, from the quaternary beds of Lyons, are all dismemberments from and referable to H. hispida.

In Austro-Hungary, it is recorded by Prof. Sandberger from Nussdorf near Vienna in valley loess of Lower and Middle Pleistocene age; and by Beyrich from that of Mogyoros near Gran, Hungary.

In Switzerland, Prof. Sandberger quotes it from Aargau in beds of Lower and Middle Pleistocene age; and Dr. Brockmann-Jerosch gives H. sericea Drap. as very common in the loess of the Rhine valley, St. Gall.

In India, it has been found in an interglacial deposit near the river Indus, at Kuardo, in Skardo, Cashmire, by Lieut.-Col. H. H. Godwin-Austen.

HOLOCENE.—In Somersetteshire, Kennard and Woodward report it from an alluvial deposit at Castle Cary.

In Wiltshire, Rev. R. A. Bullen has found it at West Harlington near Salisbury.

In Dorset, Mr. Harold St. George Gray found the sub-var. major commonly under the floor of the Roman arena and in other places during the excavations at Mannbury Rings. Dr. Blackmore has found it at Dewlish; and the Rev. R. A. Bullen at Dudle Barn Door.
In Isle of Wight, Prof. Forbes records it from the lacustrine beds at Totlands Bay; and Kennard and Woodward from St. Catherine's Down.

In Hampshire, Mr. J. T. Kemp found it very rare in the tufa of Test Valley at Mottisfont; also in the Itchen Valley; and Mr. C. Ashford in friable calcareous tufa at Twyford near Winchester.

In Sussex, Mr. J. P. Johnson found it at Brighton; and the Rev. E. S. Dewick at Eastbourne.

In Kent, it is recorded from the brick-earth of Rochester by Mr. J. Wilfrid Jackson; at Cuxton, Seal, Greenhithe, Farleigh, Ladywell, Exelton near Wrott- ham, and Otford, as common in Stanley's Quarry at the base of a grave of Roman-British age, and a single specimen in a deposit on Allen's Farm, Ightham, by Kennard and Woodward; from the base of a rainwash at Darenth by Mr. Kennard; from a deposit of Roman age at Barton Court, Dover, by Rev. R. A. Bullein; from Pegwell Bay by Mr. Alfred Bell; from the excavations at the Crossness Sewage Outfall, and from Erith Marshes by Mr. B. B. Woodward.

In Surrey, Mr. L. E. Adams found it abundantly to a depth of three feet in the Horseshoe Pit, Reigate; Mr. B. B. Woodward records it from Kew; R. H. Chandler from Walton Heath; and Kennard and Warren from Strand street, Bermouisy.

In Essex, Dr. H. Woodward records it from the shell-marl of the reservoir of the East London Waterworks, Walthamstow; Mr. W. M. Webb from deposits at Shalford; Kennard and Woodward from Iford, Copford, Witham, Chignall, Raine, Tilbury, Braintree, and the Lea Valley; Mr. B. B. Woodward from Roxwell; and Mr. J. French from Felstead.

In Herts., Mr. C. Oldham found it common in molehills at Wistone.

In Middlesex, Mr. J. E. Cooper records it from the excavations of the Gas Works, Staines; Kennard and Woodward from a deposit on the Thames bank near that town; they also record it from London Wall, and as the commonest Helicoïd in the deposits at Exbridge; and Mr. B. B. Woodward has recorded it from Blackfriars, Clapton, and the Docks.

In Berkshire, Kennard and Woodward record it from Wallingford and Newbury.

In Oxford, Kennard and Woodward record it from Clifton Hampden, and also from Caversham, and as found by Mr. J. Osborne White in marl on the Thames bank opposite Wargrave.

In Bucks., Mr. A. S. Kennard records it from Maidenhead; and Mr. J. E. Cooper from Boveney in the alluvial brick-earth and from the stratum beneath it, which is characterized as Planorbis stromi.

In Norfolk, Kennard and Woodward record it from the Neolithic flint mines known as "Grimes graves," at Weeting near Brandon.

In Cambridge, Rev. O. Fisher found it in a Romano-British deposit near Butler's Spinney, Harlton.

In Gloucester, Hinton and Kennard tabulate it as found in the deposits on Cleeve Hill, near Prestbury; and Mr. H. Bolton as found at a depth of 44 feet in a deposit on Dumball Island, Avonmouth.

In Hereford, Boycott and Bowell record it as found by Mr. Ballard at Ledbury.

In Staffordshire, it has been recorded by Mr. H. Overton at a depth of four feet in company with the form known as H. liberta Westerlund at the Roman station of Letocetum, at Wall.

In Glamorgan, Mr. Clement Reid records its occurrence at Barry Docks, Cardiff.

In Lincoln, Mr. J. F. Musman found it at a deposit at Greethwell Iron Works.

In Leicestershire, it is recorded by Mr. Horwood from the alluvium exposed by the excavation for gasworks at Aylestone.

In Nottingham, Mr. Musson found it in the black-earth thrown up by moles at Bingham Moor, Gotham Moor, Scarthingmoor, Grassthorpe, and Egmonton; and Mr. Horwood in the alluvium of the River Devon, Vale of Belvoir, also in that of Car Dyke, and River Thirlebeck.

In Lancashire, it is recorded by Dean and Jackson from the shell deposits of Hawes Tarn, Silverdale; and by Mr. J. Wilfrid Jackson from below the foundations of the site of the old Roman fort in Collier street, Manchester.

In Berkshire, Rev. E. Percy Blackburn records it as found by Mr. Mortimer in a "barrow" of "Bronze age" at Birdsall Brow, Driffield; Mr. Tom Petch records it from Hornsea: Dr. H. H. Corbett from an ancient lake-bed near Askern; and Mr. J. Wilfrid Jackson from Great Mitton and Clapham.

In Westmorland, Mr. J. Wilfrid Jackson records it from the deposit at Hale Moss.

In Fife, Dr. T. Scott records it from the deposit near Elie Railway Station.
In Galway, Mr. R. D. Darbishire found it in the old land surface, between layers of blown sand, at Dog’s Bay, Connewara.

In Tipperary, the Rev. A. H. Delap found it in a marl deposit near Clonmel.

In Belgium, it is found abundantly in grey limestone at Orp-le-Grand, Brabant.

In Scandinavia, Dr. Nordmann records it as common in the Holocene of Sweden and Denmark; and Steenberg from the freshwater chalk beds Oxnehjerg, Jutland.

**Variation.**—*Hygromia hispida* varies greatly in size and shape, in the degree of contraction of the umbilicus, and in the density or sparseness of its hispid covering, and has on one or other of these variable characters been split up into quite a number of species; but the necessity for specific names for these forms has never been justified as yet by the demonstration of anatomical differences, and every purpose would be better served for the present by regarding such forms as varietal only, inasmuch as a varietal nomenclature, while emphasising the differences that may exist, keeps prominent the relationship.

As so aptly remarked by the late Mr. Alder, whose judgment was so thoroughly sound in the perception of distinctive characters, “the great difficulty of distinguishing these hispid shells by any permanent character has induced us to consider them all as varieties of the same species, of which *H. concinna* and *H. sericea* Drap. form the two extremes.”

As affecting the shape of the shell, Dr. Germain has declared that the effect of a very humid and relatively cold climate is shown in this species by the slow and very regular coiling of the whorls; while Mr. Searles Wood believed that a marshy habitat induces an elevated form of shell.

The pale peripheral zone is in a general way the only indication of the existence of a former scheme of spiral banding, but M. Picard alludes to a form from Abbeville, France, ascribed to this species, bearing a very narrow brownish band beneath the last whorl.

The degree of hispidity is in inverse ratio to the calcification of the shell and reflects the character of the environment, the very hispid shells usually showing a very feeble development of the apertural rib, and are always proportionately duller in colouring than the depilate forms.

Though isolated instances occur of hispid individuals inhabiting somewhat exposed and arid situations, thus apparently controverting its more general prevalence in shady and moist places in accordance with the principle that dense shade and a certain degree of moisture conduce to the development of a thick epidermal covering with a tendency to its chitinous prolongation into hair-like processes; while aridity and exposure always lead to a reduction in the thickness of the periostracum and the loss of any hirsute adornments, and frequently to several successive formations of the labial rib to the shell during its growth, traces of which are perceptible and persistent throughout after life.

Prof. Lessona has described and figured the Piedmontese varieties *ripularum, vulgaris, trochiformis, hemispharica, subeculata,* and *subplebeia* in the Atti Acc. Scienze di Torino of 1879, but this work has not been available for examination, and it is probable that all the forms indicated could have been appropriately placed under some of the numerous names previously published.

The true position of *Helix sericea* var. *fontainei* Colbeau from the banks of River Dourd, Hainault, is very uncertain, being described as having its affinities with *H. occidentalis* Recluz, and to be quite different from the *H. sericea* of other localities.
The var. *sepulceralorum* of Westerlund from Christiania, Norway, and from an ancient burial-ground near Calmar, Sweden, which he had previously noted as a variety of *H. rafescaenas* and as *H. hispida* var. *montana* Westl., does not appear to differ markedly from the type form.

The *Helix terrena* Clessin is described as differing from the type by its smaller size, more risen spire, and narrower umbilicus, which expands at the last whorl. Four varieties have been described by the author, viz.:—


Fitzinger, studying the group in Austria, distinguished as var. *draparnaudiana* the form described by Draparnaud as typical of the species, and noted its restriction to montane districts; the *H. hispida* of Schrank he named var. *schrankii*, and noted its occurrence about Brigittenau and Prater, and the *H. serica* of Studer and Hartmann he established as var. *studeriiana*, and recorded it as common on the plains.

**VARIATIONS OF FORM OF SHELL.**


Helix hispida var. depressa Pascal, Moll. Haute Loire, 1873, p. 39.


Helix hispida var. calicica Fagot, Mal. Quart. Lyon., 1879, p. 56.


Helix (Fruiticicola) ptonii Loeher, Conch. Franc., 1894, p. 136.

Helix hispida var. plana Steenberg, Danmark Fauna Landsmedlec. 1911, p. 97.


Shell large and widely umbilicated, spire very flat, and whorls regularly enlarging, mouth oval.

The var. *depressula* D. & M., s.s., is described as large, with a very flat or depressed spire, and an open umbilicus.

The sub-var. *depressa* Pascal is described as being as large as the type form, of a pale horny tint; very flat or depressed, and with a very open umbilicus. The var. *depressa* Germain is more depressed. Diam.,10 mill.; alt., 4½ mill.

The sub-var. *decora* is subdepressed, thin, and semitransparent, only slightly hisante, and possessing a rather wide umbilicus.

The sub-var. *calicica* is larger and more depressed than the type; the whors also enlarge more quickly, and the umbilicus is slightly narrower.

The sub-var. *gyrata* has a hispid shell, a flat spire, wide umbilicus, and distinct labial rib. Diam., 10 mill.; alt., 4 mill.

The sub-var. *plana* has a quite flat spire.

The sub-var. *foni* is described as of a reddish-horny tint, sometimes showing a paler peripheral zone; spire only slightly risen. Diam., 7½ mill.; alt. 4½ mill.

The vars. *depressa* and *subdepressa* Germain may be assigned to this form.

The var. *depressula* in Savoy and Isère said to be a mountain form, and in the pine forests ascends to nearly 6,000 feet altitude, the shell becoming flatter and the umbilicus wider as the locality becomes more elevated.

Dumont & Mortillet regard the *Helix celata* Studer as being only a strongly striate form of this variety.

The *H. rafescaenas* var. *ptonii* of Clessin judging chiefly by specimens in my own collection, is certainly not a form of *H. striolata*, but belongs to the present species, where it is also placed by Dr. Westerlund.

**CONTINENTAL DISTRIBUTION.**

Germany—Recorded as fossil by Sandberger from the Lower Pleistocene of Baden at Mosbach, and in deposits of Lower and Upper Pleistocene age at Weimar, Grafentonna, Burgtonna, and Mühlhausen, Thuringia.
In the Lower and Mid Pleistocene beds he cites it from Oberweiler, Sulzburg, Steinbach, and Oss, in Baden; from Oppenheim, Weilburg, and Wiesbaden, in Hesse Nassau; from Frankenhausen and Sondershausen, Thuringia; Priesn, Meissen, and Dresden in Saxony; from Passau, Bavaria; also at Nidda and Geisnidda in the Niddathal.

It is recorded by Herr von Ihering from tufta of Streitberg and Ober Zunabsch, Franconia; and by Hesse from calcareous tufts and peat at Pyrmont.

France—The var. depressa var. sub-var. is recorded by Dumont and Mortillet from Grande Chartreuse and other places in Isère, and from Mont Cenis, etc., in Savoy.

The sub-var. depressa Pascal is recorded by Pascal from Puy, Haute-Loire; and from the environs of Paris; the sub-var. depressa Germain as being quite gregarious about Angers, Maine-et-Loire; and the sub-var. patonii is quoted from the Vosges by Clessin.

The sub-var. fusi is rather common in France, and is specially recorded from about Angers, Maine-et-Loire, by Germain; and from the Meuse by Cardot.

Dr. Germain records it as common in the fossil state in the loess about Lyons; and Jodot from the tufts of Celle-sous-Moret, Seine-et-Marne.

The sub-var. calceata is only known in the fossil state, and is from the quaternary deposits near Lyons.

The sub-var. decora was found on a species of Carex in the Forest of Hez, Oise.

Belgium—The sub-var. patonii reported by Dr. Westerlund; and a "very flat" spired variety is recorded from Grez in Brabant by Raeynaeckers and Locé.

Sweden—The sub-var. gyrata is recorded from Sweden by Dr. Westerlund.

Denmark—The sub-var. plana is recorded from Soro, Zealand, by Steenberg; the sub-var. gyrata is found at Klint, Isle of Moen.


Helix litora Westerlund, Moll. Suece et Norv., 1871, p. 54.


Helix hispida var. subglobulosa Locard, Moll. Lyons, 1877, p. 43.


Helix (Trichia) sericea var. subconica Wattbled, Journ. de Conch., 1889, p. 322.

Helix (Trichia) hispida var. perforata Wattbled, Journ. de Conch., 1889, p. 224.


The var. globulosa D. & M. is described as of an elevated, globose, and nearly trochoid form, with a narrow umbilicus.

The sub-var. subglobulosa of Locard is somewhat globose, clear horny yellow, and varies from 6-7 mill. in diamiters.

The sub-var. conica Baudon is globose in shape, spire conical. Diam. 7 mill.; alt. 5-6 mill. The sub-var. conica Jeffreys is described as shell smaller, spire more raised. The sub-var. conica Clessin has 5-6½ whorls, the last expanded. Diam., 8 mill.; alt., 5 mill.

The sub-var. subconica Watt is small, globose, conoid, whorls quite convex, thin, glossy, and without hairs in the adult, and links the variety with the type.

The sub-var. conoidea Broeck is conoid and very elevated.

The sub-var. liberta is narrowly umbilicate, and sparingly hisrute, or even smooth above. Diam., 6-7 mill.; alt., 4-5 mill. Though in recent years this form has been frequently referred to H. sericea Drap., yet such allocation was especially deprecated by its author Dr. Westerlund.

The sub-var. septentrionalis Clessin is described as possessing a narrower umbilicus and a more elevated spire. Diam., 9 mill.; alt., 4 mill.

The sub-var. falsani is distinguished from the type by its somewhat more globose-elevated form and more distinct sutures.

The sub-var. perforata is relatively smaller and more globose, and is more narrowly umbilicate than the type, of a horny-fawn colour, with a broad whist peripheral band, and is intermediate between H. hispida and H. sericea.

The var. globosa, subglobulosa, and alta Germain also probably belong here.
It is also, according to Searles Wood, the *Helix conica* of Sowerby (Mag. Nat. Hist., vii., p. 429, pl. 2, ff. 4, 5) from the fossiliferous beds of Chetton. Mr. Wood remarking that in marshy places *H. hispida* assumes an elevated form.

**BRITISH ISLES.**

This variety is known from the Channel Isles (according to Messrs. Tomlin and Marquand it is the prevailing form in the Isle of Alderney), Isle of Wight, Sussex, Norfolk, Derby, Nottingham, Lancashire, Yorkshire, and Durham. The sub-var. *conica* was found at Cane Hill, Surrey, by Mr. J. E. Cooper, and is recorded by Dr. Jeffreys from roots of *Rosa spinosissima* on sandhills near Swansea, Wales. In Ireland, Mr. L. E. Adams reports it as common about Coleraine, Loundebury.

**CONTINENTAL DISTRIBUTION.**

**Germany.**—The sub-var. *conica* Clessin is reported from Westphalia by Mr. Gude; the sub-var. *septentrionalis* is known from Pyrmont, Corbach, Cologne, Breidenstein and Sternberg near Lemuco, Lippe Detmohld.

**Belgium.**—The var. *conica* in ditches, Sluys-Kill, Brabant.

**France.**—The var. *globulosa* inhabits the lowland fields and roadsides in Savoy, and does not ascend beyond 1,550 feet; the sub-var. *conica* Band, is very rare, and recorded from the Prairie d’Hautainville, Oise, by M. Baudon; the sub-var. *juliana* is found in the quaternary deposits about Lyons; the sub-var. *perforata* is said by Capt. Wattebled to occur at Auxonne, Côte d’Or, and to be common on the banks of the river Loire in the departments of Jura and Doubs; and the sub-var. *subconica* rare about Auxonne and the wood at Flagey, Côte d’Or.

**Norway.**—Miss Esmark records it from Bygdö near Christiania; and from Eker, Sandefjord, and Manger in the Bergen district.

**Sweden.**—Recorded from Stockholm, Upsala, and Drottningholm; the sub-var. *septentrionalis* from Baltehega, Kinnekulle, and Skane; and sub-var. *liberta* from Lund in Skane.

**Denmark.**—Found throughout the country, according to Dr. Westerlund; and the sub-var. *septentrionalis* from Fredriksdal, and at Aarhus in Jutland.

**Siberia.**—Middendorff’s Siberian specimens are regarded by Clessin as belonging to the var. *septentrionalis*.

**Var. pratensis** Baudon, Cat. Moll. Oise, 1862, p. 23.

*Helix hispida* var. *subangulosa* Sandberger, Vorwelt, 1875. p. 810.


Slightly keeled at the periphery.

The sub-var. *subangulosa* Sandberger, which was not described, may probably be properly placed here.

The sub-var. *milleti* is thin, of a clear fawn or reddish colour, with a slight peripheral keel, most perceptible when young, with short stiff blackish hairs; peristome thickened. Diam., 5–10 mill.; alt., 3–5 mill.

**CONTINENTAL DISTRIBUTION.**

**Germany.**—Dr. Sandberger alludes to a sub-variety *subangulosa* fossilized in the Lower Pleistocene sands of Mosbach, Durlach, and Bruchsal, Baden.

**France.**—Var. *pratensis* in fields, especially at the foot of poplars, near Mouy, Oise (Baudon, l.c.). The sub-var. *milleti* is gregarious about Angers, Maine-et-Loire, on plants by the water, or amongst decayed leaves beneath trees.

**Var. major** Sandberger.

*Helix hispida* var. *major* Sandberger, Vorvelt, 1873, pl. 36, f. 8 a, b, e.

The var. *major* is named and is figured without precise details and without description; the figure shows a shell over 10 mill. in diameter; the line indicating size is certainly quite incorrect.

![Fig. 35.—*H. hispida* var. *major* Sandberger (after Sandberger).](image)

**BRITISH ISLES.**

In England, Mr. L. E. Adams found specimens at Maidenhead, Berks., about 11 mill. diam.
HIGROMIA HISPIDA.

CONTINENTAL DISTRIBUTION.

Germany.—Sandberger cites many localities in the Lower and Middle Pleistocene for this variety, as Heidelberg, Durlach, Bruchsal, etc., in Baden; Frankenhausen and Sandershausen in Thuringia; Priesa and other places in Saxony, etc.

Switzerland.—Sandberger gives as localities the Lower and Middle Pleistocene deposits at Aaragan.

Sweden.—Var. major recorded by Dr. Westerlund.

Var. minor Picard.

Helix hispida var. 7 Draparnaud, Hist. Moll., 1859, p. 104, pl. viii., f. 22.

Helix hispida var. minor Picard, Moll. Sonome, 1840, p. 228.

Helix hispida var. minor Bourguignat, Mal. Alger., 1894, i., p. 169, pl. xvii., ff. 40, 42.

Helix hispida var. minor Sandberger, 1873, Vorwelt, pl. 28, f. 10 a, b, c.

Helix hispida var. nana Jeffreys, Brit. Conch., 1862, i., p. 199.


Shell smaller than type; diameter not exceeding 6 mill. This variety, which is said to have a stronger labial rib in proportion to the reduction in size of its shell, is seldom very hispid.

The var. minor Picard s.s., is described as conoid, very small (5 mill. diam.), rather thick, perforate umbilics, and with a rib or tooth about an millimetre long at the angle of the columnella. The var. minor of Bourguignat is 6-9 mill. in diameter and 4-6 mill. in altitude.

The var. minor Moquin-Tandon has the shell much smaller, more depressed and white, and is identical with the var. 7 Draparnaud. The var. minor of Sandberger is figured, enlarged, and is described as 5½ mill. in diameter and 3½ mill. in altitude. The var. minor of Pfr. is depressed; diam. 6½ mill., alt. 3½ mill. The var. minor Germain of same form, but darker; diam. 5-5½ mill., alt. 3 mill.

The var. nana Jeffreys has the shell much smaller, but with a strong labial rib, spire depressed. Diam., 5 mill.; alt. 2½ mill.

The sub-var. nitida is 5-6 mill. in diam., and 4-4½ mill. in alt., glossy, solid, of a transparent clear fawn, scarcely hispid, and the labial rib visible outwardly.

The sub-var. terrena is small, globose, and somewhat thick-shelled. Diam., 5-3 mill.; alt., 4-5 mill.

The sub-var. tardigua Westl. has a funnel-shaped umbilics, closely coiled whorls, and a labial rib fairly well defined basally. Diam., 6 mill.; alt., 4 mill.

In the British Isles, it is not common; it is, however, plentiful and very characteristic on Afton Down, Freshwater, and Boniface Down, Ventnor, in the Isle of Wight; and has been reported from Wiltshire, Hampshire, Somerset, Sussex, Kent, Norfolk, Gloucester, Glamorgan, Pembroke, Lincoln, Derby, Yorkshire, Westmorland, and Northumberland.

In Scotland, it is recorded from Haddington and Fifeshire.

CONTINENTAL DISTRIBUTION.

Germany.—As a fossil it is recorded by Dr. Sandberger from the Lower and Middle Pleistocene deposits of Germany, at Durlach, Achern, Steinbach, and Oos in Baden; Cannstadt, Neckarelz, etc., in Wurtenburg. Reported by Clessin from "Mid-Germany," and the H. terrena from the older loess of Heidelberg, etc. The sub-var. tardigua from Vegesack by Standinger.

Belgium.—M. Colbeau reports it from Furnes and Nieuport in West Flanders; and from Brussels and Louvain in Brabant.

France.—Recorded by M. Cardot as very rare at Deville, Ardennes; by M. Picard from the Somme; by Mr. Oakeshott for the Alpes Maritimes; by Dr. Jeffreys for Pas-de-Calais; by M. Pascal from Haute Loire and the department of the Seine; by M. Tasté from Morbihan; and by Dr. Germain from Sorges, Maine-et-Loire.

The sub-var. nitida is rare on Allium on the marshy ground in the forest of Fourneau, Mony, Oise (Bandon, i.e.).

Austro-Hungary.—Reported by Dr. Standinger from the Tyrol.

Sandberger records fossil specimens from the Lower Pleistocene of Nussdorf near Vienna, with a tooth-like thickening on the basal margin of the apertural rib.
Norway—Noted by Miss Esmark from the neighbourhood of Christiania.

Sweden—Var. minor recorded by Dr. Westerlund. Sub-var. turdigyna from Othem, Gotland, and Lund in Skane.

Algeria—M. Bourguignat records his var. minor as rare near Mostaghanem, but his range of size includes the typical form.

**VARIATION IN COLOUR OF SHELL.**

**Var. albida** Jeffreys.


*Helix hispida* var. albida Jeffreys, op. cit., p. 199.


Trichia hispida var. *albina* Esmark, Journ. of Conch., 1886, v., p. 120.

**SHELL** white.

The var. *albina* Westerlund is described as hyaline and densely hispid.

The sub-var. *nebulata* is, according to Herr Clessin, a small depressed whitish form, linking the var. *albida* with the type.

The *H. villiersii* de Malzine is regarded by Van den Broec as the albina form.

The *Helix hispida* var. *albida* s.s. of Jeffreys and the *H. hispida* var. *palliata* of Picard, Westerlund and Steenberg, include both white and pale horned shells, and are therefore only partially referable to this form.

**BRITISH ISLES.**

This form is widely dispersed throughout the geographical range of the species, and though usually occurring sporadically, is yet frequently found in colonies almost exclusively consisting of the variety.

Occasionally shells are found which are only partially albina, the earlier growth being usually normal and the later growth becoming suddenly albina.

**CONTINENTAL DISTRIBUTION.**

**Germany**—Found in Georgenthal, Thuringia, by Mr. F. H. Stikes; in Saxony by Schmidt; in Baden by Gysser; and at Rödöngen, Schleswig, by Mr. H. Schlesch.

The sub-var. *nebulata* is recorded from North Germany by Dr. Westerlund.

**Belgium**—The sub-var. *nebulata* recorded by Dr. Westerlund.

**France**—Recorded from around Paris by M. Pascal; the sub-var. *palliata* from the Somme by M. Picard; and sub-var. *nebulata* from France by Dr. Westerlund.

**Switzerland**—Found at Laveyrne by Mr. Hugh Watson.

**Norway**—Miss Esmark records the var. *albina* from Krokkleven and Ringerige, near Christiania.

**Sweden**—The sub-var. *albina* is recorded from near Christianstad, from Skane, and the Island of Oland; and the sub-var. *nebulata* from Kinnekulle by Westerlund.

**Denmark**—Recorded for the Isle of Bornholm by Mr. H. Schlesch; and the sub-var. *nebulata* by Dr. Westerlund from the same island.

**Var. rosea** Broeck.


**SHELL** of a rose-brown colour.

This variety in the original locality is also stated to be strongly pubescent; the shell to be more elevated and fragile and the mouth rounded with a stronger white basal rib than in the type, and hardly showing a trace of the pale peripheral zone.

The *Helix vendana* Letourneaux would appear to be perhaps most suitably placed with this variety, chiefly on account of the vinous tint of its shell, though also agreeing in its pubescent surface and rounded whorls. It is stated to be intermediate between *H. hispida* and *H. cornicina*, and to be moderately abundant in the Bois-Plat near Fontenay, Vendée, France.

**England**—Mr. Tom Petch collected the dark red form at Lynn, Norfolk.

**Ireland**—The same variety is recorded by Messrs. Welch and Stelfox as common on grassy ledges under the cliffs at the coves, Gleniff, and a few at Glenear, Sligo; a similar form was found by Mr. W. F. de Visme Kane at Glen Druid, near Carrickmines, Dublin.

**Belgium**—Var. *rosea* Hastière, Namur, May 1872 (Broeck, l.c.).
HYGROMIA HISPIDA.

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Var. fusca Moquin-Tandon.

_Helix hispida_ var. fusca and cornnea Moquin-Tandon, Hist. Moll., 1855, p. 221.
_Helix (Trichea) sericea var. fusca_ Wattebled, Journ. de Conch., 1889, p. 333.

_SHELL_ of a clear brown or horny tint.

The var. _fusca_ Moq.-Tand., s.s., is described as of a clear brown; the var. _fusca_ Wattebled is thin and of a very dark horny-fawn colour; the var. _fusca_ Westerlund is described as “dark brown.”

The sub-var. _cornnea_ is described as of a pale horn colour.

Westerlund describes _cornnea_ and _fusca_ as never of a rufous-brown colour.

_York S.E._—Var. _fusca_ Moq., Wressle, G. Roberts.

_Lancashire S._—Var. _fusca_ Moq., Read, near Burnley ! R. Standen.


_Cantire_—Var. _fusca_ Moq., Campbeltown, 1888 ! Alex. Shaw.

**CONTINENTAL DISTRIBUTION.**

_France_—Var. _fusca_ Moq. is cited as rather rare about Lyons in the Rhône and Saône valleys by Locard, and by Pascal as occurring in gardens of the Grand Montrognon, Orly, Choisy-le-Roi, Villiers-sur-Marne, etc., in the environs of Paris. The sub-var. _fusca_ Wattebled is common on the ramparts of Aunxonne, Côte d’Or. The sub-var. _cornnea_ is recorded as rare on the mountains of the Bugey and the Colombier, Ain, by Locard; the _fusca_ and sub-var. _cornnea_ from Hérault by Dubrœuil, and by Pascal from Areneil-Cachan and gardens of Grand Montrognon in the environs of Paris.

**VARIATIONS IN CHARACTER OF SHELL.**

Var. albocincta Taylor.

_Shell_ showing a pale and somewhat more heavily calcified peripheral band.

This variety, which is probably atavic, retains the calcified area separating the upper and lower group of bands probably existent in the ancestral form. It is perhaps more frequently found in the more remote or isolated parts of its natural range than in its assumed area of origin, and this is rendered more probable as Prof. E. von Martens, of Berlin, in alluding to the reported occurrence of pale-banded specimens of _H. hispida_, remarked that he knew of no banded _H. hispida_.

In the _British Isles_ it has been recorded from Somerset, Suffolk, Cambridge, Lincolnshire, and Derbyshire in England; Perthshire in Scotland; and Dublin, Meath, Louth, Londonderry, and Kildare in Ireland.

On the _ Continent_ it has also been found by Mr. L. E. Adams at Liban, Courland, Russia; and it is also, according to M. Mortillet, the _Helicella prevostiana_ of Risso, from the Alpes Maritimes, France.

Var. mörchi Westerlund, Fauna Binnencnoch, Suppl., 1890.

_Shell_ spirally lineate beneath.

_Iceland_—In gardens, Thorshannon (Westl., Syn. Moll., 1897, p. 49).

Var. sericea Draparnaud (not Jeffreys).

_Helix hispida_ var. subglobosa Jeffreys, Brit. Conch., 1862, p. 199.

The _sericea_ Draparnaud is described as somewhat globose, subdepressed, clear horn colour and yellowish, thin, transparent, slightly carinate, very lightly striate, clothed with long yellowish recurred hairs. Spike 4½–5 gradually increasing whorls; aperture lunate, higher than broad; peristome simple, or with a very slight internal rib, which is visible through the shell as a yellowish band; the peristome slightly reflected around the very narrow umbilicus.

The sub var. _subglobosa_ Jeffreys is described as more globular, much thinner, born colour or white, and umbilicus very small.

Though _H. sericea_ Drap. is figured by Lehmann as differing from _H. hispida_ in possessing tricuspid median teeth, while those of _H. hispida_ are shown as unicuspid only, yet this assumed difference is probably founded on some error, as British specimens do not show this divergence.
It has long been known that the shell bearing this name abroad is a widely distributed inhabitant of the British Isles, and has also from time to time been published by successive English conchologists as a new discovery and as a member of or an addition to our fauna, but no convincing evidence has as yet been adduced by any of its sponsors to substantiate the distinction claimed for it.

In a fossil state it is recorded from the Pleistocene deposits of Barnwell Abbey, Cambridge; Swanscombe, Kent; and Copford, Essex. It also occurs in the Holocene deposits of Uxbridge and Staines, Middlesex; Wallhampton, Chignall, and Ilford, Essex; Greenhithe in Kent; Westbury in Gloucester; Clifton-Hauplin in Oxfordshire; and Knattishall in Suffolk.

In a recent state it is widely distributed through the continent, and is found in the Balkan peninsula, but precise records are not always available.

**Continental Distribution.**

- **Germany**—Recorded as living in Alsace, Baden, Brandenburg, Holstein, Nassau, Prussia East, Posen, Reuss, Saxony, Silesia, Sambia, Thuringia, and Wurttemberg.
- **France**—Known to occur throughout the country, and has been especially noted from Ain, Aisne, Alpes Maritimes, Ardennes, Aube, Basses Pyrénées, Charente Inférieure, Gart, Girond, Lozère, Morbihan, Nord, Savoy, Seine, Seine-et-Marne, Vienne, Vanelse, and Yonne.
- **Austro-Hungary**—Reported from Austria, Bohemia, Carinthia, Carniola, Galicia, Hungary, Styria, and Tyrol.
- **Switzerland**—Only recorded from Aargau, Appenzell, Basel, Berne, Grisons, Lucerne, Neuchâtel, and Valais.
- **Italy**—Recorded from Lombardy; Piedmont, and Venetia.
- **Spain**—Catalonia, Galicia, and the South Pyrenean slope.
- **Russia**—Known from the Crimea and the Caucasus.
- **Siberia**—Recorded from Irkutsk and the valley of the Anur.
- **North Africa**—Bourgniquat records it from Algeria.


**Shell** globose, narrowly umbilicated, and densely hispíd.

The sub-var. *hispidula* Germain has the hairs particularly numerous, very fine and persistent, having a soft and woolly aspect.

This is the form which was formerly considered as the type of the species, but which is now superseded by Jeffreys' var. *continent*, in accordance with the character of Linne's type shell in the possession of the Linnaean Society.


In the **British Isles** it is widely distributed within the range of the species, but is more especially found in shaly places.

**Continental Distribution.**

- **France**—Sub-var. *hispidula* is recorded as rare about Angers, Maine-et-Loire, by Dr. Germain.
- **Russia**—Known from many points in the Caucasus; also in Western Transcaucasia; and Mr. L. E. Adams found it at Libau in Courland.

**Var. depilata** Alder.


*Helix hispida var. subrustra* Jeffreys, Brit. Conch., 1862, i., p. 190.

**Shell** almost or entirely destitute of epidermal hairs, labial rib developed.

The sub-var. *subrustra* Moq. is described as more solid, smooth and reddish, and the sub-var. *subrubra* Jeffr. as reddish-brown, more solid, with a strong labial rib.

This form, which is probably identical with the *Helix depilata* of Pfeiffer, as was believed by Mr. Alder, was first indicated and described by Draparnaud, and is said by Dr. Jeffreys to be "not uncommon in dry situations."

In the **British Isles** it is widely distributed, and has been reported in England from Cornwall, Devon, Somerset, Dorset, Hampshire, Wiltshire, Sussex, Surrey, Bedford, Leicester, Norfolk, Suffolk, Gloucester, Hereford, Stafford, Northampton, Derby, Nottingham, Lincoln, Cambridge, Cheshire, Leicester, Lancashire, Yorkshire, Westmorland, and Cumberland.
Distribution of *Hygromia hispida* (L.)

In the Counties and Vice-Counties of the British Isles.

**ENGLAND AND WALES.**

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**Probable Range.**

**Recorded Distribution.**

**Distribution verified by the Author.**

**Geological Distribution.**
HYGROMIA HISPIDA.

Wales—Recorded from Pembroke, Merioneth, and Denbigh.
Scotland—Lanark, Renfrew, Main Argyll, Dumfartoon, Perth, and Forfar.
Ireland—Noted from county Leitrim.

CONTINENTAL DISTRIBUTION.

Germany—Found at Triberg by Mr. F. H. Sikes and recorded from Mannheim, Baden, by Mr. Daniel; and from Nassau by Dr. Kohlt. The Helix depilata C. Pfr. is recorded from Cassel and from the Kratzenberge by its author; and by Dr. L. Pfeifer from Heidelberg.

France—Dr. Grateloup cites this form as inhabiting the centre, north, and west of France; M. Cardelet as common in the Ardennes; Dumont and Mortillet for Savoy; Capt. Wattelebed from Côte d’Or; M. Locard from the Ain; de l’Hôpital from Calvados; M. Clement from the Gard; and Mr. E. Collier from the Jura.

The sub-var. subrufa from Morbihan by Tassé; and from Herault by Dubrueil.

Switzerland—M. Charpentier quotes var. depilata from St. Maurice, Valais.

Norway—The var. depilata is recorded from about Christiania by Miss Esmark.

Sweden—Dr. Westerlund records its presence at Lund and Christianstad, Skane.

Denmark—Recorded from Veile, Jutland, by Dr. Westerlund; and by Steenberg from near Copenhagen.

Russia—Helix depilata is cited for Kursk by Kryniki.


Shell reversed in coiling.

ENGLAND.

Cambridge—A specimen is recorded by Dr. Jeffreys as found by Rev. E. S. Dewick in a post-tertiary deposit near Cambridge.

Berwick—A specimen of the openly umbilicated form found by Mrs. Carphin at Coldingham near Eyemouth.

CONTINENTAL DISTRIBUTION.

France—Recorded by Norguet from Avesnes, Nord; by Dr. Baudon from the Prairie de Moineau, near Mont, Oise; and by Locard as very rare in the alluvium of the Rhône to the north of Lyons in the department of the Ain.

Belgium—Recorded by M. Rollieu from the left bank of the Meuse, between Wansfort and Hastière in the province of Namur.


More or less scalariform. Dr. Baudon describes his type specimen as having the first three whorls obliquely inclined to the axis, and almost detached from the fourth whorl, which surmounts but is sharply separated from the body whorl, appearing like two shells of unequal size superposed.

ENGLAND AND WALES.

Kent W.—A characteristic specimen found by Mr. J. Stacey, at Stony Hill Wood, May 1894, is now in the collection of Mr. A. S. Poore.


Cumberland—Ireby, three specimens, April 1910, W. J. Farrer.

Isle of Man—Niarbyl, Aug. 1893, R. Cairns.

CONTINENTAL DISTRIBUTION.

France—Recorded by Moquin-Tandon from Paris; and by Dr. Baudon from Prairie de Moineau, Oise.

Geographical Distribution.—Hygromia hispida is widely dispersed throughout Central Europe, and extends as far as the Ussuri and Amur Valleys in the extreme east of Asia, and has been carried by commerce and become established in North America.

Under the name of Helix sericea Draparana, it is probably more widely known throughout the continent than the typical H. hispida, of which it is a thinner, more globose, more hispid, and more narrowly perforate form. It has been and still is a source of much confusion to systematists, Dr. Jeffreys at one time even considering it as synonymous with the differently organised H. granulata Alder.
In the British Isles it is well diffused over England, Wales, and Ireland, and extends over the southern half of Scotland, but is quite unknown beyond, except that Mr. A. W. Stelfox has reported his discovery of the species at Stromness in the Orkney Islands. Its occurrence there may be regarded as correlated with its presence in Iceland and the Faroes.

**Fig. 42.**—Geographical Distribution of *Hygromia hispida* (Linné).

**Probable Range**  
**Recorded Distribution**

**GERMANY.**


**NETHERLANDS.**

Holland—Known from Friesland, Gelderland, North and South Holland, Limburg, Utrecht, and Zealand.

Belgium—Throughout the kingdom, and records are known for Antwerp, Brabant, Flanders West, Hainault, Liége, Limburg, Luxemburg, Namur, and the Grand Duchy of Luxemburg.

**FRANCE.**

As *H. hispida* it has been generally spoken of as inhabiting all or almost all France, and has been specially noted from Ain, Aisne, Allier, Alpes Maritimes, Ardennes, Ardèche, Ariège, Aube, Auvergne, Aveyron, Basses Alpes, Basses Pyrénées, Bouches-du-Rhône, Calvados, Champagne Meridionale, Charente Inférieure, Cantal, Côte d'Or, Côtes-du-Nord, Drôme, Eure, Eure-et-Loir, Finistère, Gard, Gers, Gironde, Haute Garonne, Haute Loire, Hauute Marne, Hantes Pyrénées, Haute Savoie, Herault, Ille-et-Vilaine, Indre, Indre-et-Loire, Isère, Jura, Landes, Loire Inférieure, Loir et Cher, Lorraine, Maine-et-Loire, Manche, Morbihan, Meuse, Moselle, Nièvre, Nord, Oise, Orne, Pas-de-Calais, Pay-de-Dôme, Pyrénées Orientales, Rhône, Somme-et-Loire, Sarthe, Savoie, Seine, Seine Inférieure, Seine-et-Marne, Seine-et-Oise, Somme, Var, Vaucluse, Vendée, Vienne, Vosges, Yonne, and the Island of Corsica.

**ITALY.**

Recorded by Prof. Lessona from Piedmont; by Adami and Pini from Lombardy; by Strobel from the north slope of the Appenines in Emilia; it is also reported from Venetia and the province of Catanzaro, Calabria, by Mr. G. K. Gude, though not included by Marchioness Paulucci in her Malacological Fauna of Calabria; and specimens labelled "Sicily" are in the University Museum, Manchester.
HYGROMIA HISPIDA.

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SPAIN.

Confined to the north of the country, and recorded from Catalonia, Galicia, and Aragon, by Prof. Hidalgo.

AUSTRO-HUNGARY.

Distributed throughout the empire, being recorded from Austria, Bohemia, Bosnia, Carinthia, Carniola, Croatia, Galicia, Goritz, Hungary, Illyria, Moravia, Silesia, Slavonia, Styria, Tyrol, Transylvania, and Vorarberg.

SWITZERLAND.

Probably found throughout the country, and has been recorded for Appenzell, Aargau, Basel, Berne, Geneva, Grisons, Lucerne, Neuchâtel, Schwyz, Solothurn, St. Gall, Uri, Valais, and Vaud.

BALKAN PENINSULA.

Roumania—Recorded from Brostheni in Moldavia by Clessin.

Servia—Recorded by Moellendorff from Kosljanse Stene.

SCANDINAVIA.

Norway—Very common in places, as about Christiania, Christiansand, and Bergen, but not extending beyond 63\(^{3}\) deg. north lat.

Sweden—Common in the southern provinces, but not extending beyond 60 deg. north lat. It is recorded from Christianstad, Malmuhls, Goteborg, and found also in Jonkoping, Smaland, Varmland, Blekinge, Nerike, Uplandia, Westergotland, Westmanland, etc., also on the Islands of Gothland and Oland.

Denmark—Found throughout the kingdom, and also in the Faroes, the Isle of Bornholm, and Iceland.

RUSSIA.

Probably dispersed over the western, southern, and central parts, extending to 62 deg. north latitude, and has been specifically recorded from Archangel, St. Petersburg, Caucasus, Courland, Esthland, Finland, Kaluga, Kharkov, Kursk, Lithuania, Livland, Moscow, Nijni-Novgorod, Perm, Podolia, Poland, Smolensk, Tartida, Tcherningov, Vladimir, Vologda, and Tiffis in Transcaucasia.

SIBERIAN SUB-REGION.

Siberia—Recorded by Middendorff from Beresov, Tobolsk; and Barnaul, Tomsk; by Maack from Irkutsk; by Gerstfeldt from the Issuri valley; by Mr. G. K. Gide from the Altai Mountains and Aral region; and by Dr. Germain from the Amur.

ASIA MINOR.

Armenia—Recorded by Dr. C. A. Westerland as having been found in Armenia.

NORTH AFRICA.

Algeria—M. Bourguignat records it as rare under stones at foot of trees near Mostinghamem.

ATLANTIC ISLES.

Azores—Recorded by Dr. Gwyn Jeffreys on the authority of Gerstfeldt.

Madeira—Erroneously given by Dr. Jeffreys as Madeiran, owing to his misapprehension of Lowe's Index.

Canary Isles—Found at Las Palmas, Gran Canary, by Capt. W. J. Farrer.

NEARCTIC REGION.

Canada—Recorded by Dr. Pilsbry from Montreal, province of Quebec, and from Halifax, Nova Scotia.

United States—Mr. J. H. Thomson recorded receiving specimens from near Gay Head, on the Island of Martha's Vineyard, Massachusetts, which differed only from European specimens in being "thinner and lighter."

ORIENTAL REGION.

Kashmir—Godwin-Austen found fossil shells in an alluvial deposit of probably interglacial age near the Indus river, at Knardo, in Skardo.
**Hygromia revelata** (Michaud).

1831 *Helix (Helicella) revelata* Michaud, Compl., p. 27, pl. 15, 6, 8.  
1839 — *subviridecens* Bellamy, Nat. Hist. South Devon, p. 418, pl. 18.  
1841 — *subviride* Bellamy, British Association Report.  
1858 *Hygromia revelata* H. and A. Adams, Gen. of Moll., p. 215.  

**HISTORY.** — *Hygromia revelata* (revelata, discovered) was first noticed with certainty by Lieut. André Louis Gaspard Michaud, who in his Supplement to the work of Draparnaud described and figured the species, which is here associated with its distinguished author.

The *Helix revelata* previously mentioned by Ferussac, was apparently neither described nor figured and according to Dr. Gwyn Jeffreys was based upon specimens of *Helix granulata* from Angers and Paris; while Mabille was of opinion that Ferussac's *Helix revelata* was probably a young *Helix incarnata* or *H. striigella*, but M. Michaud was a contemporary of Baron Ferussac, and believed the species of Ferussac to be identical with his own.

Moquin-Tandon regarded his *Helix occidentalis* to be that of Recluz and consequently the same as *H. pontentina* of Morelet, as Recluz never described his species, the name being simply one he suggested to supersede that of *pontentina*, on the ground that Morelet's name did not conform to the accepted rules of nomenclature. Moquin-Tandon also believed his species to be identical with *Helix revelata* Michaud, but he regarded the *H. revelata* of Ferussac and Bourguignat as distinct therefrom.

Dr. L. Germain on the contrary considers the *Helix revelata* of Ferussac and Bourguignat as quite identical with *H. occidentalis* of Moquin-Tandon but as specifically different from both the true *occidentalis* Recluz, and the *Helix revelata* Michaud, referring the latter species to *H. monticaga* Westl., a globose shell with a white peripheral zone bordered on each side with brown. Dr. Germain and other French authors do not, however, appear to be well acquainted with *H. monticaga*, as they ascribe that name to a different form which may well be the *Helix revelata* as usually understood.

Abbé Dupuy who examined many Portuguese specimens of *H. pontentina* received from M. Morelet, is emphatic that they are identical with French specimens of *Helix occidentalis* and M. Morelet himself had not the least doubt that his *Helix pontentina* was quite the same as *Helix revelata* Fér.
The description of *H. occidentalis* given by Dr. L. Pfeiffer and based on specimens in the Cuming collection would seem to refer to *H. ponentima* as described by Morelet or may be allied to or identical with *Helix montivaga* Westh., to which the *H. lisbonensis* Pfr. probably also conforms.

A study of the original figures and description of *Helix ponentima* Morelet leads, however, to the view that possibly two species are confused together, the one to which the figures and the greater part of the description applies being evidently not the British *H. revelata*, but a globose spirally-banded shell with a thick, white and reflected lip, closely related to *H. montivaga*, a species described by Dr. Westerland from specimens he found intermixed with a number of shells sent to him as *H. ponentima* by M. Morelet.


In 1827 Capt. Thomas Brown in his Illustrations of British Conchology described *Vitrina membranacea* based upon specimens found on the Lomond Hills, Fife-shire, and which in the later editions of his work he regarded as identical with *H. revelata*, but authors now more correctly refer it to *H. fusca*.

The honour of adding this species to the British fauna has been very generally accorded to Prof. E. Forbes, who found specimens on the Island of Guernsey, but that honour probably really belongs to Mr. J. C. Bellamy, who found specimens at Mevagissey, in Cornwall, and published under the name of *Helix subvariscens* a description and figure in 1839, and mentions that a Mr. Colley had previously found two dead shells, which he had referred to *Helix subvariscens*, a synonym of *H. fusca* Montagu.

**Diagnosis.**—*Hygromia revelata* differs from *H. hispida* in its smaller size, more globose shape, greenish colour, rounder mouth, and the number and length of the periostracal hairs.

From *H. fusca* it is separated by its smaller shell, the distinctly hairy investment, and the much more open umbilicus.

Internally, it is separated from *H. hispida* by the vestigial dart sacs, the swollen vagina, and the enlarged median part of the penis sheath.

*H. fusca* differs by having only a single dart sac and accessory gland, by the long whip-like flagellum, and by the very elongate spermatheca.

**Original Description.**—*Helix (Helicella) revelata* De Fé., Prod. page 44, no. 273. Coquille: Orbiculaire, presque globulente, légèrement striée, perforée, très-mince et légère, diaphragmée, lui sainle, d'un vert-pâle, hispide, poils rares, courts et jetés irrégulièrement sur l'épiderme: cinq tours convexes, le dernier plus grand relativement aux autres; ouverture ronde; périostome simple et trans- chant; sommet mancanlé, Hantuer 1½ à 2 lignes. Diamètre 3 lignes.

Cette coquille très-voisine de *Helix sericea* Drap, s'en distingue par sa taille plus petite, l'ouverture de son ombilic qui est plus large, par sa couleur plus foncée, son ouverture plus arrondie. Notre espèce est plus transparente, sa spire est moins élevée et sa suture plus profonde; la disposition, le nombre et la longueur de ses poils sert surtout à faire reconnaître l'espèce de Draparmand.

Habite: (les environs de Paris et d'Angers, De Féruassac). Les valons des Alpes. Elle est rare (Mon Cabinet).—Michaud, Complement, 1831, p. 27.
HYGROMIA REVELATA.

Description.—The animal of a Guernsey specimen had a pale translucent yellowish-grey body, becoming darker grey above, the dorsum sparsely covered with irregularly shaped tubercles, which become more rounded on the sides, giving the surface a granular appearance and showing in some lights faint longitudinal lineation, but the transverse rows described by Dr. J. Gwyn Jeffreys were not detected, while the retractors are perceptible through the skin as dark subdorsal bands on each side of the body; the dorsal grooves not distinct and enclosing a row of ill defined elongated tubercles; ommatophores rather thick, moderately long, and elongately bulbous at the end, of a translucent grey, and finely granulated; the lower tentacles are only one-fifth the length of the upper pair, and somewhat enlarged basally. Mantle yellowish-brown or whitish, faintly marbled or spotted with brown.

Shell subglobose in shape, very thin and translucent, usually slightly glossy, of a pale olive-green or greenish-umber colour, with a thick transversely wrinkled epidermis somewhat puckered at the sutures with somewhat irregular and more delicate intermediate striæ; the spiral sculpture is microscopic and formed by a close and beautiful series of distinctly incised striations, which gradually become abruptly undulate towards the umbilical region; and the whole surface is also beset with distantly rooted and erect or somewhat bent whitish hairs arranged in a forwardly directed, sinuous oblique series which cross the lines of growth; whorls 4-½ in number, convex and swollen; spire slightly raised, suture deep; mouth ample, broadly semi-lunar, expanded and forming nearly four-fifths of a circle; peristome scarcely inflected above, slightly thickened and darkly margined, somewhat dilated basally and partially reflected around the narrow umbilicus. Diam., 7 mill.; alt., ½ mill.

Fig. 46. —Periostracum of Hygromia revelata, showing arrangement of the hairs on its surface, after a drawing by Mr. G. Sherriff Tye (highly magnified).
Fig. 47. —Periostracal hairs from the shell of Hygromia revelata, after a drawing by Mr. G. Sherriff Tye (greatly enlarged).
Fig. 48. —Periostracal hairs from the shell of Hygromia revelata, from Guernsey, from a microphotograph by Mr. W. Bagshaw, X 55.

Interiorly, specimens from Guernsey showed a cream-coloured renal organ and a dusky-brown liver or digestive gland, with an indistinct leaden-blue hepatic artery.

The alimentary system possesses a very elongate esophagus and relatively small and compact salivary glands with long slender ducts, showing a notable difference from those of the immature H. occidentalis from Tangiers, which display larger and less compact glands and quite short ducts, differences, however, which may be due to age or may be indicative of deeper divergence.

The reproductive organs show a creamy-white ovotestis, a hermaphroditic duct convolute and thickened below; albumen gland yellowish-white or ochreous-grey; oviduct white and semi-transparent; sperm duct or prostate granulate and of a cream-white colour but variable in its width as in H. granulata; spermatheca oval or pyriform, white when immature, flesh coloured when adult, the slender stem or duct as long as the oviduct, is thickened below, and originates just above the vaginal mucus glands; vagina broad, narrowing below, and in its natural position divided upon itself; vaginal mucus glands nearly a millimetre in length, one on each side, both deeply divided sometimes quite to the base into two opaque cream-coloured branches; the stylophores or dart-sacs are quite vestigial, and represented by two mere nipples when immature, but which are distinctly bifid when mature; penis-sheath very narrow at the base, broadly swollen above; the epiphallus is somewhat fusiform; the flagellum short, thick, subulate; the
RETRACTOR MUSCLE is attached to the epiphallus; vas deferens slender, but thickened at its junction with the penis-sheath. When immature the dart-sacs are

The JAW or mandible is about three-fourths of a millimetre in width; narrow, slightly arcuate, thin, of a fawn or amber colour, except along the cutting edge and the thickened transverse ribs, which are of a blackish brown; there are about twelve fairly distinct transverse or vertical ribs, which extend across the anterior surface, and dentilcate the upper and lower margins, and in the specimen examined appear to be arranged in three groups of about four ribs each, the central group forming an obscurely defined median projection.

The RADULA is of the usual type, and about 1½ millimetres long and three-fourths of a millimetre wide, with about 92 sinuately transverse rows of teeth, with a maximum of about 39 teeth in a row, each row being composed of a symmetrical tricuspidiate somewhat quadrate median tooth, bearing a stout median cutting point or mesocone and two distinct side cusps or ectocones; this central tooth is flanked on each side by about twelve laterals, which are unequally biform, the endocone becoming prominent as an obliquely projecting cutting point; as the margin is more closely approached the ectocone may be duplicate, and the teeth become quadripart, before reverting to the simple unicusp type of the outermost row.

The formula of a specimen from Guernsey collected by Mr. Tomlin is

$7 \frac{7}{3} + \frac{12}{2} + \frac{1}{3} + \frac{12}{2} + \frac{7}{3} \times 92 = 3,588$ teeth.
Reproduction and Development.—Nothing is known of the details of the congress of this species; it is, however, believed to become adult in the autumn, when reproduction takes place. Dr. Brooksbank remarking that in its favourite haunts in West Cornwall the eggs are so abundant in late autumn as to betray the whereabouts of the snail.

Food and Habits.—*H. revelata*, according to the experience of Mr. J. R. le B. Tomlin, is best collected in dry weather, when it may be found at the foot of stones and rocks which are closely edged with short thick grass. After rain it becomes very active, and may be found dotted over the grass and herbage, but is then very difficult to detect.

It is most frequently found near the roots and beneath the foliage of nettles and plants of a tufted and recumbent character, beneath or amongst stones on the tops of cliffs or open downs, but sometimes clustered beneath the shade of the spreading branches of Gorse (*Ulex europaeus*).

It is gregarious, and more especially congregates in hollows on slopes where small pieces of disintegrated rock have slipped from above and become piled together.

It shows, according to Mr. Tomlin, a great partiality for a small fragrant wild thyme which abounds on the cliffs. Mr. Rimmer especially remarked that its favourite food was the leaves and roots of the sorrel (*Rumex acetosella*), about whose roots it congregates in its native resorts, and that in captivity it devoured that plant with apparent relish. Mr. Sikes in Scilly always found it at the roots of small dandelions (*Taraxacum officinale*).

In this country it appears to be restricted to the vicinity of the sea, which does not appear to be the case in less vigorous regions, where *H. occidentalis* may be found far from maritime influences in pine woods, at the foot of old oaks, etc., often buried more or less deeply in the earth, but especially on waste land beneath tufts of *Artemisia campestris*.

In winter and during persistent dry weather it is said to bury itself rather deeply in the earth, and in winter forms a protective epiphragm, which is thick, opaque, and white, and sunk somewhat within the aperture; but for summer aestivation this protective device is usually, though not invariably, thin, glistening, and iridescent, with a small opaque spot, or, according to Dr. Jeffreys, a small round hole opposite the respiratory orifice.

At such times it must be looked for by pulling up tufts of grass and turning over large stones which are sunk in the ground, or by searching among the roots of furze bushes or other shrubs.

Geological Distribution.—Recorded by Mr. A. W. Stelfox in a somewhat ancient Holocene deposit at Whitesand Bay, Cornwall.

Variation.—The known variation of this species is very restricted, although several assumed species have been established which differ but slightly from the type.

Profs. Hidalgo and Pilsbry regard as varieties the *Helix coimbricensis* and *H. nevesiana* Silva. Prof. Hidalgo also adds the *H. martigenopsis* of Servain from Lisbon and Miranda de Ebro, *Helix venetorum*, *Helix villata*, and *Helix platylosia* Bourguignat; whilst Prof. Pilsbry adds *H. martigena* Fér.; but some of these, as *H. martigena* Fér., are probably more closely allied to *H. montivaga* or *H. ponentina*. 
Distribution of *Hygromia revelata* (Mich.)

In the Counties and Vice-Counties

of the British Isles.

**ENGLAND AND WALES.**

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Probable Range.

Recorded Distribution.

Distribution verified by the Author.

Geological Distribution.
HYGROMIA REVELATA.

41

I have, however, carefully collected such information as was available, and whether some of the more distinct forms may eventually be justly separated from *Hygromia revelata* remains to be confirmed by demonstration of structural differences, but the testaceological divergences between the various forms seem to be usually slight.

A variety from Oporto, named by Silva *var. major*, is described as a darker coloured form, with the last whorl somewhat more deflected, and having a diameter of 7½ mill. and an altitude of 4½ mill., but these dimensions do not apparently differ from the size of the type.

Var. *ptilota* Bourguignat.


*Shell* described by M. Bourguignat as small, and depressed in shape, equally convex above and below, thin, translucent, and of a pale, dull greenish-brown colour; apex smooth, of a rich black, without striations or hairs, rather strongly striate, and beset with numerous small and rigid white hairs, which are arranged in series in an inverse direction to the lines of growth, which is incorrectly avowed not to be the case in *Hygromia occidentalis*, in which also the hairs are stated to be longer and more irregularly distributed. Whorls 4, rapidly increasing in size; suture deep; last whorl more dilated and slightly deflected at the mouth, which is roundly lunate; peristome simple and direct, but slightly reflected round the small and narrow umbilicus.

Diam., 5½ mill.; alt., 4 mill.

France—Rather rare in the hedges bordering the road between Vannes and Auray, about three kilometres from the former place, in the department of Morbihan.

Var. *coimbricensis* Silva.


*Shell* globose, depressed, with a blunt spire, thin, greenish horn colour, slightly striated, and beset with very short whitish hairs. Whorls 3½, convex, rapidly increasing in size, the last very large and convex, and gradually descending in front. Aperture rounded, somewhat obliquely oblong. Peristome simple. Umbilicus perforate, and more or less covered by the reflection of the pillar lip. Diam., 6 mill.; alt., 4 mill.

Portugal—Coimbra and Bussaco, province of Beira (Westl., Binnenc., 1889, p. 61).

Var. *nevesiana* Silva.


*Shell* depressed and umbilicated, opaque yellowish olive, with diffuse wrinkled striation, and irregularly covered with short hairs. Whorls 4, convex, rather quickly but irregularly increasing, the last large, very convex beneath, rapidly descending in front and deflected at the aperture; suture very deep. Aperture obliquely rounded and enlarged, but narrow internally. Peristome simple and direct, reflected only above, margins closely convergent. Diam., 6½ mill.; alt., 4 mill.


Var. *platylasia* Bourguignat.


*Shell* very depressed and almost flat, but quite convex beneath, yellowish or greenish horn coloured, beset with small whitish and mostly remnant hairs. Whorls increasing regularly in size, the last not expanded, but gradually descending and strongly deflected at the aperture, which is oblique and moderately rounded with approximating margins. Umbilicus more open than in var. *villula*.

Portugal and Algeria—(Westl., Binnenc., 1889, p. 62).
HYGROMIA REVELATA.

Var. occidentalis Moquin-Tandon.

*Helix occidentalis* Moq.-Tand., Hist. Moll., 1855, p. 221, and pl. 17, f. 10-13, not of Recluz.

The shell as described by Moquin-Tandon differs little from our British *revelata*, and the divergence shown by the anatomical drawings here reproduced may be due to the less rigorously precise methods formerly in vogue, and cannot be cleared up until the anatomy of the various forms has been carefully studied.

**Original Description.**—"COQUILLE subglobulense, assez convexe en dessus et en dessous, à stries longitudinales demi-effacées, fines, inégales; mince, fragile, couverte de poils courts un peu roides, peu luisante, transparente, d'un corne fanve légèrement verdâtre. Spire composée de 4 à 5 tours assez convexes, croissant rapidement; le dernier un peu grand, non carène; suture profonde. OMBILIC petit. OUVERTURE oblique, ronde, un peu échancrée par l'avant-dernier tour. PERISTOME interrompu, sur rifleschi, avec un bourrelet interieur plus ou moins épais, blanc, à bords très rapprochés, très convergents; le colmellaire très arqué, raflechi sur l'ombil. Hauteur 4-6 mill.; diam. 5-5—8 mill."—Moquin-Tandon, op. cit.

The strite of the shell are further noted as "obliques et onduleuses. Poids long de 0.75 mill., grèles, pointues, légèrement courbes, un pen transparents, caunes."

The animal as described by Moquin-Tandon does not differ appreciably from the preceding account of the animal of *Hygromia revelata*.

The animals of the two immature shells sent in Nov. 1887 by Mr. J. H. Ponsonby from Tangiers, had black and dusky bodies, with paler patches and marblings; the fore-mantle was yellowish-white, with a few scattered black specks, rest of mantle silvery-white also speckled with black; foot whitish; kidney whitish; liver or digestive-gland dark sepia-brown.

The alimentary canal of the immature *Helix occidentalis* from Tangiers differs from that of adult *H. revelata* from Guernsey in the comparatively greater development of the salivary glands and the shortness of their ducts, the Guernsey shells having small, compact, secretory masses and very elongated ducts.

The reproductive system of *H. occidentalis* as figured by Moquin-Tandon shows certain differences which if confirmed would probably justify its separation from *H. revelata*. The mucous-glands are described as reduced to two nipples cleft at their summits and in comparison with those of *H. revelata* are figured shorter, thicker, and much more fused together, while there are no traces whatever of the dart-sacs, etc., which are so perceptible in our species. The penis-sheath is quite in harmony with that of *H. revelata*, but the flagellum which in our species is short, thick, and sulculate, is figured by Moquin-Tandon as somewhat regularly cylindrical, and described as short and slightly sulculate, continuing the contracted distal end of the penis-sheath by a somewhat shorter appendix.

The penis-sheath and appendages of the immature specimens sent from Tangiers by Mr. Ponsonby are almost identical with those of *H. revelata*. 
The mandible of *H. occidentalis* is figured by Moquin-Tandon and described as three-fourths of a millimetre in width, strongly arenuate, yellowish, extremities slightly dilated and very blunt, with a dozen feebly indicated, flat, and somewhat mucosal ribs, which bluntly denticulate the concave margin.

The mandible from one of the immature Tangeri specimens is comparatively narrow, and shows twenty or more or less indistinctly defined ribs, which are grouped in assemblages of two, three or more ribs, and somewhat irregularly encrate the cutting margin, but show indications of a blunt median rostrum or beak.

The radula of the immature Tangeri specimen shows a smaller and slenderer form of tooth than the British form, and the marginal teeth are less pectinate, a circumstance which, combined with the immaturity of the animal, does not tend to confirm the identity of the two forms. The count of the teeth is also somewhat different, showing 77 rows and 43 teeth in a row in the widest part.

*Fig. 64.—Representative teeth from the radula of an immature shell of *H. occidentalis*, Tangeri, after a highly magnified microphotograph by Mr. W. Bagshaw.*

**Habits and Habitats.**—According to Moquin-Tandon, *H. occidentalis* is a very slow, sluggish, yet very sensitive animal, living mainly at the foot of trees and beneath bushes. Prof. Nobile remarks that it is rather common amongst plants by walls and on sandy soils, but is difficult to find when adhering to old walls; it, however, frequents damp as well as dry ground, as beneath stones on river banks; it is also found by the shore on walls or in rock-crevices, often in company with *Clausilia* and *Pugia* as at Viano, Foz, and Bon Nova near Leça.

**Geographical Distribution.**—This form, according to M. Bourguignat, is especially abundant in all countries bordering the Atlantic Ocean from Portugal, Spain, and France, to England. He also cites it for the centre of France, around Angers and Paris, and extends its range to Switzerland, Lombardy and the valleys of the Tyrol, as well as noting its reported occurrences in Algeria.

**Var. venetorum** Bourguignat.


Shell depressed, and covered with very short hairs, which are quickly shed. Whorls flattened, but turgid at the sutures, the last long and descending very low. Aperture oblique, with approximating margins. Umbilicus perforate. Diam., 8 mill.; alt., 5 mill.

**France**—(Westerlund, Binnen-Conchyl. 1889, p. 62).

**Portugal**—Povoa de Varzin, Minho (Westl., Binnenc., 1889, p. 62).

**Var. villula** Bourguignat.


Shell depressed and almost flat, densely covered with oblique rows of very long hairs. Whorls convex, very rapidly increasing in size, the last somewhat dilated and gradually descending in front. Aperture relatively very ample. Peristome with margins somewhat convergent and reflected basally around the somewhat open umbilicus. Diameter attaining to 8 mill.

**France** and **Portugal**—(Westl., Binnenc., 1889, p. 62).
Geographical Distribution.—Under the names of *H. revelata* and *H. occidentalis* this species has been reported from almost the entire extent of the European Atlantic littoral, to which regions it was formerly believed to be restricted, but it has now been reported from other and inland districts, and, according to Mr. Gude, its known range, which was formerly the fifth parallel of east longitude is now extended to the fifteenth degree.

It has, however, been also recorded not only from Central but from Eastern Europe, and if these occurrences prove trustworthy they will strengthen the grounds of belief in the decadent character of the species and in the evidences of its expulsion from the chief evolutionary area.

M. Michaud cites the Alpine valleys as habitats, while M. Bourguignat gives its range as central France, Switzerland, Lombardy, and the Tyrol.

Dr. Kobelt believes it to be a southern and comparatively modern species, as no traces of it have ever been found in pre-glacial deposits.

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**Fig. 65. — Geographical Distribution of *H. revelata* + *H. occidentalis* Moq.**

**ENGLAND AND WALES.**

Channel Isles.—In Guernsey it is locally plentiful on the downs of the south coast, and south of Doyle’s Monument. Mr. Tomlin records that it extends to the Goufre, and occurs over the flat ground near Cobo. It was found at St. Peter’s Port by Mr. Dodd; and at Moulin Huet by Mr. E. Collier. Numerous specimens collected on the adjacent island of Lihou by Dr. Lukis are in the British Museum.

In Jersey Mr. Benson in 1847 recorded it from the downs on the cliff near Rozel harbour; Mr. Dodd found it on the walls of Port Regent; and Mr. F. H. Sikes at Corbière, Plémont, and La More on the west coast and in July 1905 on Green Island.

In Sark it is locally plentiful on the south downs. Mr. Sikes found specimens in Creux Valley, July 1905; and Mr. Wynilham at Dxicart Bay in June 1904.

In Herm Messrs. Cooke and Gwatkin record it as local but abundant.

In Alderney Mr. Tomlin records it as rather common on the cliffs.

Cornwall W.—The southern coast of this extreme westerly section of England would seem to be the present metropolis of the species in this country. Mr. W. P. Cooke in 1886 found specimens on the Pendennis peninsula and at Falmouth. Mr. J. R. le R. Tomlin reported its presence in Sept. 1884 at the Lands End, at Kynance Cove, and the Lizard. Mr. J. P. Johnson discovered it on rock ledges “high up” on St. Michael’s Mount; Rev. Canon Horsely found it at Gwiliham, near Portleven, in August 1900. Mr. C. E. Wright collected it in January 1905 from the moss-covered granite walls by Williams’ farm, Rosekastel; and Messrs. Wright and
Adams, along the wall on the cliff-top between St. Leven and Porthcurno. Mr. A. P. Gardiner reports its occurrence at Sennen. Mr. H. C. Huggins discovered it at Porthleven; and Dr. Brook-bank found it plentifully at Marazion, Rosennil, Goldswithney, Monespel, and Nanjizal Bay in Oct. and Nov. 1910.

Scilly Islands—Mr. F. H. Sikes records it from Tresco, Tean, and St. Mary’s.

Cornwall E.—The known localities in this district are not numerous, though the species was first discovered in the British Isles with its limits. Mr. J. C. Bellamy in Oct. 1839 having found specimens near Mevagissey, though examples had previously been collected by a Mr. Colley, who, however, regarded them as *H. fusca*. It has also been collected by Mr. John H. Adams at Lemaun near Looe; reported by Mr. C. Ashford as common in Sept. 1870 beneath furze-bushes on Rame Head near Plymouth and has been found in Whitesand Bay by several observers.

On the north coast it was first found in 1887 by the Rev. A. H. Cooke and the late Mr. S. J. da Costa, at Newquay, on the downs above the cliffs near the sea; and Mr. Howard Fox has found a single shell at St. Columb Minor.

Devon S.—Mr. G. C. Bignell found this species commonly in places about Stonehouse and Plymouth in and before 1876. Mr. G. D. H. Carpenter discovered it on Bolt Tail Cliffs near Kingsbridge; Mr. Penn at Totnes; Mr. George Sich at Brixham; and Mr. Hanley at Torquay. Specimens are in the Exeter Museum collected at Dawlish by the late Mr. E. Parrit, who also found it at Axminster.

Devon N.—Discovered on Lundy Island by Mr. J. R. le B. Tomlin, who found it abundantly on the grassy slopes of the granite cliffs in April 1906.

Somerset N.—One specimen reported as found Aug. 1883 on the cliffs near Lady Bay, Clevedon, by Miss Jessie Hele.

Notts.—Mr. E. J. Lowe recorded finding three specimens of this species in Sept. 1851 among moss and fallen leaves under an oak tree at Stanton-on-the-Wolds.

SCOTLAND.

Fife—Capt. Brown recorded that in 1827 he described as *Vitrina membranacea* specimens of this species from the Lomond Hills, but these are evidently *H. fusca*.

FRANCE.

Apparently chiefly in the western region, and has been recorded from

Basses Pyrénées—Reported from St. Jean-de-Luz by Mr. G. K. Gude.

Charente Inférieure—M. Granger quotes it as most common in the littoral region.


Côtes-du-Nord—Reported from Dinan by Mr. G. K. Gude.

Deux Sèvres—Recorded by Dronet from Niort.

Gironde—Dr. Gasses says it is dispersed over the department, but rarely common, and mentions Arcachon, La Teste, La Hume, Facture, Mios, Salles, Andegeo, Ares, Lège, Piquey, etc., as localities. Dr. Scharff also discovered it at Branne on the River Dordogne.

Indre-et-Loire—Recorded for the department by Michaud and others.

Ille-et-Vilaine—As *H. occidentalis* M. Bourguignat reports it from the sandhills of Cancale, and as well distributed in Brittany.

Isère—Rare in the Alpine Valleys (Gras, Moll. Isère, 1840, p. 32).

Landes—As *H. occidentalis* recorded by Moquin-Tandon from Mont-de-Marsan.

Loire Inférieure—M. Dautzenberg quotes *H. recelata* as present in the Caillaud Collection in Nantes Museum under the name of *H. poenitina*; the localities named by Caillaud under that same name are Nantes, Croisic, Pornic, Nozay, Derval, etc. As *H. occidentalis* M. Bourguignat reports it as common on the coast at St.-Nazaire.

Lot-et-Garonne—Moquin-Tandon records it as *H. occidentalis* from St. Julien-de-Fargnes; and M. Pagot records *H. recelata* from Nérac.

Maine-et-Loire—Reported on the authority of Baron Férussac from Angers by Mr. Michaud, who later recorded it from Boupécan; Abbe Ravaud from the Forest of Combrée; Abbe Bardin from Sainte-Gemmes-sur-Loire; and M. Servain from Petit-Puy near Saumur.

Morbihan—M. Tadé reports its presence at Vannes, Quiberon, Roche-Bernard, Ploermel, and Belle-Île; and M. Bourguignat records *H. ptitota* from near Vannes.

Pas-de-Calais—Recorded for the department by Comn. Caziot.

Seine—Reported by M. Michaud from Paris on the authority of Baron Férussac.

Vendée—Cited by M. Leitournel in 1860 from Fontenay-le-Comte.

ITALY.

Lombardy—M. Bourguignat gives Lombardy as a locality for *H. occidentalis*.
SPAIN.

Andalusia—M. Pallary alludes to the specimens from the south of Spain as being a trifle larger than Moroccan shells.

Asturias—Recorded by Dr. P. Fischer from Asturias and reported from Picos de Europa by Prof. Hidalgo.

Galicia—Recorded by Mr. McAndrew and confirmed by Prof. Hidalgo from Vigo; and by Zapater and Macho as rare about Villagarcia and Santiago.

Navarre—Recorded as H. occidentalis by Martorelli and Paz.

PORTUGAL.

Beira—Prof. Nobre records Helix occidentalis from Aveiro, Aazarara, Buarcos, Bussaco, Cabo Mondego, Coimbra, Condeixa, Figueira, Fonte da Vinha, Granja, Serra do Pilar, Soare, Valongo, and Vila Nova de Gaia, also from Pinheiro da Bemposta on the authority of Ribeiro.

Alemtejo—It is quoted for Estremoz by Prof. Hidalgo; and as H. occidentalis from Evora and Castelo de Vide by Prof. Nobre.

Estremadura—Prof. Nobre records H. occidentalis from Algés, Benfica, Celdas da Reinha, Cnttra, Colores, Leiria, Lisbon, Marvila, Serra da Arrábida, Setabal, and Soure. Dr. G. Servais cites the alluvium of the Tagus; Furtado gives Sabugo; de Sousa records Alfeite, and specimens from Serra de Monsanto and Callariz are in the Museum Bocage; and Mr. Ponsonby found it in open fields about Lisbon.

Minho—Recorded by Prof. Hidalgo from Leça da Palmeira; as H. occidentalis from mossy garden walls in a shady lane on the banks of the R. Douro near Oporto by Mr. J. H. Ponsonby, and by Prof. Nobre from Valença, and Viana do Castelo.

Tras os Montes—Recorded as H. occidentalis by Prof. Nobre from Macedo de Cavaleiros, Miranda. 

SWITZERLAND.

M. Bourguignat cites this country as an undoubted location for H. occidentalis.

AUSTRO-HUNGARY.

Tyrol—Dr. Jeffreys, on the authority of Strobel, quotes the Lower Tyrol as a locality, and Paetel cites the Tyrol.

Lower Austria—Dr. von Martens quotes Parreyss' record of Klosternenberg.

RUSSIA.

Kiev—Dr. Westerlund records that specimens exist in St. Petersburg Museum, collected at Kiev in 1849.

NORTH AFRICA.

Morocco—Djebel Kébir, near Tangiers, found by M. Vaucher. Mr. J. H. Ponsonby has also collected H. occidentalis only under stones on the open scrubby downs near Tangiers.

Algeria—Recorded as H. occidentalis by M. Debeaux from beneath stones in the forest of Boghar, and along the roads to Miliana; and M. Lallemant found a single specimen among Cistus on the dry slopes at Agha near Algiers.

Portrait and Autograph of M. Arthur Morelet, the author of "Mollusques Terrestres et Fluviales de Portugal," wherein is described and figured Helix poncinna, which hitherto has been regarded as a synonym or variety of H. revelata.
Sub-Genus Zenobia Gray.

Hygromia fusca (Montagu).

1823 — subrufescens Miller, Ann. of Philos., vi., p. 379.
1838 — revealed Bouchard-Chantereaux, Moll. Pas de Calais, p. 44.
1850 — (Hygromia) fusca Pfeiffer, Verz., p. 127.
1906 — (Capillifer) fusca Honigmann, Beitr. zur Moll., p. 190.
1843 Zonites fusus Macgill, Moll. Aberdeen, p. 93.

History.—Hygromia fusca (fusca, brown) was added to science and to the British list in 1803 by the famous British zoologist, Colonel George Montagu, with whom the species is herewith associated, and it is with especial pleasure that I am able to give the accompanying authentic portrait and autograph, for which privilege I am indebted to the sympathetic interest of Dr. B. Daydon Jackson, the courteous and learned secretary of the Linnean Society.

This species would seem to be little known on the continent, possibly on account of its being overlooked and neglected as the young stage of some of the larger Helices.

The sub-genus Zenobia is a group instituted by Dr. J. E. Gray in 1821 for H. fusca and other species, but has been widened and altered by later authors to include other species in its scope.

It has been defined as shell conoid, with a perforate umbilicus, and a thin and simple apertural margin, to which should be added to ensure more stability to the group, the more striking features of the internal organs, as the presence of a four-bladed dart—recalling that of Helix pomatia—a single dart sac with a small accessory gland, and well-developed mucus glands.

Dr. Grateloup described a shell as H. aquitanica which he was inclined, and probably correctly, to regard as a variety of H. fusca.

It was characterized by its greenish-amber colour, and was thin, translucent, and glossy; whors were five in number; mouth semilunar; lip simple, sharp, and fragile. Diam., 8 mill.; alt., 5 mill.

Abundant in autumn in gardens and woods, Mont-de-Marsan and Agen.

Diagnosis.—H. fusca differs from H. revelata with which it is most likely to be confounded by its larger size, more depressed spire, and the absence of the greenish shade which is so marked a feature in that species.

Internally, it is easily separated by the presence of a well-developed dart-sac and accessory gland, by the characteristic love-dart, by the peculiar and almost filiform spermatheca, and the long and delicate flagellum.
HYGROMIA FUSCA.

Description.—Animal elongate and varying in colour between a vinous-yellow and blackish or greenish-grey, but darkest anteriorly, and there is no trace of facial grooves; the body is more or less tuberulate; the DORSAL FURROWS are fairly distinct; OMMATOPHORES long and slender: LOWER TENTACLES blunt and short; there are dark subdorsal lines, one on each side the body, which run to near the tips of the tentacles, and are due to the TENTACULAR RETRACTORS being perceptible through the semi-transparent tissues; the MANTLE is marbled or speckled with white and brown.

When crawling, the PULMONARY RETICULE is clearly visible through the pellucid shell and tissues, and extends backwards about half a whorl from the APERTURE up to the long and narrow yellowish RENAL ORGAN; the HEART, which is closely adjacent, clearly displays its responsive pulsations. Beyond the renal organ, the MANTLE is black, finely speckled with yellowish or greyish, the spots increasing in number until the general effect towards the apex of the shell becomes reversed, and shows as yellowish-grey with black spots. The margin of the aperture usually shows a black patch extending along and near to the suture.

Shell subglobose, subconical above, convex beneath; Whorls 4½ to 5 gradually enlarging in size, the last whorl ample and subangulate at the periphery, suture distinct but not deep; shell substance very thin, fragile, and of a deep transparent amber colour, but exceedingly glossy; transverse striæ irregularly plicate or corrugate with intermediate finer growth lines; spiral striae ill-defined and slight, but most perceptible in the umbilical region; aperture obliquely and broadly lunate, outer lip sharp and thin, abruptly inflected above and much reflected basally, partially concealing the very minute umbilical perforation. Diam., 9 mill.; alt., 5½ mill. Epiphragm extremely thin and vitreous.

Dr. J. E. Gray describes the hairy investment as so fine and delicate that the surface is frequently supposed to be without hair. Reeve describes the shell as “minutely hairy,” and the late Mr. G. Sherriff Tye has stated that the hairs are thickly clustered on the surface of the shell, are very short and bent towards the aperture, but are only perceptible under a high magnifying power.

A careful examination of the shell surface with a 1 inch objective shows that the appearance of crowded hairs referred to by Mr. Tye is possibly due to the minute sculpture which, however, lies parallel to and not at right-angles with the growth lines as described by him, and are probably the fine striae referred to by Dr. Gwyn Jeffreys as found on immature shells and which he compared to “hair-cloth.”

Interiorly, the cesophagus and STOMACH are greyish-white; the liver or digestive gland dark brown, sometimes flecked with whitish, the hepatic artery not conspicuous, and the intestinal fold whitish; the KIDNEY or renal organ is almost sagittiform in shape, of a salmon colour, speckled with yellowish-white, and the HEART has the junction of the auricle and ventricle almost filiform.

The REPRODUCTIVE ORGANS show a large and white ovotestis, which has its upper side partly imbedded in the brown or russet liver; the Hermaphrodite duct is dusky-white or cream colour spotted with brown; the ALBUMEN GLAND is of a very pale greenish-yellow; the OVIDUCT ochreous-grey; the PROSTATE or sperm-duct whitish-buff of a granular aspect, and externally wider than the ovibuct in parts; SPERMATHECA narrow, digitate, or lanceolate, of a whitish colour dashed with bluish, and borne on a long and slender stem; PENIS-SHEATH short and
obovate, abruptly flexed and bluish white in colour, with longitudinal white streaks at the narrowing distal end; EPIPHALLUS long, of an uniform thickness and furnished with a retractor about midway of its course; the FLAGELLUM is long and filiform.

The vaginal MUCUS GLANDS are three or four mill. in length, and bluish white in colour, subspatulate vermiform and irregularly tumid; they are usually seven to nine in number, though somewhat variable in this respect, as by bifurcation there may be as many as twelve or even more terminations.

DART-SAC pearly-white, elongately ovate, and fairly bulky, combined with a smaller accessory glandular sac or lobe, which rises a little higher, and fused to the vagina on almost the total length of the gland; the outer sac contains and secretes the dart.

The DART occupies the large outer sac or lobe, is of a subulate shape, about two mill. long, very sharply pointed, the shaft gracefully bent, with four equidistant longitudinal blunt-edged blades, which arise from the expanded base, and gradually diminish towards the apex, quite reminiscent of that of Helix pomatia; the swollen base occupies about one-fourth of the total length of the dart and expands somewhat abruptly from the gently tapering shaft; there is no annulus, but there are usually one or more horizontal encircling grooves.

The JAW is about three-quarters of a millimetre from side to side, of a fawn or deep amber colour, darker in the central area and towards the cutting-edge, of a crescentic shape, with bluntly rounded ends, with twenty to twenty-eight not very prominent ribs which encircle the cutting margin.

Moquin-Tandon describes the jaw as possessing fifteen fine closely-set indentations on the concave cutting margin, and figures it as very broad, with a very wide and obtuse but quite perceptible median rostrum or beak.

The RADULA is of the usual oblong shape, and composed of 95 transverse rows of teeth, with a maximum of about 33 teeth in a row, each row formed by a median

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**Fig. 70.** Dart-sac of *Hygromia fusca* (showing position of the dart within the sac), accessory sac and digitate mucus glands, greatly enlarged.

**Fig. 71.** Reproductive organs of *Hygromia fusca*, greatly enlarged; d.s. dart-sac and accessory gland; f.d. flagellum; m.g.l. mucus-glands; ov. oviduct; p.s. penis-sheath; r. retractor; s.p. spermatheca; s.p.d. sperma duct.

**Fig. 72.** Gyposelium or Love-dart of *Hygromia fusca*, with mid-section of stem, × 12.

**Fig. 73.** Ovotestis imbedded in the digestive gland of an immature *H. fusca*, greatly enlarged.

**Fig. 74.** Jaw of *H. fusca*, (Montagu) highly magnified, from Scarbro, Yorks.
tricuspidate tooth, with a strong central cone, and quite small ectocones; the laterals are about 14 in number, and also tricuspidate, the ectocones being well developed, but the endocones are very feebly represented and gradually diminish in size; the marginals are more or less quadrate in shape, and characterized more especially by the splitting of the mesocones, by a very decided overlapping of their lateral margins and in a lesser degree by the division of the smaller ectocones.

The formula of a Huddersfield specimen collected by Mr. Lister Peace and the radula prepared by Rev. Prof Gwatkin is

\[ \frac{11}{3} + \frac{14}{3} + \frac{14}{3} + \frac{14}{3} \times 95 = 5,035 \text{ teeth.} \]

**Reproduction and Development.** — No observation appears to have been made of the sexual congress of this species, except by Capt. Farrer, who, on Nov. 11th, 1905, observed individuals in conjugation at Bassenthwaite; but the function probably takes place from August till towards the end of the year. The eggs are laid shortly after the congress, and are from 30–50 in number, 1 to 1\(\frac{1}{2}\) mill. in diameter, and globular in form, with a thin, transparent, and opalescent envelope; they hatch in about twenty days, the young becoming adult during the following season.

**Habits and Habitat.** — *Hygroma fusca* is found fairly commonly in districts where it occurs, living upon the sedges bordering the streams in moist or damp woods, and is a habitual climber, especially in the early autumn months, ascending the alder, beech, poplar, hazel, osier, juniper, mountain-ash, and other trees, feeding upon the leaves and clinging to their undersides. It also frequents many plants, especially the great hairy woodrush (*Luzula sylvatica*), the meadow sweet (*Sparaxis alnaria*), campion (*Lychnis dioica*), dog mercury (*Mercurialis perennis*), Iris, *Equisetum*, nettles, sedges, ferns, brambles, etc., and is easily collected by shaking shrubs or the lower branches of trees over an umbrella.

In France, at Mont-de-Marsan, it abounds on the bindweed in the hedges, as well as on the osiers and the marsh-reed.

It is a very hardy species, and in late autumn and winter is remarkably active and more geophils in habit, living amongst the decayed leaves and herbage.

Though evidently feeding on a great variety of plants, Capt. Farrer finds that in the Lake district its favourite food is wild carrot (*Daucus carota*).

M. St. Simon has recorded that he had observed 85 pulsations per minute of the heart of this species, but gives no details of the conditions under which the observation took place.

Mr. Masefield has noticed its marvellous protective resemblance to the decayed seed capsule of the campion (*Lychnis dioica*), the thin shell being the exact colour of the capsule when wet, and the base being of a pale yellow colour exactly resembles a portion of the viscera of the snail as seen through the shell.

**Parasites and Enemies.** — In addition to the usual Helicidian enemies, Mr. Evans has observed that the bank vole (*Ectomys glareolus*) seems particularly fond of this species, as he has found an abundance of broken shells at the entrance of their burrows.

**Geological Distribution.** — Recorded by Dr. Jeffreys as fossil in our Upper Tertiary formation; by Prof. Morris as found in the Mammaliferous Crag, at Stutton, Suffolk; and by M. Laville, in France, from the gravels of Joinville-le-Pont, department of the Seine.

**Variation.** — Only two forms of *H. fusca* have as yet been distinguished, as it is not a species which lends itself to a splitting-up into many forms.
Abbé Dupuy has observed that this species is more especially maritime in habit, and remarked that the finest specimens are always found in the vicinity of the coast, the shells gradually becoming smaller and rarer in proportion as the inhabited district is removed from maritime influence.

The var. alba alluded to in the Journal of Conchology, vol. ix., p. 110, as found at Worth Wood, Ramsor, Staffs., would appear to be an error, but it may be remarked that Colonel Montagu alludes to a "beautifully white and pellucid shell," sent to him from Scotland by Mr. H. Boys, "in every respect like H. fusca except in colour," though Dr. Jeffreys, who made a special examination of the type shells in Montagu's collection now preserved in the Exeter Museum, states that the Scotch specimen above mentioned is really referable to the species now known as H. carttisiana.


Shell pale glassy-green, animal pure white except the tentacular retractors.

Only as yet recorded from few localities.

**ENGLAND.**

Cumberland—Not uncommon with the type form, Park Woods, Bassenthwaite (Farrer, i.e.).

**IRELAND.**

Wicklow—Abundant with type, Powerscourt demesne, Enniskerry, Aug. 1904, P. H. Grierson.
Kerry—Abundant with type on "flags" near Aghadoe, Sept. 1898 (Stubbs and Adams, Irish Nat., 1898, p. 262).

![Fig. 76.—Geographical Distribution of Hygromia fusca (Montagu).](image)

**Geographical Distribution.**—Hygromia fusca, as far as at present recorded, is quite occidental in its range, and is scarcely known from Eastern Europe or elsewhere, probably passed over as the immature state of some of the larger species, so that this apparently limited distribution may be due in some measure to oversight and misapprehension.

This is a striking example of a recessive or retreating species, the recorded and also the verified occurrences showing its apparent absence from the south-eastern counties of England, and its increasing abundance as it recedes from the probable point of entry of superior life. In the north of Scotland it is the most generally distributed of the Hygromiae.
In the British Isles, its distribution is distinctly western and northern, being commonly found over the greater parts of Scotland, Ireland, and Wales, extending as far north as Sutherlandshire.

In England, it appears to be quite absent from East Anglia, and rare for some distance adjacent to that area.

On the Continent, it is only recorded for Belgium, the North and West of France, Spain and Portugal, although Dr. Jeffreys recorded it from Transylvania, but not as a result of his own observations, but on the authority of Bielz.

NETHERLANDS.

Belgium—Tabulated for Belgium by Dr. Hermann Jordan.

FRANCE.

In this country _H. fusca_ has a southerly range, and seems in a large measure submartitime in its resorts. It is known from

**Basses Pyrénées**—Found at Salies-de-Bearn in 1903 by Mr. Hugh Watson.

**Calvados**—Said by M. de l'Hôpital to be somewhat rare about Caen, Colombières, Fouguerolles, forêt de Cerisy, etc.

**Côtes-du-Nord**—Recorded for the department by Mabille.

**Eure**—Found in a beech wood at Évreux in April 1912 by Mr. F. H. Sikes.

**Gers**—Abbe Dupuy and others cite the environs of Auch.

**Gironde**—Reported by M. Fagot.

**Ille-et-Vilaine**—Recorded by M. Desmars.

**Landes**—Recorded by Abbe Dupuy from Dax and Mont-de-Marsan.

**Loire Inférieure**—M. Calland reports it as common in the copse near Nantes; in Brilliant wood from Caen to Paris; and at Saintongue; and Dr. Jeffreys found it at Etretat in the autumn of 1836.

**Lot-et-Garonne**—Reported by M. Fagot from Nérac.

**Nord**—Recorded for the department by M. Norguet.

**Orne**—Quoted by M. Letacq from the marsh at Radon, etc., in the forest of Eonvres, the marshes of Fontenay-les-Sonvets, and the woods of St. Ortaire and Ferté-Macé, etc.

**Pas-de-Calais**—Common about Boulogne-sur-Mer, according to M. Bonchard-Chantemerle, who recorded it as _H. recedula_.

**Sarthe**—Cited by Letacq for the wood of Noé-de-Gesne, Ancyronay; the wood at Champ-Charlot, near Bourg-le-Bocq, etc. Langlois cites the wood of Ferrocelle, etc.

**Somme**—Recorded by M. Norguet as living on _Populus canadensis_ at Abbeville.

**Vendée**—M. Letonneraux reports it as rare at Vouvant, Fontenay-le-Comte.

SPAIN AND PORTUGAL.

M. Fagot reports it as Pyrenean and also as a species of the Spanish littoral, which is also found in Portugal, but this is not confirmed by any other writer.

AUSTRO-HUNGARY.

Recorded by Bielz from Transylvania.

Autograph of Dr. Joh. Christ. Albers, the distinguished German conchologist, and author of "Die Helicen" and other meritorious works on land and freshwater mollusca.
Helicodonta obvoluta (Müller).

1792 — bilabiata Olivi, Zool. Adriatic, p. 177.
1801 Planorbis obvolutus Poiret, Coq. de l'Aisne, p. 89.
1837 Torton obvoluta Beck, Ind. Moll., p. 29.
1837 Goanostoma obvoluta Held. Isis, p. 915.
1842 Polygra obvoluta Gray, Fig. Moll. Anim., pl. 290, f. 13.
1853 Anchiostoma obvolutum Adams, Genera Recent Moll., p. 297.

HISTORY.—Helicodonta obvoluta (obvoluta, rolled up), belongs to the sub-genus Helicodonta of Férussac, which is wholly or partially equivalent to Chilodon and Helicodon Ehrenb., Drepanostoma Porro, Contorta Muhlf., Caracolium Beck, and other groups cited in the synonymy.

With this interesting species I feel great pleasure in associating my esteemed and valued friend, Prof. A. E. Boycott, F.R.S., who has given special attention to this species and authoritatively elucidated many doubtful and important points of its structure, and to whom many of the special illustrations and much of their descriptive matter is due.

Helicodonta, which Dr. Scharff regards as originating in the Lusitanian region, is a group of Mediterranean species in which the shell is characterized by an angulate or rhombic aperture and a depressed spire, and an animal allied in organization to Helicigona and apparently linking together that group and Hygromia; its relationship with the higher groups is shown by the position of the right tentacular retractor which passes between the ε and ϑ organs, as in the true or typical Helices, and its affinity with Helicigona is evidenced by the paired mucus glands and lanceolate love-dart, which, although wholly or partially lost by degeneration in the present species, are still possessed by some of the less dominant Helicodonts, which are now chiefly restricted to the lofty mountain ranges of Central Europe.

This very remarkable phenomenon of the total atrophy of the dart and the partial loss of its accessories by the present species though still retained by H. holoserica, its less dominant and probably more ancient congener, lead us to place less implicit faith in the presence of any particular organ or in any specific detail of the internal bodily structure—save of the sensory or nervous system—as irrefragable evidence of
superiority in dominating power of any species and show that the facts of geographical distribution as proof of dominance must always receive the consideration due to their undeniable importance.

Dr. Germain regards as the ancestral form the *H. bernardi* Michaud, a much smaller shell, of about 3 mill. in diameter, with a more vertical aperture, which replaces *H. obvoluta* in the diluvial clays of Combe-de-Clary, near Hanterive, Drôme.

It was first discovered in this country in Ditcham Wood, Hampshire, and added to the British list in 1831, by Dr. Lindsay, in a communication to the Linnean Society.

**Diagnosis.**—*H. obvoluta* cannot be confused with any other British species, the depressed and somewhat concave spire, and the more or less distinct indications of the apertural denticles preclude possibility of error.

**Internally**, the differences from other British species are equally striking, the degree of degeneracy exhibited by the organs assumed to represent the mucus-glands and dart-sac being amply sufficient to satisfactorily determine the species.

**Description**—The *animal* is slender, of a dark leaden-grey colour, with large and moderately distinct rugae, which do not present any readily perceptible arrangement; *dorsal grooves* distinct, and enclosing a single row of *elongate tubercles*; there is no trace of facial furrows, and a mere indication of *lateral grooves* shown by the paler colouring of the area beneath their position, the tubercles of this paler portion appear of a darker grey against the pale ground colour; the *tail* is narrow and pointed, and does not extend beyond the margin of the shell; *mantle* pale greyish, speckled with a darker shade; *ommatophores* long and slender, semitransparent, and showing the dark *retractors* throughout their length, and giving a darker shade to each side of the back; the *mucus* is colourless and thin, but not very plentiful. The shell is carried almost horizontally, and slightly inclined to the right.

**Shell** discoidal in shape, flat or slightly concave above, convex beneath; *whorls* ½ increasing slowly in size and deflected at the aperture when adult, laterally compressed, but bluntly angulate above, near the suture, which is thus deeply channeled; *epidermis* thick, opaque warm-brown in colour, bearing obliquely undulate strie and beset by a number of smooth, stiff, caducous and slender whitish hairs, furnished with several knobbed excrescences along their length, sometimes bent at the tip, or even almost prone and usually inclined to be recurved or directed in the opposite direction to those of *H. hispida*; they are arranged in oblique rows, which run in an almost opposite direction to the lines of growth, and are borne upon indistinct protuberances, which are said to be arranged somewhat quinquefolia, but do not all support hairs. *Aperture* small and obliquely triangular, inflected above; *outer lip* very thick, reflected, and obscurely toothed within on the basal and palatal margins, of a purplish colour, which, however, is very fugitive and quickly fades on the death of the animal; there is also a distinct constriction or groove behind the lip, especially deeply sunk behind the palatal tooth-like thickening. The *umbilicus* is openly convoluted, almost tubular, and exposing all the internal spire.

*Diam.* 12 mill.; *alt.* 5 mill.

The *reproductive organs* are, according to Moquin-Tandon, thick and white and aggregated in a trifoliate form; the *hermaphrodite duct* is thick and somewhat convolute, but attenuate at each extremity; the *albumen gland* is small, thin, of a yellowish colour, irregularly lobulated and curiously bent over at the tip;
the **VESICULA SEMINALIS** is rather large, the bulb white, and the stalk red with pigment evidently resident in the epithelium; and Andrô says the pedicle shows a longitudinal furrow similar to that shown in a grain of wheat, and the free extremity there is a slightly trilobed glandular body, connected by an excessively thin pedicle from one of the lateral lobes. The **FREE OVIDUCT** is curiously slender and long, and bears high up the small oval **SPERMATHECA** on a long and slender stem. Immediately beneath it is an elongate thin walled blind vermiform sac, slightly swollen at end, destitute of muscle fibres, and fairly full of amorphous white flocculent particles, but there are no large calcareous cells, such as are often found in the genital passages; this is probably a **MUCUS-GLAND**.

Another, but much shorter cecum, quite different in structure, is attached to and opens into the mucous gland before merging into the free oviduct, which is probably a vestigial **DART-SAC**, which has, however, now lost all traces of the crystalline love-dart it formerly possessed, but still retains the thicker walls and a fairly
abundant muscular coat, but no calcareous cells were detected; the vas deferens is slender and generally shows an abrupt and very persistent sigmoid flexure, which is basally attached to the coecum or muscle, before entering the penis-sheath; the retractor is attached to the vas deferens, which thickens before joining to the penis-sheath, and though showing differences of size, etc., there are no apparent differences of structure, and therefore probably there is no epiphallus; the penis-sheath is singularly voluminous, thick, but attenuate above, the vas deferens entering terminally.

In the natural position when the animal is extended, the free oviduct from its commencement to the opening of the dart sac is bent in a sigmoid flexure, the spermatheca duct arising from its highest point; the spermatheca, as is usual, lies against the oviduct, and the musca gland is twisted round the S bend.

The alimentary system shows an excessively long oesophagus, with thick and bulky whitish salivary glands; the oesophagus gradually merges into the crop, which is apparently merely an expansion of it, and combined with the stomach, whose pyloric end is abruptly bent; the gut is of the usual triodontous character, the middle tract being somewhat capacious, and the rectal tract long and slender.

The cephalic retractor shows an elongate central stem, attenuate at its insertion on the columella of the shell, and near the base giving off a muscular strand to the rectum, as well as the penial retractor, which arises from a point about one-third of the length from the distal end, agreeing in this arrangement with the primitive Australian genus Pandia. The two tentacular muscles are given off almost subterminally, they are powerful muscular bands, and each divides to serve the ommatophore, tentacle, and lip of their respective sides; the buccal retractor is formed by the continuation of the main muscle, and just before reaching the buccal bulb it divides, each branch again bifurcating before attachment thereto.

The mandible or jaw is about one mill. from end to end, flatly crescentic in shape, and bluntly rounded extremities, of an amber colour, of rather delicate consistency, with thickened and darker areas most distinct medially and towards the ends, and showing one central and several longitudinally parallel paler lines; there are a somewhat variable number of broad, flat, rather indistinct vertical ribs, which slightly crenulate the lower or cutting margin, but do not extend quite across the jaw.

The radula of the usual oblong shape, and consists of from about 145 to 170 transverse rows of teeth, each row consisting of 71 to 91 teeth, and constituted by a median unicuspid tooth, about 13 or 14 micuspids laterals, and about 28 bicuspids and tricuspid marginals, which at the extreme margins degenerate into simple chitinous bars.

The formula of a Ditcam wood specimen, according to Prof. Boycott, is

\[
\begin{align*}
2.5 & + 4 \text{ to } 5 \times 1.5 \text{ or } 1.4 \times 1 + 1.3 \text{ or } 1.4 \times 1.4 + 1.4 \text{ or } 1.5 + 1.4 \times 160 = 14,240 \text{ teeth.}
\end{align*}
\]

Reproduction and Development — Few observations have been made upon the sexual congress of this species, but Mr. L. Dawes, who has carefully studied this species in confinement, found a pair in the act of conjugation in the early morning of June 27th, 1912; the animals were facing each other, but not in actual contact, except by their intromittent organs, which were united together over the heads of the snails; he also verified that oviposition takes place from May to the end of June, the eggs being white and laid in clusters varying in numbers from 8-20, and
Distribution of Hygromia fusca (Montagu) 

In the Counties and Vice-Counties of the British Isles.

ENGLAND AND WALES.

SCOTLAND.

IRELAND.

Probable Range.

Recorded Distribution.

Distribution verified by the Author.

Geological Distribution.
slightly adherent to each other, though separable by the slightest touch; that they hatch in about a month; and that all the young hatched in captivity after June died, while those hatched earlier in the year and kept under identical conditions survived, full growth being attained in October and November of the following year.

Mr. H. Beeston, from a long acquaintance with the species in its native habitat, thinks that oviposition is continued all through the summer months, as he finds shells in all stages of growth quite late in the autumn and even in their winter quarters when they had only attained about one-third of their normal size, and believes that the eggs are deposited singly or at most two or three together, so that the young unlike those of many other species are not naturally gregarious; Mr. A.W. Stelfox, however, has recorded the finding on May 17th, 1908, of a nest of about a dozen newly-hatched young under a fallen log in the woods on Dunston Beacon.

Mr. Beeston also states that the individuals hatched in spring became adult in October or November, those hatching later attaining full growth in spring after hibernation.

Dr. Gassies records that in France accomplement takes place from May to July, and that the oviposition of about a score very small eggs follows a few days after mating. The eggs are agglutinated together by a colourless mucus; the young emerge in about twenty days; they are when young intensely hirsute with stiff velvety pile, and become adult at the end of November.

Food.—In captivity Miss Hele found the favourite food to be dock (Rumex obtusifolius), but they also fed upon plantain (Plantago major), dandelion (Leontodon taraxacum), and cabbage (Brassica oleracea).

Mr. L. Dawes, who has had considerable experience in rearing this species, found the animals to eat lettuce (Lactuca sativa) greedily, but they also freely feed upon fungi, preferring a thick leathery fungus growing on old logs (Lenzites betulina), and especially a small, soft and watery cup-shaped kind; they also devour very rotten beech wood, or the minute growths thereon.

The late Mr. W. Jeffery kept this species in confinement, supplying them with decayed wood, leaves, and damp moss, on which they appeared to thrive; he was of opinion that when at liberty the food was principally lichens from the stems of trees, and rotten wood.

Mr. Beeston, who has studied this species for twenty years, is strongly of opinion that naturally it does not usually feed on the living leaves of trees or plants, but regards minute lichens, mycetozoa, and fungi as their staple food, to which in dry, hot summer days he adds the damp and dead decaying beech leaves. He also has often observed them collected together devouring the plasmodium of certain species of the Mycetozoa found upon decaying timber lying in contact with fallen leaves or the bare ground, and he especially remarks on their preference for putrifying and deliquescent fungi, particularly Boletus edulis; in such situations specimens may always be found if inhabiting the vicinity. The mycelium of fungi is probably also fed upon.

Habits.—II. obvoluta is said to be rather active, and secretes a good deal of clear slime, and is not easy to find, except when out feeding after rain, or in the evening. In showery weather it may ascend high up the beech trees. In dry weather it retires into the hollows of old decaying
beech stumps, and other hiding places, protected from the wet. Rev. W. A. Shaw says it only seems to come out on very wet days, when it crawls under logs, etc.; at other times it is concealed amongst the "eaked beech leaves or amongst stones." Mr. L. Dawes has observed that in captivity they seem to avoid the light, and after feeding conceal themselves beneath the leaves, and do not emerge from their shelter even at night during strong northerly winds. They are quite timid, and retreat instantly within the shell when touched. Locard says they live in small colonies and are rather common in shady places at different altitudes, but generally at more than 1,000 feet elevation, though it is recorded as having been found at an altitude exceeding 5,000 feet in the Tyrol.

Dr. Lindsay, in recording its occurrence in this country, affirmed its presence only on the north slope of the South Downs, a belief which has in a great measure persisted to the present time; but Mr. Beeston declares that individuals are actually more plentiful and finer on the southern slope.

This species is characteristic of the mountain regions of Central Europe, extending to the Pyrenees, and according to Calcara is found in Sicily; and though in this country practically confined to the calcareous hills of the South Downs is, in other countries, not restricted to any particular geological formation, or to any special environment.

The species still lurks in the recesses of the primeval woodland tracts on the slopes of the downs and in ancient parks, often associated with Clausilia rolphii and C. laminata var. albina, and dead shells are found in spots where repeated search has failed to yield the living animal. Mr. Clement Reid remarks that it is really abundant in all suitable localities in Sussex as far east as the river Arun, usually occurring on a dry calcareous shady soil with a steep slope, and that its rarity is due to the scarcity of ancient woodlands, as it is quite absent from the extensive beech-woods planted a century ago.

\textit{H. obvoluta} is essentially a geophilous and somewhat gregarious species, seldom climbing trees except during showery weather, which is the only time when it comes out freely in the daytime from its retreats amidst the aggregated beech leaves and other places, and crawls freely about. In dry weather it hides within the hollows and crevices of decaying stumps, and usually in places sheltered from excessive wet.

The method of locomotion is often very peculiar; the whole length of the foot not being applied closely to the surface traversed, but touching in three or four places only, the points of contact changing. In this mode of progress the animal raises the fore-part of its body and applies the most anterior part to the surface, forming an arch, which gradually passes by undulatory motion down the body, by the gradual affixing of the fore-part of the foot and a corresponding raising of the hind-part of the arch; the arch thus travels from the head to the tail, the tail being then lifted up and put down as the arch travels down to it.

\textit{Hibernation and Aestivation.}—It is commonly reported to hibernate for a long period, commencing as early as September, but this may be based upon a misconception, as each time the mollusk withdraws within its shell, after feeding, etc., it always secretes the cretaceous epiphragm, which hermetically seals up the mouth, and this everyday occurrence has been adduced as proof of the mollusk being actually in winter quarters.
Mr. Beeston remarks that it is apparently a hardy species, and can withstand a certain amount of cold. The adults tend to be gregarious, and gather together in close proximity in autumn and winter, before retiring to their winter quarters in November or December, according to the rigour of the season, though reappearing in any milder intervals that may occur, the favourite place being heaps of dead leaves and especially the underground crevices amongst the dead and decaying roots of the moss-covered stumps of beech trees, burrowing in such places often to a considerable depth, and not secreting the usual epiphragm, which is always present when hibernation takes place amongst the leaves above the ground. On finally reappearing in the moist days of early spring, the snails climb a few feet up the beech trunks, probably to feed upon the small, soft, succulent lichens which grow in that position.

The epiphragm is thick, white, and calcareous, slightly sunk within the aperture, and therefore reproducing the somewhat trifoliate shape of the aperture, as well as showing one or even two externally concentric lines of growth or secretion. H. obvoluta, unlike the generality of Helices, does not appress and attach the apertures of the shell to the surface upon which it is resting by means of the epiphragm, but very frequently, before sealing up the aperture, secretes in addition to the epiphragm, a filament of mucous rich in lime which emanates from the basal margin of the aperture and is affixed to the surface upon which the creature is resting; this filament varies in size, and may be 5 mill. in length; the attachment to the object rested upon is almost linearly arcuate in shape; it has also a broad basis of attachment to the lower lip, and is quite capable of sustaining the animal and its shell. This habit, which resembles that of certain Clausilia and several operculate species, is interesting, and would also serve to explain the "ball" of H. obvoluta said to have been once found hibernating socially and "stuck together" in a cluster. It is recorded as hibernating at the base of hazel trees, and in hedge banks, amongst dead leaves, and in other convenient places. It is not a close hibernant, but reappears and feeds in any milder intervals.

Geological Distribution.—The former wider range of H. obvoluta in this country is attested by its occurrence in the fossil state in the Pleistocene gravels of the Cam, in which neighbourhood it is quite unknown in the living state.

Though the genus existed in the Miocene age, the earliest record of the present species is from the Pliocene deposits of Italy, but it has not yet been detected below those of Pleistocene age in other countries.

In Quaternary deposits it is known from many places in Central Europe, North Italy, Switzerland, South Germany, the Danubian Valley, etc.

Upper Pliocene.—In Italy, it is recorded by Prof. Sandberger from Castellarquato near Piacenza, Tuscany.

Pleistocene.—In England, Mrs. McKenny Hughes records the finding of one adult and one immature shell in the gravels of Granchester near Cambridge, the specimens being deposited in the Woodwardian Museum.

In Germany, Dr. Böttger records it as present in the old alluvium of Frankfort, Nassau; Dr. Hocken from diluvial sands and calcareous tufa near Bruhoden, Gotha; Dr. von Ihering from diluvial tufa at Ober-Zaunsbach and Streitberg, Francoonia; and by Herr Clessin from the tufa of Regensburg.

In France, Comm. Caziot records its presence in the Alpes Maritimes, in the clays of Villefranche-sur-Mer; in the tufa of Montigny near Vernon; and in the recent stalagmitic deposit near Vence; Manry and Caziot found it in the tufa of Mantega and Magnan; and Mr. G. Neville from the zone of Helix parietana in the
deposits of Rosquebec, and from the bome breccia of Menton. M. Laville records it from the gravels of Joinville-le-Pont, Seine. H. Cardot from the Ardennes at Montey-Notre-Dame; from the section exposed in the railway cutting at Hirson near Wasigny Station, and in a calcareous tufa deposit on the outskirts of the wood of Nendan. Dr. Germain records it from the tufa of Baume d’Hostun, and Buisse, Isère; of Prele, Alpe; and of St. Pierre-les-Esions, Seine Inferieure; from the loess about Lyons, St. Fons, and Irigny, as well as from the marls of Gerland, Rhône.

In Belgium, it is recorded by Locard from the Upper Pleistocene of Hainault.

In Switzerland, it is reported by Dr. Sterki from Cavenne near Thunngen, Canton Schaffhausen.

In Italy, it is present in the glacial clays of Piedmont, according to Pollonera; in the "terra rossa" of Monte Picano, according to Locard; Dr. Pantanelli records it from the post-Pliocene travertin of Siena, Tuscany; and Signor Valentini from the similar deposit at Ascoli-Piceno, Marches.

LOWER PLEISTOCENE.—In Germany, Prof. Sandberger has recorded it as small and very rare in the sands of Mosbach, Baden.

MID. PLEISTOCENE.—In Germany, Sandberger quotes it from calcareous tufa at Cannstadt, Wurttemburg, Burgtonna, and Weimar, Thuringia.

In France, Locard records it from the tufa of Celle-sous-Moret, Seine-et-Marne.

UPPER PLEISTOCENE.—In Germany, Sandberger states its occurrence in the tufa at Weimar, Burgtonna, and Mulhausen, Thuringia, and Cant in Silesia.

HOLOCENE.—In England, Rev. W. A. Shaw found specimens thrown up by the moles from a Holocene deposit two to three feet below the surface on the open treeless down, the nearest trees being the ancient Yews at Kingley Vale near Chichester.

In Germany, Prof. Cockrell reports specimens in the museum of Basel from glacial diluvium of Roman age at Kilbs, Lower Alsace.

In Belgium, Gregoire cites it from the "tourbe" of Ucele-lez-Bruxelles, Brabant.

In France, M. Dolflus records it as common in a deposit of Roman age exposed during an excavation at Lyons-la-Forêt, Eure. The species does not now inhabit the neighbourhood.

In Sweden, Dr. Westerlund records it from a submarine peat-bed at Ystad, Malmöhus; and Ollmer from calcareous tufa at Skultorp, Westergötland.

In Denmark, Dr. Johannsen records it from the freshwater limestone at Free Harbour, Copenhagen; Steenberg from deposits at Korsør, Zealand; and Nordmann from those at Storvaljebringer near Oxnebjerg, Isle of Funen.

Variation.—In the gloomy mountain forests of Switzerland it has been observed by Dr. Hartmann that the shell becomes paler, thinner, and more transparent.

The H. obvoluta var. bosiaca Bottger and H. obvoluta var. edentula West. seem equally referable to the typical form as understood on the continent and as figured herein after Prof. Sandberger.

The British specimens incline more or less distinctly to the toothed form, var. dentata, but this peculiarity is not often strongly developed.

Var. albina Taylor, var. nov.

SHELL white.

CONTINENTAL DISTRIBUTION.

Germany—Recorded as numerons at Poleseina, Franchise, by Clessin, who also records colonies all albina found on heaps of loose stones in the 'Muschelkalk' region near Oeheenfurth, Bavaria; and Gysser records it from Carlsnhe, Baden.

Belgium—One specimen found in June 1872 at Haute, Namur, by M. van den Broeck apparently link the present form with the var. pedilata, the shell being quite transparent, the peristome of brilliant porcelain-white, and the hairs quite colourless. The muschel was not albina, but very pale.

France—Recorded from Alsace by Prof. von Martens on the authority of Dr. Muhlenbeck.

Shell thinner, more transparent, and of yellowish-rufoius colour, with a more velvety surface.

The shells from Provence described by Dupuy as thinner, nearly pellucid, and of a velvety aspect, owing to the more numerous and more recumbent hairs, would appear to belong to this variety, and are probably the form he discriminated as var. pyrenatica.

**CONTINENTAL DISTRIBUTION.**

France—Rather common in Haute Loire according to Pascal; Locard cites it as rare about Lyons, Rhône, and as rather rare at Haut-Bugey, Hanteville, Ain.

Var. dentata Clessin, Exc. Moll. Fana, 1884, p. 133.


The apertural projections more distinct and prominent.

The sub-var. *blancti*, of which *H. spinelliana* is a synonym, "differs from typical *obvoluta* in the more distinctly trilobed aperture, which is more outwardly prolonged at its lower external angle, by the basal margin being more strongly calcified internally and nearly concave externally, and also by the deeper external depressions at the termination of the last whorl corresponding to the two apertural teeth." The most striking peculiarity is perhaps the somewhat rectangular callousity or denticle on the convex inner basal margin.

**Fig. 90.**

**Fig. 91.**

**Fig. 90.—** *H. obvoluta* sub-var. *blancti* Pollonera, from Bassano, Venetia, slightly reduced.

**Fig. 91.—** *H. obvoluta* var. *dentata* Held, from Weimar (after Sandberger).

**Hants. S.—Var. dentata,** DITCHAM Wood near Petersfield (C. S. Coles).

**CONTINENTAL DISTRIBUTION.**

**Germany**—Recorded from NASSAN and PAPPENHEIM, Wurzburg, and EICHSTADT, Bavaria, by KOBELT and SANDberger; by BÖTTGER from CLAUSWALD and the ruins of Bodenlaushe, Kissingen, FRANCEONIA; and by SANDberger from the SNABIAN ALPS.

SANDberger records and figures it from Weimar in calcareous Tufa of Upper PIESTOCENE age.

**Italy**—Prof. POLLONERA reports sub-var. *blancti*, Piedmont; Bassano and Schio, Venetia; and Arona, Lombardy.


**Var. major** Locard, Moll. Ain, 1881, p. 35.

Shell larger.

The var. **major** s.s. is described as "shell of large size and of a paler colour."

**Hants. S.—** Mr. H. BEESTON has found a specimen in DITCHAM Wood, 14 mill. in diameter.

**CONTINENTAL DISTRIBUTION.**

**France**—Locard records this variety as rather common at Miribel, Ain; and WATTENBLED from Bois de Ternant and Bois St. Jean-de-Benf, Côte d'OR.

M. Charpentier has observed that the shells from Provence attain a larger size than those living in the north.

**Switzerland**—Specimens 13 mill. in diameter from Balstal, Canton Basel, are recorded by BOLLINGER.

**Var. parvula** Hartmann, Gaster. Schweiz., 1840, p. 16.

*Helix obvoluta* var. **minor** Locard, Moll. Ain, 1881, p. 35.

Shell smaller; 8 mill. in diameter and 4 mill. in altitude.

The sub-var. **minor** Locard is described as "shell small, less than 10 mill. diam., of a darker colour, with close and rather long hairs." The sub-var. **minor** of Caziot as 10 mill. in diameter and 4½ mill. in altitude.
Dr. Hartmann states that in Sturm’s Fauna he named the dwarf form *Helix parvida*, but apparently did not describe it. **CONTINENTAL DISTRIBUTION.**

**Germany.** Dr. Hartmann records his var. *parvida* from Neuwied, Rhenish Prussia; and Dr. Sandberger records “small” specimens as very rare in the Lower Pleistocene sands of Modbach, Baden.

**Belgium.**—Extremely small shells recorded by Rollicen from Dinant, Namur.

**France.**—Recorded by Lecard from the mountains of Parves near Belley, Ain; by Wattebled from Bois de Ternant and Bois St. Jean-de-Boeuf, Côte d’Or; and by Comm. Caziot from the Alpes Maritimes at the Col des Quatre Chemins near Nice, from beneath pine trees at Cannes, and on the road to Pegomas.

**Switzerland.**—Dr. Hartmann has found his var. *parvida* at St. Gallen and St. Gallencappel; Bollinger recorded specimens 9 mill. in diameter from Allschwiler Wald, Canton Basel; Prof. Studer discovered it near Berne, and Comm. Caziot records specimens from the same place 9 mill. in diameter and 4½ mill. in altitude.


*Shell reversed.* The only known shell, which is now in the collection of Mr. J. R. le B. Tomlin, was purchased many years ago by Mr. W. H. Heathcote, of Preston, at a sale of shells at Messrs. Stevens’ Auction Rooms, London. The shell is not quite mature, has about 5½ whorls, and has not formed the adult aperture.

It is stated to have been found in Ditcham Wood, Hampshire.

**Monstr. scalare** Grateloup, Cat., p. 54, 1855.

*Whorls more or less dislocated.* **CONTINENTAL DISTRIBUTION.**

**France.**—Recorded from North France by Dr. Grateloup.

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**Geographical Distribution.**—Dispersed throughout Middle and Southern Europe, in moist and cool places, and usually though not invariably in mountain regions, but is most plentiful in the south, but according to Comm. Caziot never found in the immediate vicinity of the sea.

In England it occurs only on the South Downs of Sussex and Hampshire, and is apparently curiously restricted to an area about forty miles in length and six miles in width. It has also been recorded from Kent, but this record appears to have been due to error or oversight.
HELICODONTA OBVOLUTA.

Hants. S.—First recorded as a British species in 1831 by Dr. James Lindsay who during May 1830 found specimens in Ditcham Wood near Buriton, where it is still fairly common. Dr. Gwyn Jeffreys has, however, placed on record that he had previously received a specimen from Mr. G. B. Sowerby, collected at the same place. Miscombe Hangar near Harting, C. E. Wright. Crabbe Wood, Winchester, Sept. 1885—Thomas Rogers.


On the southern escarpment of the South Downs, W. Jeffery recorded it from Woodend and Kingley Vale near Chichester, but the Rev. W. A. Shaw believes that only dead shells were found, and that they were probably fossil and washed from the Post Pliocene deposits of the neighbourhood in which H. obvoluta is found.

On the east side of the Arun, Mr. W. Borrer is recorded as having found it at Spring Head near Storrington.

Surrey.—Several dead shells were found from time to time by the late Mr. S. J. da Costa in widely separated spots in the beech woods of Norbury Park near Box Hill, and as the Dorking line of Downs is quite distinct from the Buriton-Duncton range, its occurrence there in a living state would be interesting. The Druids’ Grove, Dorking, where other dead specimens were found by Mr. Kenneth McKeen, is really a part of Norbury Park, but consists mostly of yew trees.

GERMANY.

Distributed mainly in the west and south of the empire, and specially noted as existing in Alsace, Baden, Bavaria, Bremen, Coburg, Darmstadt, Franconia, Gotha, Hanover, Holstein, Hesse-Cassel, Lauenberg, Lippe, Lorraine, Magdeburg, Merseburg, Nassau, Pymont, Reuss, Rhenish Prussia, Saxony, Schleswig, Silesia, Suabia, Thuringia, Weimar, Westphalia, and Wurttemburg.

NETHERLANDS.

Belgium.—Probably found throughout the country, and has been reported from Brabant, Hainault, Liege, Limburg, Namur, Luxemburg, and Grand Duchy of Luxemburg.

FRANCE.


ITALY.

Distributed throughout the peninsula, but chiefly restricted to the southern slope of the Alps, and to the upper zone of the Appenines; and found in Abruzzi, Calabria, Campania, Emilia, Liguria, Lombardy, Marches, Piedmont, Romana, Tuscany, Umbria, Venetia, and the Island of Sicily.
HELCODONTA OBVOLUTA.

IBERIAN PENINSULA.
Spain—Recorded by Fagot, Giaells, and also by Zulueta from Catalonia.
Portugal—Comm. Caziot records it as indicated for Portugal in Musée Martorell, but remarks that the record may be erroneous; it is, however, also given as Portuguese by Locard, Sandberger, and others.

AUSTRO-HUNGARY.
Ranging through the empire and existing in Upper and Lower Austria, Bohemia, Bosnia, Carinthia, Carniola, Croatia, Dalmatia, Galicia, Goritz, Hungary, Moravia, Transylvania, Tyrol, and Vorarlberg.

SWITZERLAND.
Probably ranging over the whole country, but actually known from Aargau, Appenzell, Basel, Berne, Geneva, Grisons, Lucerne, Neuchatel, Schaffhausen, St. Gall, Schwyz, Solothurn, Ticino, Unterwalden, Uri, Valais, Vaud, and Zurich.

DENMARK.
Reported by Dr. Westerlund from the Island of Aero.

Beech Horse, in Bitcham Wood, near Bitcham House, on the south slope of South Downs, Hants., a rich locality for H. obvoluta. The photo shows Mr. H. Beeston, who has so thoroughly studied this species, holding a dead fallen beech branch on which are several H. obvoluta.
Opinions of Eminent Scientific Men.

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OF THE
BRITISH ISLES.

JOHN W. TAYLOR, M.Sc.

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Ashfordia granulata (Alder) × ½.
Ashley Down, Bristol, Miss F. M. Hele.

J. W. Taylor, del. ac nat.  
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HYGROMIA UMBROSA (Partsch).

HISTORY.—Hygromia umbrosa (umbrosa, living in shady places), was first discovered by Herr Ziegler, who collected numerous specimens in Austria, especially on the islands in the R. Danube near Vienna. The name was applied by Partsch in the Mus. Cesar. Vindob. and adopted by Carl Pfeiffer, in his classical work on the German Mollusca.

It was first found in the British Isles in a living state by Mr. J. C. Dacie, of London, a devoted student of the Littorinidae, who, when spending a holiday at Margate, in East Kent, found several specimens associated with Hygromia striolata and other species in the immediate vicinity of that place. I feel a pleasure in associating this species with its discoverer in this country.

Mr. Dacie was at first inclined to regard the shells as a somewhat peculiar variety or form of H. striolata, and as such exhibited them at a meeting of the London branch of the Conchological Society; the members present were, however, so much impressed with the peculiarities presented by the shells that Mr. Dacie was requested to send them to me for examination.

On communicating my opinion of its identity to Mr. Dacie, he paid a special visit to the spot, at the earliest possible moment, to endeavour to obtain living examples for the examination of the animal and its internal organization; but in this, owing perhaps to the lateness of the season and possibly not very favourable weather, he was unsuccessful.

A prior record exists of its discovery in a fossil state in the Pleistocene deposits within the Ightham fissure, West Kent, but this record was made in error.

This species is stated to be H. rugosinscula of Sabatier, not Michaud, and was, according to Dr. Pfeiffer, regarded as H. concinna var. a of Jeffreys by Beck.

In referring this species to the sub-genus Trichia Hartm., I have in the absence of practically all knowledge of its internal structure, adopted the classification approved by Prof. v. Martens and other esteemed authorities.

Diagnosis.—H. umbrosa may be distinguished from H. striolata, with which it is most likely to be confounded, by its thin semi-translucent shell, granulate sculpture, wide umbilicus, and very oblique aperture, with reflected and practically approximating margins.

30.7.17
HYGROMIA UMBROSA.

Internally, little is known of its structure, but while \textit{H. striolata} always possesses a pair of gypsobela or love-darts, the present species has never more than one, which is described as straight and pointed, of a conical shape, and longer than that of \textit{Eubota fruticium}.

**Description of Animal.**—Biels describes the animal as yellowish-grey, with darker head and dorsum; mantle beset with black spots.

**Description of Shell.**—Shell depressed, spire only slightly elevated; whorls 5½, slowly increasing in size, the last gradually but considerably deflected as it approaches the aperture, and thus bringing about an approximation of the mouth margins; greenish, corneous, or reddish in colour, thin shelled and translucent.

![Fig. 95. Hygromia umbrosa Pilsch, x 2. Margate, Kent. Mr. J. C. Dacie.](image)

![Fig. 96. Highly magnified shell sculpture of \textit{H. umbrosa}, from photograph by Mr. W. Bagshaw.](image)

with a blunt, though perceptible carination, and showing a fine, rounded striation. It is also delicately but distinctly granulate in interrupted, wavy, oblique series, which are directed in an opposite direction to and cross the lines of growth, while Merkel says it is sparsely clothed with delicate hairs. Aperture very oblique, with expanded margins, and sometimes showing a delicate and slender submarginal rib. Umbilicus very wide and deep. Diam., 11 mill.; alt., 5 mill.

**Geological Distribution**—\textit{Hygromia umbrosa} has not yet been found in any deposit older than Pleistocene.

**Pleistocene.**—In the British Isles, Messrs. Kennard and Woodward have recorded that Mr. W. J. L. Abbott found four specimens, two of which were immature, in the celebrated fissure at Ightham, Kent, but the record was afterwards found to be erroneous.

In Germany, Prof. Sandberger has recorded its presence in the Mid-Pleistocene tufa deposits of Weimar, and the valley loess of Leuben near Lommatsch, and Bobshutz near Dresden, Saxony, also in tufa at Weimar, from which latter place it also records it from Upper Pleistocene deposits.

**Variation.**—Rossnässler has named a var. minor of this species, and I have distinguished by the name \textit{rubra} the "beautiful reddish variety" described by Dr. L. Pfeiffer.

I have also followed Dr. Westerlund in regarding several species described by Dr. Servain as probably local forms of \textit{H. umbrosa}.

Dr. Slavik remarks that Bohemian specimens are smaller than those from more southerly countries.

**Variation in Form of Shell.**

\textbf{Var. aporata} (Bourguignat ms. 1879) Servain.


Shell more narrowly umbilicated, spire more depressed, whorls somewhat more rapidly increasing, the last comparatively large, aperture almost spherical, abruptly and strikingly deflected, and the margins very convergent. Diam., 12-13 mill.; alt., 6½ mill.

Dr. Servain states this form was originally sent to M. Bourguignat from Agram, Croatia, as \textit{H. eujoveci}.

**Austro-Hungary**—Agram, Croatia, and Sarajevo, Bosnia (Westerlund, l.c.).
Var. oecoscia (Bourguignat ms. 1879) Servain.


Umbilicus very wide and funnel-shaped, whorls small, cylindrical, and almost subcarinate; aperture small, almost circular, margins almost continuous, thin, and expanded.

According to Dr. Servain, the Croatian specimens have been erroneously referred to _H. erjaveri_, and the Polish shells to _H. striolata_ by various observers.

**- Austro-Hungary—Agram, Croatia (Servain, l.c.).**

**- Russia—Ojecow, Poland (Westerlund, Palaeont Moll., 1889, p. 44).**

Var. umbrosella (Jousseaume ms. 1883) Servain.


Shell more depressed, umbilicus wider, aperture less oblique, less deflected, but relatively larger, and its margins stronger and more expanded.

This form was discovered in 1883 by Dr. Jousseaume, who provisionally gave it in ms. the name it now bears.

**- Austro-Hungary—Banks of the river Salzach, Salzburg (Servain, l.c.).**

Var. amela (Bourguignat ms. 1879) Servain.


Shell more depressed but scarcely so large as var. _oecoscia_, umbilicus excessively dilated (4 mill. wide), whorls 6, subangular, very small and vermiform, slowly increasing in size and compactly coiled, the last not large, with a very slight deflection at the aperture, which is of an oblong shape with a thin peristome uniformly expanded and almost continuous.

This is said to be an extreme form of the var. _oecoscia_, and is remarkable for its very narrow and closely coiled vermiform whors.

**- Austro-Hungary—Carinthia (Westerlund, l.c.).**

Var. sciraia (Bourguignat ms. 1879) Servain.


Shell larger than _H. umbrosa_, with a more open umbilicus, and whors more rapidly increasing in size, and remarkable for the slow and gradual deflection of the last whorl, the deflection originating half a whorl from the aperture, which is almost circular, the peristome is direct, and only slightly reflected basally.

The shell figured as _H. umbrosa_ by Rossmaessler in his Iconographie, fig. 424, to a certain extent represents this form in its size and contour.

**- Austro-Hungary—Croatia.**

Var. minor Rossmaessler.

Shell smaller, paler, with a narrow umbilicus.

This, according to Prof. Brusina, is the most common form in Croatia; it is smaller than the type, darker in colour, with a less reflected peristome, and said to serve as a passage to _H. hispida_.

The var. _minor_ Brusina, according to Dr. Servain, does not, however, appertain to _H. umbrosa_, but to the group of _H. circinata_, and is the _Helix mabara_ of Bourguignat.

**- Austro-Hungary—Croatia.**

CONTINENTAL DISTRIBUTION.

**- Austro-Hungary—Recorded by Gallenstein as plentiful in the garden of the Benedictine College, Klagenfurt, Carinthia; by Prof. Brusina from Styria, and from the banks of the Save and Una, Croatia; and by Rossmaessler from Tharand, Saxony, and from Gunzburg, Saubia.**

**VARIATION IN COLOUR OF SHELL.**

Var. rubra Taylor var. nov.

Shell of a "beautiful reddish" colour.

**- Austro-Hungary—Recorded by Dr. L. Pfeiffer from the Monchberg, Salzburg.**
Geographical Distribution.—*H. umbrosa* is another illustration of the expulsion of a subdominant or weaker species from an active evolutionary area, its present known range partially encircling the Germanic area, within which it is practically confined to the montane regions.

In the elevated wooded region of Lauban, Silesia, it has been observed to frequent *Geranium robertianum*.

*H. umbrosa* is not known in France, Scandinavia, Italy, or the Iberian Peninsula, but it is possible this may arise from oversight.

**BRITISH ISLES.**

Kent E.—Discovered associated with *H. striolata* in Sept. 1914 on the outskirts of Margate, near the depot for the town's refuse, by Mr. J. C. Dacie. It was previously erroneously recorded in the fossil state from the Ightham fissure, West Kent.

**GERMANY.**

Distributed in the Alps of South and Mid Germany, over the elevated plateaus of Bavaria and Silesia, the upper drainage system of the Elbe in Saxony, and the Harz Mountains, and has been recorded from Baden, Bavaria, Lasatia, Merseburg, Posen, Reuss, Saxony, Silesia, Silesia, Thuringia, Wurttemburg, and Danzig, West Prussia.

**AUSTRO-HUNGARY.**

Herr Clessin describes *H. umbrosa* as inhabiting the whole region, and it is stated to inhabit the entire range of the Austrian Alps, the Erzgebirge, the Iseregebirge, the Böhmerwald, the Upper Elbe region of Bohemia, the Danubian valley from Regensburg to Belgrade, and the valley of the Save.

The following countries are specifically recorded as inhabited by this species: Austria, Bohemia, Bosnia, Carniola, Carinthia, Croatia, Galicia, Goritz, Hungary, Moravia, Salzburg, Servia, Slavonia, Styria, Transylvania, and the Tyrol.

**SWITZERLAND.**

Herr Clessin records that this species is found throughout the country.

**DENMARK.**

Zealand—Recorded by Dr. Morch from a garden at Bisserup, Holsteinborg; and Herr Steenberg mentions a single fine example (14 mill. × 7 mill.), larger than the German shells, found amongst *H. striogella* at Bisserup Haven by Pastor Jacobsen.

**RUSSIA.**

Poland—Recorded from Ojeow by Dr. Westerlund.
HEREWITH a new genus is instituted for the reception of the *Helix granulata* of Alder, whose internal structure is so strikingly different from that of *Hygromia* that they cannot logically be grouped together, although the shells are so similar in their general aspect.

The name *Ashfordia* is here proposed to emphasize the peculiarities presented by the typical species and also to honour and perpetuate the memory of the late Mr. Charles Ashford, of Christchurch, the well-known and skilful malacological anatomist, who first demonstrated the distinctive character of its organization.

The very close convergence in external aspect of *Ashfordia* and certain species of *Hygromia*, due to their adoption of a similar mode of life, has hitherto led to their being universally but incorrectly associated together, a proceeding which their divergent organization clearly forbids.

The animal, which offers no special features, is pale and translucent, faintly granulate, and besprinkled with minute opaque-whitish dots.

The shell of *Ashfordia* is characteristically globose, of a thin, somewhat translucent, and feebly calcified texture, showing no trace of the paler peripheral zone occasionally present in *Hygromia*, and the whole surface is beset with numerous long, erect, and persistent whitish hairs arising from a bulbous base and arranged in oblique rows which cross the lines of growth; the umbilicus is very narrow, and partially overshadowed by the reflection of the columellar margin; and the peristome is thin and simple, with a weakly developed white submarginal rib.

Internally, this genus is broadly separated from *Hygromia* and the typical *Helices* generally by the right tentacular retractor having its course quite to the left of the genitalia and free from entanglement with them.

The genitalia are reduced by atrophy to an almost primitive simplicity, the dart sacs, mucus glands, etc., which undoubtedly were formerly possessed, having become lost by degeneration; the penis-sheath is short and bulky, possibly harbouring a fleshy egersidium or excitatory organ, and is prolonged into an epiphallus, terminated by a short flagellum.

The jaw is very broad and deeply lunate, divided into two distinct areas, the broad upper part being colourless and translucent, while the hardened chitinous, and amber-coloured lower area is comparatively narrow, tapering off at the ends; there are numerous slight, flat, outwardly convex divergent ribs, which extend quite across the jaw and slightly crenulate the margins, with occasionally a median projection on the cutting-edge.

The radula as exemplified in the type species is quite distinctive in character from *Hygromia*, and remarkable for the feebly developed ektcones of the median series and for the strong bifid mesocone and the bi- and tri-furcation of the ektcones of the marginal teeth.

The geographical range and the species which may be ultimately allocated to this group are alike still problematical, as it is not certainly known to occur outside the British Isles, and additions to the group awaits careful anatomical study of the probably allied continental species.
Ashfordia granulata (Alder).

1863 — hispida Montagu, Test. Brit., p. 423, pl. 23, f. 3.
1832 Tethis hispida Leach, Syn. Moll., p. 98.

History.—A. granulata (grannum, a grain) has ever been and still is misunderstood by continental conchologists owing to the prevailing ignorance of its structure and the similarity of its shell to that of other not closely allied species, with which it has been so frequently confused, that its distribution is still quite uncertain, and though doubtless inhabiting the European continent, we have few or no really certain grounds for saying that it is found elsewhere than in the United Kingdom, though there are many more or less unreliable records of its occurrence in other lands.

This species is associated with Dr. William Turton, author of the "Manual of the Land and Freshwater Shells of the British Islands," and other important works, by whom it was detected, differentiated, and provisionally named prior to its discovery by Mr. Alder.

The portrait of Dr. Turton, herewith given from the title-page of the "Conchological Dictionary," is in the form of an ornament constituted by two facial profiles, a right and a left, placed vis à vis and separated by a dark background, which represents a classical vase, whose two sides form the facial outlines of Dr. Turton.

This species, so very distinct anatomically, was first noticed in 1803 by the famous Colonel Montagu, who, however, confused it with the Helix hispida Linné. It was next observed by Dr. Turton, who recognized its distinguishing characters, and applied to it the ms. name of granulata to express its most striking peculiarity. Later it was independently discovered near Newcastle by Mr. Joshua Alder, and described by him in 1830 as Helix granulata, the name suggested to him by Dr. Turton.

In 1833 Dr. Gwyn Jeffreys proposed to rename the species Helix globularis on the ground that Alder's name was not an appropriate one, as it expressed an imperfect appearance of the shell, an objection which Mr. Alder sufficiently refuted.

The present species has also from time to time been regarded by various continental and British conchologists as synonyms with Helix hispida L., H. sericea Müll., H. sericea Drap., H. albula Studer, H. piligera Zieg., H. rubiginosa Schmidt, etc., but it is very probable that all these are incorrect and unwarranted associations.

The species is here removed from close association with H. hispida and the Hygromia generally on account of its internal organization being in such a different and much more degenerate or secondarily simplified stage of development, and the right tentacular retractor being free from entanglement with the genital complex, that they cannot consistently be closely associated or classified together, and I have, therefore, adopted the generic name Ashfordia to better emphasize the differences it presents.
ASHFORDIA GRANULATA.

Diagnosis.—This species may be distinguished from *H. hispida*, which testaceologically it most closely resembles, by its more distinctly globose form, its thinner substance, whiter colour, minute umbilicus, and the hairy investment being chiefly formed by long straight hairs.

Internally, it differs from that species and its allies by the secondary simplification the reproductive system has undergone, evidenced by the total absence, probably by degeneration, of many of its accessory organs, as dart sacs, mucus glands, etc., which are so characteristic of the *Hygromio* and the typical Helices generally.

Description.—The animal varies slightly in colour, but is usually whitish and transparent, though yellowish anteriorly, and becoming greyer towards the head, the foot yellowish, the whole body is indistinctly granular and besprinkled with small opaque-white specks; ommatophores not very slender, of a somewhat translucent iron-grey, through which the blackish retractors are clearly visible, and their continuation being also perceptible for some distance on each side of the dorsum; eye-specks black; mantle pale with black marblings and deckings.

The shell is very globose, spire well produced, greyish or yellowish-white in colour, and subhyaline, sometimes slightly tinged with rufous near the aperture, extremely thin yet firm in substance, beset with erect and persistent whitish hairs, arising from minute bulbous or tubercular bases, which impart a granular aspect like shagreen to the shell surface, and when the hairs become lost the position being indicated by their empty sockets; the lines of growth are very fine, with still more delicate intermediate striæ, while faint traces of a spiral striation are occasionally perceptible under high magnification; whorls 4½ to 6, very convex, and slowly increasing in size; aperture subnate, and in fully adult shells with a thin internal submarginal rib; lip thin, scarcely deflected above and very feebly reflected, but clearly perceptible around the umbilicus, which is very narrowly perforate. Epiphragm very thin, transparent, and iridescent in summer, becoming more calcified and opaque in winter.

Diam. 7½ mill.; alt., 5 mill. Average weight of adult shells about ⅜ the grain.

When containing the animal the underside of the shell is usually uniform yellowish, though sparse blackish marblings are occasionally present, but along the periphery of the last whorl the elongate and very pale lingiform renal organ is clearly visible; its base adjoins the shell aperture, and is defined by a black patch. The upper side shows a pale nucleus, usually destitute of hairs, the following 3 or 3½ whorls show a whitish ground colour irregularly spotted and decked with black and brown, which become most dense as they approach the apex or nucleus.

Internally, the right tentacular retractor lies entirely to the left of and is not entangled with the sexual apparatus as in the typical *Helices*; the heart shows a transparent yellowish-grey auricle, and an opaque whitish-grey ventricle; and the hepatic artery is quite indistinct.

The alimentary system shows a long and narrow oesophagus, but the slender ducts of the salivary glands are of moderate length, the lobulate secretory sections being closely appressed to the oesophagus and to the proximal portions of the crop; the somewhat voluminous stomach and crop are apparently continuous without any obvious division and brown in colour, the intestinal fold is olive-green, the rectum leaden-grey, and the hepatic section quite pale, showing conspicuously against the very dark olive-brown liver.
The reproductive organs consist of a somewhat compact and narrowly triangular ovotestis which is constituted by an aggregation of whitish cea; the hermaphroditic duct becomes much convoluted as it approaches the distinct vesicula seminalis; the albumen gland is of the usual lingualiform shape; the oviduct is very sacculate; the sperm-duct or prostate is conspicuously broad, and composed of loose, short, opaque white rods; the spermatheca is large and somewhat triangular, supported by a stoutish stem about half the length of the oviduct; the vagina, though somewhat dilated, shows no traces of the dart-sacs.

Fig. 103.—Stomach, crop, oesophagus, and salivary glands of *A. granulata* Alder, greatly enlarged.

Fig. 104.—Sexual organs of *A. granulata* Alder, x 3.

Fig. 105.—Enlarged distal end of oviduct in *A. granulata* Alder.

The radula is of the usual oblong shape, about 2 mill. long and ½ mill. wide, with an average of 120 spinate, transverse rows of teeth, each row composed of the usual three series, the median, the lateral, and marginal areas. The median row is characterised by a somewhat quadrate base, possessing a moderately developed mesocone, with a feeble and insignificant ectocone at each side; the laterals are about ten in number, and show a mesocone which increase in size and strength and whose ectocone also increases in size as the teeth recede from the centre, while the endocone is only indicated; the marginals are about fifteen in number, and are...
Distribution of Ashfordia granulata (Alder) in the Counties and Vice-Counties of the British Isles.

**ENGLAND AND WALES.**

- **CHANNEL**
  - 1 Cornwall W.
  - 2 Cornwall E.
  - 3 Devon S.
  - 4 Devon N.
  - 5 Somerset S.
  - 6 Somerset N.
  - 7 Wilt S.
  - 8 Wilt N.
  - 9 Dorset
  - 10 Isle of Wight
  - 11 Hants S.
  - 12 Hants N.
  - 13 Sussex W.
  - 14 Sussex E.
  - 15 Kent E.
  - 16 Kent W.
  - 17 Surrey
  - 18 Essex S.
  - 19 Essex N.
  - 20 Herts.
  - 21 Middlesex
  - 22 Bucks.
  - 23 Oxford
  - 24 Bucks.
  - 25 Norfolk E.
  - 26 Norfolk W.
  - 27 Norwich S.
  - 28 Cambridge
  - 29 Bedford
  - 30 Hunts.
  - 31 Northampton
  - 32 Northampton W.
  - 33 Huntingdon
  - 34 Gloucester W.
  - 35 Gloucester E.
  - 36 Worcestershire
  - 37 Warwick
  - 38 Stafford
  - 39 Salop
  - **SOUTH WALES**
    - 1 Glamorgan
    - 2 Brecon
    - 3 Carmarthenshire
    - 4 Pembrokeshire
    - 5 Cardigan
  - **WALES**
    - 1 Anglesey
    - 2 Merioneth
    - 3 Carnarvon
    - 4 Denbigh
    - 5 Flint
  - **TRENT**
    - 1 Lincoln S.
    - 2 Lincoln N.
    - 3 Lincs.
    - 4 Leic. & Rut.
    - 5 Notts.
    - 6 Derby
  - **MIDLANDS**
    - 1 N. York
    - 2 N. York
    - 3 Durham
    - 4 Westmoreland
    - 5 Cumberland
    - 6 Isle of Man

**SCOTLAND.**

- **LOWLANDS**
  - 1 W. Lowlands
  - 2 N. Lowlands
  - 3 E. Lowlands
  - 4 S. Lowlands
  - 5 Perth
  - 6 Perth
  - 7 Mid Perth
  - 8 Aberdeenshire
  - 9 Banff
  - 10 Angus
  - 11 Dundee
  - 12 Stirling
  - 13 Kirkcudbright
  - 14 Dumfries
  - 15 Ayr
  - 16 Brodick
  - 17 Arran
  - 18 Mull
  - 19 Oban
  - 20 Mull
  - 21 Tiree
  - 22 Mull
  - 23 Iona
  - 24 Mull
  - 25 Tiree
  - 26 Mull
  - 27 Iona

**IRELAND.**

- **ULSTER**
  - 115 Antrim
  - 116 Down
  - 117 Armagh
  - 118 Tyrone
  - 119 Londonderry
  - 120 Fermanagh
  - 121 Cavan
- **LEINSTER**
  - 122 Louth
  - 123 Meath
  - 124 Dublin
  - 125 Wicklow
  - 126 Wexford
  - 127 Waterford
  - 128 Cork
  - 129 Kilkenny
  - 130 Tipperary
  - 131 Carlow
  - 132 Kilkenny
  - 133 Waterford
  - 134 Cork
  - 135 Wexford

**Probable Range.**
**Recorded Distribution.**
**Distribution verified by the Author.**
**Geological Distribution.**
generally trifid, due to the splitting of the mesocone, but as the edge of the membrane is approached the ectocone is also split into two or even three subsidiary points.

The formula of a specimen from Radlett, Herts., collected and prepared by the Rev. E. W. Bowell, and photographed by Mr. W. Bagshaw, is

\[ \frac{1}{3} \times 120 = 6,120 \text{ teeth.} \]

The jaw or mandible is unusually broad, and deeply arenate in shape, with bluntly tapering ends, and occasionally showing a rounded median rostrum on the lower margin; it is of a colourless appearance, and apparently of somewhat cartilaginous consistency, except along the cutting margin, which is of an amber colour, indicative of the greater chitinization, strength and hardness of that part; there are twenty or more flat, outwardsly convex, divergent ribs, which extend quite across the jaw and slightly crenulate or undulate the lower margin.

Reproduction and Development.—Nothing appears to be known respecting the amours of this species, excepting that the seminal element is transferred by means of a closely serrate spermatophore during congress; its presence in the spermatheca being indicated by the distortion of the sac, caused by the gradual hardening of the capreolins. The eggs have been observed to be deposited during the months of October and November; they are globular in shape, slightly more than a millimetre in diameter, and at first of a slightly transparent white, but on exposure to the air become opaque white, one portion showing of a whiter hue than the rest of the shell; the envelope also becomes brittle, and cracks and breaks like the egg of a fowl.

The winter is probably passed through in the egg state, the hatching taking place in the early spring, the creatures mostly attaining full growth in the late autumn months.

After the deposition of the eggs it is probable that the adult animals die during the succeeding winter, a fate also shared by those individuals which have not attained maturity, as few or no mature shells can be found during the spring months.

Food and Habits.—A. granulata appears to be a hardy species, and unusually active in the colder days of the late autumn when the temperature ranges between 30°—40° Fahr., and also appears in the milder intervals in winter. After continued moderate frost and in severe weather it buries itself temporarily beneath matted herbage and similarly sheltered positions, finding this a sufficient protection against 2° or 3° of frost. The epipharynx, which is usually thin and delicate, becomes more opaque under these conditions. Its characteristic habitat is stated to be the margins of ash-woods, especially if close by a low ash or hazel copepe; in such places it is found, according to Messrs. Kendall and Dean, in large colonies on the silverweed (Potentilla anserina) and other plants. It clings very loosely to the leaf or branch on which it may be crawling, falling instantly to the earth or amongst the ground herbage at the slightest touch or at the first indication of danger.
In other localities it is plentiful on or among *Equisetum fluviatile*, *Equisetum cananum*, dog's mercury (*Mercurialis perennis*), etc.; while nettle (*Urtica dioica*), common alexanders (*Smyrnium olusatrum*), colts-foot (*Tussilago farfara*), bramble (*Rubus sp.*), bedstraw (*Galium aparine*), butter-burr (*Petasites vulgaris*), and other plants have been observed to be preferred in special districts; and even waste paper and rusty iron are attractive and resorted to.

It is occasionally so abundant that it actually swarms and thousands of individuals may be congregated within a very limited area, and every plant, stem, or leaf of ivy and other vegetation be so crowded that they are compelled to crawl upon and over each other when changing their location.

*A. granulata* prefers the damp or boggy ground by or near the margins of ponds, streams, ditches, rivers, etc., and in such situations may often be found plentifully on the grass and rushes, or under and amongst the dead leaves of *Phragmites* and other rank herbage.

The circulation of this species would appear to have an average pulse-rate in summer of about 40 contractions per minute when the animal is in repose, increasing to 50—55 per minute when crawling, but occasionally this acceleration may become much more pronounced.

During very hot weather the pulsations may rise even in repose to 64 contractions per minute, while the lowest winter rate observed by Mr. Ashford was 9 contractions per minute at a temperature of 28° Fahr.

Dr. Gain who kept many specimens in captivity found that although none of the foods offered were ravenously devoured, yet the foliage of the potato, dandelion (*Taraxacum officinale*), groundsel (*Senecio vulgaris*), lettuce (*Lactuca sativa*), cabbage (*Brassica oleracea*), elm (*Ulmus campestris*) and scarlet runner bean were freely eaten, while withered red clover (*Trifolium pratense*) was also readily devoured, and *Persicaria*, white turnip, and cooked potato were taken less willingly, but cornbine, speedwell (*Veronica officinalis*), white dead-nettle (*Lamium album*), creeping loose-strife, caper spurge, beet, and *Boletus edulis* were only nibbled after several days starvation.

In a state of nature Mr. G. R. Tate records that about Alnwick it feeds principally on *Equisetum telmateia*; while Mr. Step states that in Cornwall it had a weakness for the harts' tongue (*Scopolandra vulgaris*).

**Parasites and Enemies.**—In addition to being liable to be picked up and devoured by the more indiscriminate enemies of molluscan life, it has been noted as fed upon by mice, numerous gnawed shells of this species being found in their runs at Oreston, near Plymouth, by Mr. L. E. Adams.

A little Acrisid, probably *Philodromus linnaeus*, was observed infesting a specimen collected at Killarney by Dr. R. F. Scharff.

**Geological Distribution.**—*A. granulata* is recorded by Dr. Jeffreys as occurring in the “Upper Tertiaries” of this country, but I have not hitherto found this confirmed by any other author.

Owing to the mis-conception of this species being so general on the continent, there are no reliable records available for other countries.

**Pleistocene.**—In North Essex, Messrs. Kennard and Woodward have recorded it from Copford.

**Holocene.**—In West Cornwall, Messrs. Kennard and Warren record it from Holocene sand and other situations on the summit of Towan Head near Newquay; and Mr. J. P. Johnson from Riviere Towans near Camborne.
ASHFORDIA GRANULATA.

In West Sussex, it has been found by the Rev. W. A. Shaw in a deposit near West Stoke, Chichester.

In South Essex, it is recorded by Messrs. Kennard and Woodward from the alluvial shell marl of the River Lea, Waltham-stow.

In North Essex, it is recorded as *H. sericea* Müll. from the shell marl at Fel-stead by Mr. J. French; and by Mr. R. Miller Christy as rare in alluvial shell marl and black earth and peat on the banks of the River Cann, Chigwell St. James.

In Oxford, it is recorded by Messrs. Kennard and Warren from a deposit on the banks of the Thames at Clifton-Hampden.

In Yorkshire, Mr. J. Wilfrid Jackson has found it sparingly in the alluvial earth of the Ribble Valley at Great Mitton.

**Variation.** — *A. granulata* does not exhibit a great range of variation; many varieties have, however, been attributed to this species which in all probability belong to *Hygromia hispida* and its related forms, with which the present species has been so long confounded and with which it has no very intimate structural relationship.

It is curious to note that the specimens from the Isle of Skye in the north of Scotland are much more depressed in shape than southern shells, approaching in this respect *Hygromia hispida* which it apparently to some extent replaces in the north of Scotland.

In South Wales, on the North Cliff, Tenby, the shells are stated to be very thin and only sparingly hirsute; while those from the Land's End in the extreme west of Cornwall are remarkable for being often found in a soft and collapsible state, doubtless an effect of the absence of limestone in that region.

**Var. carinata** Taylor.

*Helix sericea var. carinata* Taylor, Journ. of Conch., vol. iv., p. 31, 1883.

Shells sharply angulated at the periphery.

Aperture, diam. 4 mill.; alt. 2½ mill.


**York Mid W.**—Banks of the River Wharfe, near Addingham (Taylor, i.e.).

**Variation in Form of Shell.**

**Var. cornea** Jefferys.


Shells horn colour, very thin, glossy, and semi-transparent, the labial rib perceptible on the outside.

On St. Mary's, and other of the Scilly Isles, this variety grows to a good size, and is the prevalent form there, the extreme tenuity of the shells being probably due to the islets being entirely granite, while at the Land's End, West Cornwall, where the geological formation is granite and shale, the tenuity is so extraordinary that the shells living there are quite soft and collapsible and little more than a chitinous film.

Dr. T. Scott has observed that at Tarbert the var. *cornea* was found indifferently under stones, or on grass, nettles, cow parsley (*Heracleum sphondylium*), and beaked parsley (*Anthriscus sylvestris*).

**Variation of Substance of Shell.**

**ENGLAND AND WALES.**

**Scilly Isles**—St. Mary's, Tresco, and other islets, July 1875! W. H. Hatcher.


**Devon N.**—Combe Martin, E. Collier, 1886.

**Dorset**—Lulworth (Jefferys, Brit. Conch., vol. i., i.e.).

Suffolk W.—On the banks of the River Lark, Mildenhall! A. Mayfield.


Carmarthen—Common under moss in damp places on the sandhills, Laugharne, Sept. 1883! C. Jefferys.


Carnarvon—In profusion on the cliffs quite down to the edge of the sea, Nevin, Aug. 1910, F. H. Sikes.


York Mid W.—Hackfall, March 1880!)

Westmorland and Lake Districts—Abundant and fine amongst grass in pasture near Eggershank Wood, Grange; also at Meathop on long grass and Meadow-sweet, J. Wilfrid Jackson.

Main Argyle—With type about Oban; very large on the Island of Lismore, Aug. 1893 (Staaden and Hardy, J. of Conch., vol. vii., p. 271).

Cantire—Old Castle of Tarbert, April 1886! T. Scott.


VARIATION IN COLOUR OF SHELL.

Var. albida Tye.


**SHELL**

milk-white.

It is worthy of remark that the known range of this beautiful albino form is strictly western in England and Wales, and no reliable record is yet known from any other district.

**ENGLAND AND WALES.**

Cornwall—Mr. Tye records a specimen from Cornwall.

Pembroke—Not very common, Narberth road, Tenby (Tye, l.c.).


Anglesea—Beaumaris, with type, Sept. 1881! L. E. Adams.

Geographical Distribution.—*A. granulata* is a very widely diffused but somewhat sporadic species in this country. In Cornwall and Devon and other western districts *A. granulata* is frequently the commonest and most plentiful species. According to our present knowledge, it ranges from Elgin and Skye in the north to the Channel Isles and Scilly Isles in the south.

Formerly this species was believed to be an absentee from the Channel Isles, but according to Mr. Rimmer it is plentiful in Guernsey, and Mr. J. R. de B. Tomlin has reported its occurrence in the Island of Sark. Probably it will eventually be found on the other islands also.

It is also found in Ireland, but its recorded distribution there is even more scattered and disconnected, but it would appear to be most widely distributed and common in the south-western region.

On the Continent, though recorded as inhabiting nearly all Europe, and specifically alluded to under its proper appellation or under that of one or other of its erroneously assumed synonyms, as a denizen of Germany, France, Belgium, Austro-Hungary, Switzerland, Italy, Spain, Portugal, Greece, Russia, Caucasus, and Algeria, extending in Asia to Irkutsk and the River Amur, yet it is more than probable that these records refer chiefly to *H. sericea* of Danaarmand, or to the various other species with which *A. granulata* has been so very generally confused, but as reliable figures and description of the shell and the internal organization of the animal are now available, it is hoped that a knowledge of its peculiarities will become more widely diffused and its true range quickly established.
THE genus *Theba* has been adopted for the reception of *Helix cantiana* and *H. cartusiana*, and though these are the only constituent species found in the British Isles, many others occur in the Mediterranean region.

The names *Theba* and *Teba* are doubtless essentially the same, although Comm. Caziot regards Leach's name as meaning a hill, and that of Risso as having a different signification, yet the close association between Risso and Leach justifies the view, that in spite of the probably accidental orthographical difference, both names have the same significance and are presumably based upon the name of the ancient city of Thebes, which is rendered the more probable from the predilection of Dr. Leach for geographical, eastern, or biblical names, with no necessary connection with the objects to which the names were applied, as has been so clearly demonstrated by the Rev. G. A. F. Knight, and we have in further corroboration Dr. Jeffreys' authority for the statement that Risso did obtain the name *Theba* from Dr. Leach's ms.

With the present group I associate the late Dr. S. P. Woodward, one of the most eminent of British conchologists, and author of the classical work "A Manual of Recent and Fossil Mollusca," a work which was and is held in such high appreciation by the scientific world that it has run through several editions, and been translated into other languages, as well as formed the basis upon which similar works have been issued in France and elsewhere. In the domain of philosophical thought, he was, perhaps, the first or one of the first to suggest the probability of the existence of one chief evolutionary centre "from which the first and greatest types of life have emanated."

The genus *Theba* has a smooth, narrowly umbilicate and whitish shell, often faintly translucent, with faint sculpturing or delicate spiral lineation, and often exhibiting a pale supra-peripheral zone, analogous to and probably homologous with that of other Helicidians, and indicating their descent from a distinctly banded, far distant, but common progenitor.

Interiorly, the Thebæ possess a slightly arcuate and narrow jaw, with numerous flattened ribs, and with or without a slight medial rostrum.

The genitalia show the most striking peculiarities; the penis-sheath is short and tumid, with a long, tapering epiphallus, a short flagellum, and no retractor; the dart and dart-sacs have undergone more or less degeneration, and in some cases their original form has become lost, and their functions have become transferred to the new organs into which they have become modified. As in *Ashfordia* the right tentacular retractor is free from entanglement with the genitalia, and the seminal products are transferred by means of an elongate and serrate spermatophore.

The group is widely distributed in Europe and the near East, and is somewhat improbably assumed by M. Fagot to have arisen in the Tauric region, and to only live within maritime influence.
Theba cantiana (Montagu).

1801 *Helix carthusiana* Draparnaud, Tabl. Moll., no. 29, p. 86.
1848 — gallaprovincialis Dupuy, Hist. Moll., p. 204, pl. 9, f. 5.
1826 — *charpentieri* Risso, loc. cit.
1826 — *comnelae* Risso, loc. cit.
1826 — *robelia* Risso, loc. cit.
1831 Theba cantiana Leach, Syn. Moll., p. 94.
1837 Fratricida carthusiana Held, Isis, p. 914.
1878 Embola cantiana Paulucci, Matériaux Fanne Mal. Ital.

**History.** — *Theba cantiana* would appear to have been first observed by Dr. Martin Lister and cited by him in 1678 as a large variety of *Helix cauciscent*, or as a distinct species found in Kent. In 1801 Draparnaud detected the species in the south of France, and described it under the name of *Helix carthusiana*, mistaking it for Müller's species of the same name; afterwards in 1805 it was figured and fully described in his "Histoire."

In 1803 our own countryman Colonel Montagu again brought the species forward, figuring and describing it under the name of *Helix cantiana*, by which appellation it is now generally known.

With the present species I associate the late Archidioecons Adolf Schmidt, of Aschersleben, the venerable conchologist and malacological anatomist, who was the first to describe and carefully figure the organization of "*Helix gallaprovincialis,"* Dupuy, the south European form of *Theba cantiana*. He was also in his time the universally acknowledged authority upon the difficult genus *Clausilia*, upon which group he wrote several valuable monographs.

The portrait, for which I am indebted to Herr Pauli Hesse, of Venice, represents the distinguished scientist in the eighty-fifth year of his age.

Dr. Kobelt was decidedly of opinion that *H. gallaprovincialis* of Dupuy and *H. cantiana* of Montagu were two well marked species, but the figure of the internal organs given by A. Schmidt of a South European example quite coincides with that of British specimens of the typical form.

*Helix aulaco* Bourguignat and the Corsican *Helix ostreven, monerbia*, and *gundefoni* of Mabille have all been regarded as synonyms by authors of repute, while Dr. Kobelt has remarked that *H. frequens* Mouss., *H. aulcone* Issel, and *H. dirphica* Blanc are scarcely to be distinguished from
the true and characteristic *cantiiana*, but the anatomy of the *H. dirpha*, as shown by Herr Paul Hesse, shows divergences.

Kickx and Van Beneden have, according to M. Colbeau, apparently confused this species with the *H. cartusianella* of Draparnaud.

**Diagnosis.**—*Theba cantiiana* has its greatest affinity with *T. cartusianella*, which in this country is always so considerably smaller that size alone is a sufficiently distinguishing character.

From *Hygromia striolata*, with which it is sometimes confused, it differs in its larger and more globose form, its narrower umbilicus, more delicate striation, and the absence of the subcarinate periphery.

**Internally, T. cantiiana** is sharply separated from its congener by the long and filiform sarcobelum, or excitatory organ, which has now lost all semblance of the stylophore and accessory sac, from which it has been evolved, and both of which, though in outward aspect only, still exist in *T. cartusianella*.

From *H. striolata* it is at once separated by the absence of twin-darts and dart-sacs, which are such striking objects in that species.

**Original Description of *H. cartusianella* Drap.**

Animale à peau pres comme le précédent [*H. cartusianella* Drap.].

Coquille aussi semblable à la précédente, solide quoique mince, transparente, blanchâtre, irrégulièrement changée; mais elle est plus bombée et moins aplatie. On ne voit guère la ligne dorsale blanchâtre. L'ouverture est semilinaire, moins allongée et plus arrondie. L'ombilic est un peu plus ouvert. Le bord colomellaire est n'ouvrelet de la même couleur au dessus, et une bande laetée au delà.

Habite dans les champs.

**Draparnaud, Hist. Nat. Terr. et Fluv. France, 1805, p. 102, pl. vi., f. 33.**

**Description.**—Shell globose depressed, rather thin and translucent, slightly glossy, and of a creamy-whiteish colour, usually with a rufous flush on the under-side of the shell and on the upper side towards the aperture; the same colouring is also often present at the termination of the periodic growths, and renders perceptible a supra-peripheral whitish zone, while in addition there is a broad whitish zone marginalizing the suture of the body-whorl, and perceptible only on the rufous tinted portions; the sculpture is composed of irregular transverse striae with variably shaped malleations on the last whorl, while the upper whorls show a number of punctate depressions only perceptible under a lens, and possibly the vestiges of the short and somewhat recurved whitish hairs present in young and adolescent shells, but which disappear in the adult. **Whorls** 6-6½, convex, increasing gradually in size, spire slightly raised, suture distinct; aperture slightly oblique, and elliptically lunate, margined externally by a narrow brownish-grey area, beyond which and parallel to it is a pale reddish-yellow cincture almost two millimeters broad, which limits the darker rufous colouring characterizing the termination of the whorl. Internally, the aperture is furnished with a distinct white submarginal rib, which is most prominent on the outer lip, and blends with the dilated COLUMELLAR MARGIN; the palatal margin is thin, slightly reflected, and of a rufous shade, sharply defining the white rib, which is similarly margined at the inner side also. **UMBILICUS** small and narrow, and partially concealed by the reflected lip. Diam., 18 mill; alt., 10 mill. Average weight of shell, 4-2 grains.

**Animal** with a comparatively elongate body, truncate in front, pointed and flattened behind, and the tail extending almost to the outer margin of the shell when crawling; dull pale brownish dorsally, becoming paler and greyer as it recedes from the head; the general tint is darker at the sides, although the tubercles are more closely sprinkled at their apices with minute whitish specks. The whole body is
tuberculate, and there are three longitudinal dorsal rows of oblong shape; the lateral grooves are only faintly indicated, and no facial grooves are perceptible; the mantle is deep grey, with paler veining and specks, the margin of the pulmonary orifice dark grey; the ommatophores are dully hyaline, closely covered with minute black specks, giving them a greyish-black tint; they are widely divergent, and when fully extended are long, slender, and tapering, fairly bulbous at the apex, with black eye-specks; the lower tentacles are somewhat bulbous at the end, about one-third the length of the upper pair, but more hyaline and transparent, apparently owing to the fewer and paler spots upon them; the foot sole is faintly trifasciate, due to the darker margins, when crawling the foot-fringe is distinctly separated by a groove and by its darker tint, due to the absence of the whitish spots present on the body generally; when not fully extended the foot is very sprawling; the locomotor slime is thin and colourless, though occasionally tinged with yellow. Epiphragm is basally almost flush with the margin of the aperture, but on the upper margin is fixed inside the apertural rib; the summer epiphragm is a transparent film, with a somewhat opaque and whitish appearance in parts owing to delicate ctenocones particles being dispersed within or over its surface in an arboraceous manner; the winter epiphragm is more calcareous, opaque, and solid.

Internally, the cream-coloured kidney or renal organ is very long, broadly triangular above, narrow and tapering below; as seen through the shell in life it joins the light patch so conspicuous on the underside of the body-whorl, but the russet-coloured arboraceous veining apparently spread over its outer surface belong to the mantle membrane and not to the kidney itself.

The reproductive organs are chiefly remarkable for the apparent total loss of the dart-sac and its accessory gland and for the presence of an elongate cecum opening into the atrium, which is probably evaginated prior to pairing, and acts as an egersidium or excitatory organ, and thus assuring the chief function of the lost dart. The ovotestis is composed of yellowish-white follicles in isolated groups and unilaterally arranged; the hermaphrodite duct is distally straight and slender, becoming thick, white, and innate as it approaches the vesicula seminalis; the albumen gland is elongately ligiform, and terminally narrow, of a clear yellow or pale amber, occasionally tinged with greenish, of a gelatinous consistency, and indistinctly lobular; the oviduct is greenish-grey, closely saccular and sometimes for a short distance at the base of the albumen gland; the prostate or seminal-duct is of an opaque cream colour, or light ochreous, well defined, and somewhat broad below; penis sheath tumbid, of a whitish colour, tinged in places.
with fawn, and longitudinally streaked with white, due to the foldings of the inner wall being visible through the investing tissues: the **epiphallus** is long, tapering, and naturally somewhat twisted at its origin, and is terminated by a short and abruptly flexed **flagellum**; there is no penial retractor muscle. **Spermatica** very large, subtriangular, and whitish-grey, its stem pearly-white, with frequently a double indentation: a vaginal **mucus gland** is present at each side of the vagina, each with three to five very fine, semi-transparent opaline branches, resulting from two repeated bifurcations: near the external aperture and opposite the penial opening there is a slender and tapering **cecum**, 20 or more millimetres in length; this is probably an eggersidium or excitatory organ, and represents and replaces the function of the lost dart: it is of an opaline azure colour at the slightly swollen end, the rest of the organ being pinkish-grey and minutely spotted.

Moquin-Tandon is quite misleading in his description of the anatomy of this species, as he states that it does not possess any mucous vesicles; but in British specimens there are two well-developed bundles, and Henry P. Hesse and A. Schmidt concur in attributing similar organs to continental specimens. Moquin-Tandon would also seem to be quite unaware of the presence of the conspicuous blind cecum opening into the vestibule, which is here assumed to be a modified vestige of the dart-sac formerly present.

The **alimentary organs** are of the usual character, and present a whitish or yellowish **esophagus**, which shows a series of longitudinal white streaks due to the foldings of the inner walls being visible through the investing membrane: the **salivary glands** are 6-8 mill. long, slender and whitish, fused together in their upper half, the ducts being about equal in length to the gland itself; the **stomach** is thin and capacious, of a dusky-grey colour, and elongated at the further extremity, where it receives the two biliary ducts, which also bind the stomach to the digestive gland; the **intestinal canal** is of the usual triasomous character, and of a dull green, usually paler than the ordinarily dark greenish-sepia of the liver; on leaving the stomach the first intestinal tract takes a downward course and is fixed to the integument, beneath the kidney, it then returns beneath the head of the kidney towards the stomach, before reaching which organ it again flexes and passes through the liver and gradually narrows to the anal opening.

The **jaw** or mandible is only slightly crescentic in shape, and quite narrow, with bluntly-rounded ends, of a deep brown colour, especially at the thickened cutting-edge, becoming of an amber tint towards the thinner upper margin, and bears on its anterior surface eighteen or more somewhat irregularly distributed flat ribs, which are narrowest and most crowded in the centre and widest towards the extremities, where they are somewhat convergent in an upward direction; the lower or cutting margin is feebly dentilicate or undulate by the projection of the flattened ribs, and the centre shows a feebly indicated, blunt, median rostrum.

The **radula** is oblong in shape, about 4½ mill. long and 2 mill. broad, and composed on the average of about 135 curved transverse rows of teeth, each row containing about 83 teeth, constituted by a median row of tricuspidate teeth, characterized by a long and powerful mesocone, whose cutting-point extends beyond the basal-plate, and with a fairly developed ectocone on each side. The admedian or laterals are about fifteen in number, bisuplate in character, possessing a strong and stout mesocone, and an ectocone which, as is usual, tends to become more developed as the teeth recede from the centre. The marginals are about...
twenty-six in number, and somewhat unstable and irregular in general form and in the number and arrangement of the pectinations.

The formula of a specimen from Walmer, Kent, collected by Mr. W. Whitwell in 1887, and photographed by Mr. W. Bagshaw, from a preparation by the late Mr. J. W. Neville, is

\[
\frac{2}{4}a + \frac{3}{2} + \frac{1}{3} + \frac{2}{5} + \frac{2}{6} = 135 = 11,205 \text{ teeth.}
\]

Reproduction and Development.—\textit{Theba cantiana} has been noted in congress in most of the months from May to September, the seminal element being transferred by means of a spermatophore, which is closely serrate along one side, and whose presence in the spermatheca of the partner snail is shown by the curious twisted appearance it assumes, caused by the rigid, corkscrew-shaped spermatophore, but no further details have been placed on record, though it is probable that the

The Appendix, degenerate Dart-sac or coecal excitatory organ of \textit{Theba cantiana}, showing its quiescent form, and some of the changes occurring during sexual activity, greatly enlarged (slightly modified after Prof. Boycott).

Fig. 123.—Cecal diverticulum, or appendix, in its normal aspect when quiescent; with enlarged transverse sections, showing the lumen.

Fig. 121.—Cecum during or after conjugation and during the process of its withdrawal after eversion; and Fig. 123, a hypothetical longitudinal section thereof.

Fig. 126.—The contracted cecum, also showing hypothetically the method of withdrawal in the earlier stages of its reinvagination; with fi, a transverse section through the central area, in which the dark portions represent the muscular walls of the organ; the inner and outermost spaces indicate its lumen, while the narrow intermediate space is connected and continuous with the body cavity.

Elongate vestige of the dart-sac is everted and used as an excitatory organ prior to pairing taking place, an act which may occur even before full growth is attained, the incomplete aperture of the shell being frequently
broken in the act; the probability of this eversion of the elongated coccum or vestigial dart-sac as an excitatory organ prior to conjugation is shown by the researches of Prof. Boycott, who has demonstrated that during congress this organ still continues wholly or partially invaginated.

The eggs are deposited in clusters in damp spots from May to October; they are sixty to ninety in number, about \( 1\frac{1}{2} \) mill. in diameter, of an opaline white, and globular in shape, enclosed in a shining and semitransparent envelope, speckled with very minute opaque points of mineral matter, which increase as the envelope dries; the eggs within an hour or two gradually becoming brittle and white. They hatch in about a fortnight; those hatching in the spring and summer seem to hibernate when half to three-quarters grown; the hibernation though varying according to severity or mildness of the season, usually continues from late November to March; at these times the shell is buried in the ground, with the mouth upwards, closed by an epiphragm and level with the surface; after hibernation the immature individuals commence almost at once to enlarge their shells, and many may be seen as early as the end of April with five to six millimetres of new shell growth, and practically full grown except for their peristome, the later hatched individuals maturing later. Many hibernate through a second winter. The young are quite hispid, the hairs being whitish and bent or incurved, as in Hygromia, but this investment gradually becomes lost.

**Food and Habits.**—Theba cantiana in this country is found chiefly in hedges and banks, often abundantly on nettles and other plants in wet or damp places; it is also frequently found on the sandhills near the seashore, apparently preferring the stunted grass and herbage of such places to the more rank and luxuriant vegetation of the richer soils, but it is also found in its dwarf form to exist at 6,000 ft. altitude at San Pellegrino, Italy.

During the day it can be frequently seen attached to the twigs and leafage of the vegetation and fully exposed; and when roughly handled has the habit, shared with H. striolata and a few other species, of ejecting one or more drops of a clear tasteless fluid, like water.

It is a very active and sensitive species, and on moist days and after rains crawls energetically about, carrying its shell in an inclined position and secreting a clear shine, and travelling 75 millimetres or more per minute on a horizontal surface, or at the rate of a mile in about 14 days and 16 hours, a speed scarcely exceeded by even Helix aspersa.

The circulation of the blood is also active, and, as is usual, is much more vigorous in the young than in the adult. In the month of July respiration occurred from two to six times per minute, while the average number of heart pulsations of half-grown animals was 56 per minute, though adults beat only 44 per minute at the same time and place. When extending themselves from the shells the contractions increased to 69 per minute in the immature shells and to 53 in the adults; and when placed on the warm hand the pulsations rose to 106, and in one case to 120, per minute in the young, and to 77 in mature shells.

Mr. George Roberts has actually watched this species feeding upon the growing blades of grass, and Mr. Ashford has noted it similarly occupied on dead grass beneath bramble brushes. The Rev. Ashington Bullen has recorded that at Reigate the species preferred nettles and dock, but that at Dover it haunted bramble bushes in April and May; while Vernon Wollaston states that their carnivorous predilection was shown by the fact
that four specimens of the present species and half-a-dozen individuals of smaller species devoured three dozen coleoptera of half-a-dozen different species, which were confined together in the same receptacle; the natural food, as verified by examination of the stomach contents of several individuals, by Mr. Ashford was shown to be decaying grass and leaves.

Dr. Gain, who has kept numerous specimens in captivity, records that they are shy feeders, and very discriminating or fastidious, as of 95 different kinds of food they left 54 absolutely untouched, and only one, the foliage of the swede (Brassica rapa var. DC.) was devoured with avidity; 13 kinds were, however, freely eaten, these were turnip foliage and turnip root (Brassica rapa Linné), radish foliage, pea, scarlet runner bean, apple, Boletus edulis, Agaricus campestris, sow thistle (Sonchus oleraceus), woody night-shade (Solanum dulcamara), honeysuckle (Lonicera periclymenum), lime tree (Tilia europaea), and marsh willowherb (Epilobium palustre); the remaining 27 were all more or less distasteful.

Economic Uses.—According to Dr. Brunetti, this species is regarded as comestible, and eaten in the district around Montalcino, Goritz.

Parasites and Enemies.—This species was formerly believed to be almost immune from destruction by birds, but its remains have been found, sometimes numerously around “thrush stones” in Kent, Sussex, Hertfordshire, Suffolk, Lincolnshire, and Yorkshire by several reliable observers.

Mice also prey upon it in Northamptonshire, according to the observations of Mr. C. F. Wright.

The glow-worm (Lampumis noctiluca) is also recorded by Mr. W. J. Lucas as noticed devouring this species at Oxshott, Surrey.

Protective Resemblance.—Mr. H. Crowther has described and commented upon the protection accorded to this species by its general resemblance to the fungus-infested leaves of the coltsfoot (Tussilago farfara), stating that the brown blotched, grey shell has a remarkable similarity to the autumnal patches of the invading fungoid growths on the pale green fading leaves.

Geological Distribution.—T. cantiana has not as yet been reported from any deposit older than the Pleistocene, and although Mr. B. B. Woodward has published his opinion that this species is in all probability a post-Roman introduction to this country, and does not occur in any of our British deposits, even in those of most recent date, such views are now demonstrated to be unsound.

It is on record from the gravels of Barnwell and Grantchester, near Cambridge, but Mrs. McKenny Hughes and Mr. J. R. le B. Tomlin after careful investigation have affirmed that the record is erroneous and should be attributed to Eulota fruticium.

Pleistocene.—In France, H. galloprovincialis is recorded by M. Locard from the Upper Pleistocene deposits of the valley of the Somme, as well as from the osseous breccias of Corseca.

In Italy, Dr. Pantanelli recorded "Helix cantiana" in the "Post Pliocene Travertin," at Colle, near Siena, Tuscany.

In Algeria, a possible form of this species, described as Helix subcantalum, is mentioned by Bourguignat as common in the Pleistocene calcareous deposits at the Cap de Garde, near Bone. It is said to be very similar in form, character, and aspect to Theba cantiana, but to differ in its much wider umbilicus.
Holocene.—In Dorset, it is recorded from the infusaceous deposit at Blashenwell, Isle of Purbeck, by Mr. J. C. Mansel-Pleydell.

In Kent, it is recorded from the post-Roman deposits, Bexley, near Louvain, by the Rev. R. A. Bullen; and from alluvium in North Marshes by Mr. B. B. Woodward.

In Surrey, it has been found in the upper two feet of deposit at Horseshoe Quarry, Reigate, by the Rev. R. A. Bullen and Mr. L. E. Adams.

In Essex, it was found in shell-marl at Feltstead, by Mr. J. French; and also recorded from sand and shell-marl in the excavations for the reservoirs of the East London Waterworks, Walthamstow, by Messrs. Kennard and Woodward.

In Hertf., it was collected from the subsoil of a tumulus at Highley Hill, Ashwell, by Mr. H. G. Forliham.

In Suffolk, it was recorded by the Geological Survey, from the railway cutting and brickyard west of Sudbury.

In York S.E., it was found by Mr. Mortimer in a "barrow" of Bronze age, at Birdsall Brow, Driffield.

Variation.—Though this species has so small a range of observed variation, it has been split up into a number of varieties and species, most of which differ from the type form in only a very slight degree. These named forms are about fifty in number, and their allocation has been attempted where any really definite character could be detected.

Much confusion and uncertainty, however, exists, not only as to the status but as to the affinities of many of the modifications, some believing certain forms are worthy of specific rank, while others refer them to the present species, or even to T. curtusian., as insignificant varieties.

Though the variations in form are comparatively slight and infrequent, those of colour depend upon the presence, distribution, and intensity of the rufous-brown pigmentation, and of the presence or absence of the pale peripheral zone; these traces of banding, which are probably vestigial and evidences of a former scheme of coloration are explained by the presence of the white supra-peripheral zone, only evident in the rufous-tinted shells, and which probably at one time formed the division between the upper and lower group of bands.

The var. gaudéfroyi, a native of St. Florent, Corsica, an insular region, practically at the extreme limit of the specific southern range, retains, according to the available description, the hispid periostracum in adult life, a peculiarity which may be explained by the Corsican form being an earlier or more primitive form of the species, which also probably still inhabits more umbrageous surroundings than their continental relatives.

The hispid epidermis in the more evolutionary active countries is now entirely restricted to the juvenile stage, and becomes totally lost before maturity. This change is probably due to the adoption of a more open and exposed environment gradually diminishing the formerly existent epidermal outgrowths, and may be reminiscent of the remote period, when the country was more densely afforested than is now the case.

In the Mediterranean region the general aspect of the shells as compared with North European specimens is to present a glossier and more finely striate surface, usually of a white or whitish colour with a stronger labial rib.

The north European area of distribution, which includes England, North France, Holland, Belgium, and North Germany, produces a ruder and stronger race, which seems at the present day almost or completely severed from geographical continuity with the whiter and smoother Southern or Mediterranean group.
THEBA CANTIANA.

**Variations of Form of Shell.**


*Helix abechai* Mabille, Guide de Natural, 1880.

*Helix cantiana* var. elevata Williams, Conchologist, vol. i., p. 16, 1891.

SHELL of a somewhat pyramidal form.

The sub-var. *elevata* is smaller than the type, with the spire distinctly elevated above the body-whorl; suture deep. **Diam.**, 12 mill.; **alt.**, 8.5 mill.

The sub-var. *abechai* has a conically-elevated spire, body whorl tumid and large, indistinctly angulate, and of a horn colour. **Diam.**, 16 mill.; **alt.** 9 mill.

**Fig. 127.**—*H. cantiana* v. pyramidata Colbeau (after Colbeau).

Kent W.—Sub-var. *elevata*, Sittingbourne, collected by Mr. J. R. Longhurst (Williams, i.e.).

Kent E.—Var. *pyramidata*, Maidstone, collected by Mr. H. Lamb.

Northampton—Var. *pyramidata*, Towcester, 1893, found by Mr. L. E. Adams.


York Mid W.—Var. *pyramidata*, Boston Spa, found by Mr. J. Emmet.

**Continental Distribution.**

Belgium—Var. *pyramidata*, Ostend, West Flanders (Colbeau, i.e.).


Italy—Sub-var. *abechai* Mabille is recorded from Bastia, Corsica, by Westerlund.

Var. da campi Villa.


*Theba cantiana* var. *depressa* Taylor in sched.


The var. *da campi* is a larger, depressed form, usually white in colour.

The sub-var. *campanica* is described as more widely umbilicated, spire more depressed, body whorl widened.

The sub-var. *depressa* is very similar, but of typical colouring.

The sub-var. *sobara* is a very little swollen, and moderately umbilicated, of a whitish colour, but tinged beneath with yellowish, diam., 19-20 mill. Its depressed spire probably most closely allies it with the var. *da campi*.

The sub-var. *ardesa* is a very slightly swollen, of a whitish colour, tinged with a rosy shade and microscopically striate. **Diam.**, 18 mill.; **alt.**, 16 mill.

The sub-var. *apuanica* is depressed and very slightly swollen, of a dull-yellowish horn colour, the last whorl rapidly increasing in size, but not deflected. **Diam.**, 17-18 mill.; **alt.**, 8-9 mill.

Signor Tommasi records that at Castellgofigredo and other places in Lombardy *H. da campi* is often found paired with *H. galloprovincialis*, but prefers moderately moist-grassy fields and shady positions. He also transplanted young *H. galloprovincialis* into moist and shady meadows, and after some years found that the shells had become smaller and moderately transparent, and presented the characters of *H. da campi* Villa.

**England.**


**Continental Distribution.**

France—A mutation of *Helix d'anconae* with an almost flat spire and the last whorl undeveloped is recorded by Comm. Caziot from the spring at Monraills near Nice, Alpes Maritimes.

Italy—Var. *da campi*, Mantua and shores of Lake Como, Lombardy, and from Verona, Venetia, by Dr. E. von Martens; also from the Parmese Appenines, Emilia, by Strobol.
THEBA CANTIANA.

Sub-vars. ardeoza, sobana and apumenica cited from the Apuan Alps by Westerlund. Sub-var. campagenica recorded from Monte Cassino, S. Maria di Monte-Lenzo, Pontecorvo in Terra di Lavoro, and Defensa del Matese, Abruzzi, by Marchioness Paulucci; also reported from the environs of Rome by Statuti.

Var. cemenlea Risso.


_Helix carthusiana_ Dupuy, Tabll. Moll., 1801.


_Helix cantiana_ var. cemenlea Panucci, Materialis, Mal. Italie, 1875.

_Helix osterca_ Malille, Guide de Natural, 1880.

The name _cemenlea_ of Risso must have precedence, being anterior to that of Dupuy's _galloprovincialis_ with which it is generally regarded as identical. In any event Dupuy's name is inadmissible, on account of the name having been used by Matheron in 1842 to distinguish a quite different fossil species.

This is the form described by Draparnaud as _Helix carthusiana_ and also named by Risso _Theba cemenela_, a name derived from the locality Cemenello (now Cineo) where it was first noticed by him. According to Nevill, it especially frequents the subalpine regions of the Alps Maritimes.

Prof. von Martens has remarked that this is the subglobose, more inflated form, of finer texture, whitish colour, and partially concealed umbilicus, which is generally distributed along the shores of the Tyrrhenian Sea from South France to Southern Italy.

![Fig. 129.](image1)

![Fig. 130.](image2)

![Fig. 131.](image3)

![Fig. 132.](image4)

![Fig. 133.](image5)

**Fig. 129.** — _Helix cemenlea_ Risso, Alpes Maritimes, slightly reduced (after Caziol).

**Fig. 130.** — _Helix anconia_ Issel, Alpes Maritimes, slightly reduced (after Caziol).

**Fig. 131.** — _Helix spallanzani_ Stef. = _Helix cemenela_ var. _isseli_ Vaghi, Tuscany, slightly reduced (after de Stefani).

The var. _cemenela_ is somewhat depressely globose, whitish or yellowish-white in colour, finely striate, and more narrowly umbilicate.

The Corsican _Helix osterca_ Malille is apparently slightly different from the var. _cemenela_, shown chiefly in a scarcely perceptible angulation of the periphery.

The sub-var. _galloprovincialis_ is described as more globose than _T. cantiana_, with a more elevated spire and finer spine and sculpturing, the umbilicus narrower and partially concealed by the columellar lip.

The sub-var. _galloprovincialis_ Moq. Tand., has the body-whorl depressed, the striae finer and more regular, the umbilicus narrower, and the peristome white internally and reddish externally.

The sub-var. _ancones_ is described as depressely globose, uniformly yellowish-white or whitish, closely and finely striate, and with numerous shallow malleations and close, short, and spiral microscopic lineation, especially on the upper side, very narrowly umbilicate, and also partially covered by the reflection of the basal margin. Diam., 12-14 mill.; alt., 8-11 mill.

The _Helix cemenela_ var. _isseli_ Stef. from the Apuan Alps, Tuscany, has been renamed _Helix spallanzani_ Stef. because the name _isseli_ had already been used for another species of _Helix._

**Fig. 132.** — _Helix galloprovincialis_ Dupuy, Sarre, Isle of Thanet, April 1833, T. D. A. Cockerell.

CONTINENTAL DISTRIBUTION.

France—Var. _cemenela_ is reported from the Alpes Maritimes by Nevill and Caziol; from the Bouches-du Rhone and Vaucluse by Contague; Basses Alpes by Caziol; Herault by Paladilhe; and from Ajaccio, Bastia, Corte, and St. Florent, Corsica, by Dr. Scharff.
Thera Cantiana.

Sub-var. galloprovincialis is recorded from Bouches-du-Rhône, Herault, Var, Languedoc, and from Bastia and Boucauc in Corsica by Mollin-Tambou.

Sub-var. anconae is recorded by Cañot from Vaucluse and the Alps Maritime; by Berengnier from the Var; and by Westerlund from the Island of Elba.

Italy—Var. cemenea is recorded from Lignoria at Cimiez, near Nice, by Risso and von Martens; from Avezzano and Carso, Abruzzi, and from the Republic of San Marino by Panlucic; by Lessona from numerous localities in Piedmont; by Picaglia from Bologna, Modena, etc., in Emilia; by Statuti from Terracina and Frosinone in Romano; from the Apuan Alps, Mount Argentario, and the islands, Tuscany, by Panlucic.

Sub-var. galloprovincialis is recorded from Nervi near Genoa, Liguria; and also from Tivoli near Rome, July 1888! by E. von Martens; from the Valley of the Po, at Turin and elsewhere, Piedmont; the shores of Lake Maggiore, etc., Lombardy; and the province of Emilia, by Ströbel.

Sub-var. anconae is recorded from Central Italy; and on the authority of Issel, Villa, and others, from the Island of Sardinia by Panlucic; by Polloncea from Piedmont; by Stefani and others from Bologna, Modena, etc., in Emilia; Mount Verna and other places in Tuscany; and by Westerlund from Liguria.

The Helix anconae var. marcelli Stefani (Bull. Soc. Mal. Ital., 1883), and the Helix anconae var. simplicio Parvesses are apparently insignificant varieties, which are recorded from Mid-Italy and Italy respectively by Dr. Westerlund.

Austro-Hungary—Recorded from the Trentino, Tirol.

**VARIATIONS OF SUBSTANCE AND PERIOSTRACUM OF SHELL.**

Var. tenuis Taylor, var. nov.

Shell extremely thin, delicate, and semitransparent; average weight of the type specimens from Kirkby Wiske being 1.86 grains.

This variety is the probable antithesis of the var. solidula of Westerlund, but of which the description is not available.

ENGLAND.


York N.W.—Found at Kirkby Wiske in the Vale of Mowbray. July 31, 1917! by Mr. W. D. Roebuck, the specimens in coloring are the sub-var. rubescens Moq.

Var. gaudefroyi Mabille, Guide de Natural, 1889.

Helix cemenea var. gaudefroyi Westerlund, Faune Palaeart., 1889, p. 80.

Shell depressed, whorls convexly rounded, whitish-horny in color, beset with fine but devitalized scale-like hairs, periphery indistinctly angulate, and umbilicus almost hidden by the reflected lip.

CONTINENTAL DISTRIBUTION.

Corsica—St. Florent (Westerlund, I.e.).

**VARIATIONS IN SIZE OF SHELL.**

Var. major Taylor, var. nov.


Shell larger, not less than 20 mill. diam.

The sub-var. cantianiformis is described as 20 mill. in diameter and 12½ mill. in altitude. Typically it is rosy-red or violet at the aperture, and brownish basally, and the body-whorl peripherally expanded.

This variety was recorded without name or localities by Mr. Sherriff Tye in 1878 in the Midland Naturalist.

ENGLAND.


CONTINENTAL DISTRIBUTION.

Germany—Sub-var. cantianiformis, Ellensen, near Oldenburg (Westerlund, I.e.).

Belgium—Specimens of large size recorded from Blankenberge, West Flanders, by M. le Hon.

France—Var. major, 22 mill. in diameter, recorded by Gourdon, from Brancasque, Hantes Pyrenees.

Sub-var. cantianiformis, Boulogne-sur-Mer, Pas-de-Calais (Westerlund, I.e.).

Italy—Specimens 21 mill. in diameter recorded from Vagli, Tambruna and Pania, Tuscany, by Stefani; and from Spoleto, Umbria, by Pantanelli.
THEBA CANTIANA.

Var. minor Moquin-Tandon.

Helix cantiana var. minor Westerlund, Moll. Extramarin. 1878, p. 38.
Helix ancone var. minor Westerlund, Moll. Paleart., 1889, p. 79.
Helix cemenela var. minor Westerlund, Moll. Paleart., 1889, p. 79.
Helix cantiana var. nama Fenn. Nature Notes, 1890.

The var. minor Moq.-Tand., s.s., is described as resembling the var. galloprovincialis Dupuy, but much smaller in size, and is figured as 12 mill. in diameter and 8 mill. in altitude. The sub-var. minor Westl. has a subovate aperture, and is 15 mill. in diameter and 10 mill. in altitude.

The H. cemenela var. minor Westl. is described as 14 mill. in diameter and 10 mill. in altitude. The H. cemenela var. minor Caziot has a diameter of 10½ mill. and an altitude of 8½ mill.

The H. ancone var. minor Westl. is described a diameter of 11 mill. and an altitude of 7½ mill.

The H. d’ancone var. minor of Nevill is 11½ mill. in diameter and 7½ mill. in altitude, and is regarded by its author as possibly the Helix delcourti Malbille, which, however, according to Comm. Caziot, is a somewhat larger though similarly proportioned shell.

Somerset N. - Keynsham, Nov. 1887, Miss F. M. Hele.
Middlesex - Sub-var. numai, Spring Grove, Isleworth.
Bucks. - Ivingshoe, Sept. 1907, C. Oldham.
Suffolk E. - Walberswick, 1866, G. T. Rope.
Norfolk E. - Longstratton, Aug. 1890, Lionel E. Adams.
Gloucester W. - Horfield and Stapleton, Aug. 1887, Miss F. M. Hele.
York S. W. - Notton, near Barnsley, July 1907, W. E. Brady.

CONTINENTAL DISTRIBUTION.


Sub-var. cemenela minor Strobol is recorded from Modena. Parma, etc., Emilia, by Picaglia.

Sub-var. carfanensis-minor is recorded at an elevation of 6,000 feet from San Pellegrino, Emilia.

VARIATIONS IN COLOUR OF SHELL.


Helix iadolia (Bourg.) in Mace’s Excurs. Malac., 1858.


Helix cantiana var. albida Taylor, Journ. of Conch., vol. iv., p. 35, 1883.

The var. alba is described as shell entirely white.

The sub-var. carfanensis is described by Westerlund as wholly opaque or almost hyaline white. Diam., 15 mill.; alt., 9 mill.

The sub-var. albida Taylor is described as shell entirely opaque-white.

The sub-var. iadolia differs from the sub-var. ancone in its milk-white colour, in the progressive increase of the whorls in size, and less oblique aperture. Diam., 14 mill.; alt., 10 mill.
THEBA CANTIANA.

ENGLAND AND WALES.


Somerset N.—Sub-var. alba, Bitton near Bath! and gorge of the Avon, Clifton! Miss F. M. Hele.

Isle of Wight—Interior of island (Lecanute, Bull. Sot. Mal. Belg., 1869, p. lxiv.).

Hants S.—Mudeford, 1885! Charles Ashford.

Sussex W.—Brighton and Worthing, A. F. Griffiths.


Berks.—Sub-var. alba, Reading, May 1883! C. G. Barrett.


Norfolk E.—Long Stratton, Aug. 1890, Lionel E. Adams.


Huntingdon—Sub-var. alba, Abbott’s Ripton, 1899, Rev. R. A. Bullen.


Gloucester W.—Horfield and Stapleton, Oct. 1887, Miss F. M. Hele.


Lincoln S.—Bourn, Aug. 1888! H. Wallis Kew; a specimen from Cariby in Grantham Museum.


Notts.—Stamton on the Wolds, June 1886! C. T. Musson.


CONTINENTAL DISTRIBUTION.


France—Sub-var. indaevis is recorded from the Abbey of St. Pons, Nice, and from Santa Clara, near Saiage, Alpes Maritimes, by Comm. Caziot.

Italy—Sub-var. costifrons, San Pellegrino, Apuan Alps, Emilia, at about 6,000 feet altitude, and from the Appennines of Tuscany, by L. Picaglia and Stefani.
Thera cantiana.

Var. rubella Risso.

Helix (Theba) cantiana var. rubescens Maufrin-Taudson, Hist. Moll., 1855, p. 262.
Helix putatiana Caziot, Moll. Monaco, 1910, p. 87, pl. iv., f. 3.

The var. rubella is somewhat reddish in colour, paling towards the apex.
The sub-var. rubescens resembles the sub-var. galloprovincialis, but has the last whorl reddish.
The sub-var. seminiva has the last whorl reddish.
The sub-var. charpentieri is described as a dirty-white or honey cinereous variety of Theba swantonii.
The sub-var. falconensis (the Helix putatiana and Helix putoni of Caziot, and not Helix putonii or putotiana ascribed to Clesin, which is probably a Hygromia), is depressively globose, of a pale reddish-horn colour, with a very oblique aperture. Diam. 13 mill.; alt. 8 mill.
The sub-var. riparia is globose, reddish brown-yellow, the last whorl entirely reddish, with whorl suture. Diam., 20-22 mill.; alt., 14-16 mill.
The Italian author, Dr. Picaglia, unites the var. donna with the var. rubella.

Though the allocation of T. rubella and T. charpentieri to the present species is probably correct, that course is not universally approved by scientists, some preferring to give them specific rank, while others include them as forms of T. cantiana.

England and Wales.

Somerset N.—Bilton near Bath, June 1877! Miss Hele.


Lincoln N.—Common at Scunthorpe, July 1890, Rev. E. A. Woodruffe-Peacock.


Durham—Billingham, 1884, Baker Hudson.

Continental Distribution.

France—Recorded for South France by Dr. Westernland; by Locardi from the Rhône valley near Lyons; and by Comte Caziot from between Fontan and the frontier, Alpes Maritimes.

Sub-var. charpentieri, recorded from the Alpes-Maritimes by Bourguignat.

Sub-var. falconensis is recorded from the north-west of the village of Falcon, Alpes Maritimes.

Sub-var. putatiana is recorded from Lyons and the Alpes Maritimes by Caziot.
Holland—Sub-var. rubescens Mot., very common by the Solzaete, Zealand: also in weedy ditches at Canisvliet near Westdorp; and commonly at Shys-Kill.

Belgium—Sub-var. semivirgin, Antwerp (Colbeau, l.c.).

Italy—Near Nice, Liguria; also at Siena, Tuscany; and Salerno, Campania, Dr. E. von Martens. It is also recorded from near Perugia in the Marches; from Umbria at Avellana, from the Abruzzi at Monte-Corvo, and Santa-Maria-di-Monteluce, Terra-di-Lavoro, by the Marchioness Paulucci; by Statuti as not rare at Monticelli and Terracina in Romana; from Bologna and Reggio, Emilia, by Picaglia; and by Stabile and others for Piedmont.

Sub-var. ordina is recorded from the Apen Alps by Westerland.

Sub-var. riparia, San Germano, Campania (Westerlund, l.c.).

Asia Minor—Sub-var. carnea Pür. = Helix transmutata Parreyss, Asia Minor (L. Pleiffer, l.c.).

Var. albocincta Cockerell.


**Shell** with a white peripheral zone.

This is probably an atavistic or paleogenetic form, which occurs sporadically and may be expected to occur most plentifully towards the limits of its range or in the less desirable and isolated localities.

The sub-var. *orsini* is fulvous, with a peripheral and also a sutural whitish zone, though other characters are involved in the description, which would include the shell in other categories. Diam., 15–20 mill.; alt., 8½–11½ mill.

The sub-var. *rodingensis* is described as white, with reddish mouth, usually with a peripheral whitish zone extending over more than half of the last whorl.

**England.**

Wiltshire—Shalbourne, June 1915! C. P. Hurst.


Bucks.—Ivinghoe, Sept. 1907! C. Oldham.


Lincoln.—Barton, Dec. 1905! J. F. Musham.

York S.E.—Lund near Osgodby, June 1890! W. Nelson.

**Continental Distribution.**

Germany—Sub-var. *rodingensis*, Rödding, Schleswig, with type (Schlesch, l.c.).

France—M. Poiret records this form from the Somme; and Lieut. Cribb in Sept. 1916 found this variety in the vicinity of the lagoon Calais, Pas-de-Calais.

Italy—Sub-var. *orsini* is recorded from the Ascoli-Piceno, Abruzzi, by Mascarini; by Statuti from Sezze, Romana; and from Modena, etc., Emilia, by Picaglia.


**Shell** reversed or sinistrally coiled.

**England.**

Wiltshire.—Found in Wiltshire by Mr. Rippon of Norwood, and presented to me by Miss F. M. Hele. Rev. Canon Horsley also possesses a similar specimen from the same county, received from Mr. S. C. Cockerell, and probably the specimen which Mr. Rippon had kept in his own collection.

Dorset.—Mr. G. K. Gude also possesses a specimen obtained in 1895 through a dealer and labelled Dorset.

**Continental Distribution.**

Belgium—M. Nyst has found at Antwerp a sinistral shell of this species (Colbeau, Ann. Mal. Belg., 1863, vol. i., p. 39).
Geographical Distribution.— *Theba cantiana* is apparently quite unknown in Scotland, Ireland, and on the western coast of England, as a result of natural diffusion.

In England its range is exceedingly compact, and embraces every county and vice-county on the eastern and southern coasts from South Northumberland to South Devon, also occupying the neighbouring inland counties, without a single detached outlier throughout its whole range.

![Fig. 139.—Geographical Distribution of *Theba cantiana* (Mont.).](image)

Although many attempts have been made with varying success to establish this species in localities where it was not previously known to exist, both within and beyond its known range, its natural distribution has not been very materially interfered with in England.

The attempts to found local colonies by Prof. Boycott in Herefordshire, and by Mr. J. C. Blackshaw near Wolverhampton, would seem to have been more or less successful, while many others, like Mr. Swanton's effort to establish a colony in Somerset, were failures.

It was also introduced into Cumberland, where it was not previously known to exist, by Capt. Farrer, in Aug. 1894, who liberated a number of specimens near Bassenthwaite, which largely increased in numbers the following year and seemed likely to spread.

Its presence along the banks of the Tees and Tyne and elsewhere in Northumberland and Durham has been very generally attributed to its inadvertent introduction with ballast by the "colliers" trading from the ports on those rivers, but no evidence has been adduced, beyond the shells being found plentifully on the ballast-hills of the river-banks.

In Wales it is known from Glamorganshire, where it is locally common.

In Scotland this species is naturally quite unknown, but specimens from England were introduced in 1888 into his garden at Brora, East Sutherland, by Mr. W. Baillie, which have apparently prospered, as in 1895 Mr. Baillie reported that owing to their increasing abundance he had been compelled to remove hundreds of specimens to other places.
In Ireland it was recorded in 1819 by Turton in his Conchological Dictionary as found in "woods and hedges, especially in . . . . Cork"; but no confirmation of this statement has been made.

In Sept. 1901, however, Mr. R. A. Phillips, of Ashburton, Cork, placed nineteen full grown *T. cantiana* from Knowle, near Bristol, on a grassy bank by Tivoli Railway Station, near Cork, which now appear to have established themselves there, as Mr. Phillips reported in 1911 that adults and young were quite numerous.

Dr. Turton in his Catalogue of Irish Shells also states that *T. cantiana* was found in "hedges and box-borders about Dublin"; and in 1889 I received from Colonel Dawson some undoubted specimens of *T. cantiana* said to have been collected by his son in a particular spot in Stillorgan Park; but Dr. Scharff and others have assiduously and closely investigated the precise locality indicated by Colonel Dawson, as well as the park generally, without finding a trace of the species, and believe that this reported occurrence must be due to some error.

On the Continent its distribution as far as at present reliably ascertained is more erratic, but its recorded range is somewhat unreliable, owing to the true limits of this species being as yet not authoritatively defined. The *Helix earbasiana* Drap. is usually regarded as synonymic with or a variety of the present species, but others regard it as merely a larger form of *Theba earbasiana*, or as a distinct species to which various names have been applied; but no evidence has been adduced of any differences in internal structure in justification of its separation from *T. cantiana*, though Mosquin-Tandon's figure of the internal organs must not be overlooked, although its correctness has never been confirmed.

**GERMANY.**

Oldenburg—Found along the north-west coast of Germany, between the River Elbe and the River Ems, especially about Eckwarden, Seefeld, and Ellenserdamm in the Bay of Jahde. It is also recorded from the banks of the Lower Weser by Kohlmann.

Holstein—Recorded from the neighbourhood of Hamburg by Prof. Weldon.

Schleswig—Sub-var. *reddingensis* recorded by Schlesch from Rödding.

**NETHERLANDS.**

Belgium—Only authoritatively recorded from West Flanders at Bruges, Ostend, Nieuport, Heyst, and Blankenberghe.

East Flanders: A dead shell only has as yet been found in the Polders, Assenede. Antwerp: At Malines, Santvliet, Willebroeck, and the banks of the Escaut. Especially fine specimens have been found in the area at Antwerp between the gates of Berchem and St. Georges.

Brabant: It is reported from Wechter and from Brussels. M. Colbeau thinks the latter locality erroneous, and states that he endeavoured to introduce the species in Brussels, but that the shells dwindled in size and the colony died out in two or three years time.

Holland—In Zealand it is common by the Selztæt; in the Polders of Canisvliet near Westdorp, and common at Sluys-kill.

South Holland: Reported by M. M. Schepmann.

North Holland: Collected by Mr. F. H. Sikes at Koog on the Island of Texel in Apr. 1913; and also enumerated by M. M. Schepmann as inhabiting the province.

**SWITZERLAND.**

Vaud—*H. cantiana* var. *rubella* reported from Lausanne by Miss Hele.
THEBA CANTIANA.

FRANCE.

This species is recorded by Moquin-Tandon as inhabiting northern and central France, while Reeve states that it inhabits chiefly the central and southern departments. As *H. cantiana*, *H. carthusiana* Drap., or other of its different names, it has, however, been reported by various observers from Alpes Maritimes, Basses Alpes, Basses Pyrénées, Bouche-du-Rhône, Calvados, Drome, Gard, HauMe Garonne, Hérault, Languedoc, Isère, Meurthe-et-Moselle, Nord, Pas-de-Calais, Rhône, Somme, Var, Vaucluse, Vienne, Voges, and the Island of Corsica.

ITALY.

The typical *T. cantiana* is, according to Prof. Pollonera, doubtfully present in Italy or Sicily, but in the various varietal or subspecific forms it is widely distributed and actually

Recorded from numerous localities by many observers in Abruzzi, Campania, Emilia, Liguria, Lombardy, Marches, Piedmont, Tuscany, Umbria, Venetia, and the island of Sicily.

*H. osini* Porro recorded from basly ground Sezze, Romana, by Statuti; and by Valentini from Macera della Morta, near the summit of Pizzo di Siva, Marches.

AUSTRO-HUNGARY.


**Carniola**—Reported from Carniola by Clessin, who, however, doubts the record.

*H. carthusiana* Drap. is, however, also catalogued from Wippacher Thal., etc., in the same region, by Herr F. J. Schmitz.


**Goritz**—Goritz, Miss F. M. Hele.

**Dalmatia**—Recorded by Schrickinger-Neudenberg.

BALKAN PENINSULA.

**Greece**—Var. *messecino* Blanc (Famme Mal. Greece, 1879, p. 41), which may possibly be a form of this species, is recorded from Kalamata in Messinia by Blanc; from near Athens, from Parnassus in Phocis, from Patras, and from the Ossaspitze in Thessaly, by Dr. O. Böttger; reported by Mr. J. R. le B. Tomlin from Olympia, Delphi, Corinth, Sphacteria, and Ithome; and from the Sporades.

**Roumelia**—Recorded by Mr. G. K. Gude.

IBERIAN PENINSULA.

**Spain**—Graells cites *Helix carthusiana* Drap., as common throughout all Spain; and Prof. Hidalgo also lists *H. cantiana* as an inhabitant of the country; but M. Morelet states that its existence is doubtful.

**Portugal**—Lovell Reeve (British Mollusks, 1863, p. 67), noted *H. cantiana* as Portuguese on the authority of M. Morelet's record of a larger and opal white variety of *Helix carthusianella* found only about Oporto. M. Morelet informed me in 1887 that Reeve was in error in attributing this larger variety to *H. cantiana*, the species being as stated *H. carthusianella*.

RUSSIA.

**Taurida**—*H. galloprovincialis* var. recorded from Sebastopol by Dr. Kobelt.

**Asia Minor.**

**Brussa**—Prof. von Martens records *H. cantiana* from Kumkale, collected by Herr Virehow.

**Palestine**—Dr. Böttger records the var. *longii* from Haifa.

NEARCTIC REGION.

**Canada.**

**Quebec**—Discovered by Mr. F. R. Latchford on the upper slopes of the cliff upon which the citadel of Quebec stands, and recorded in the American Naturalist for Nov. 1885; this occurrence was confirmed by Mr. Hanham, who found it common on the cliff bordering the "Plains of Abraham," and extending to the citadel, but not noticed in the city (Nantillus, Jan. 1897).

**Ontario**—Reported from Hamilton by Mr. G. K. Gude.
Theba cartusiana (Müller).

1767 La Chartreuse, Geoffroy, Traite des Coq., p. 32.

1821 — (Zeaabrun) binacrinata Gray, Med. Repos., vol. xv., p. 239.
1833 — cailabris Jeffreys, Linn. Trans., vol. xvi., p. 590.
1837 — gibbsii Leach in Brown's Ill. Conch., p. 11, pl. i., f. 18.
1841 — gibrisa Ziegler ex Lad., Pfeiff. Symb., i., p. 60.
1887 — (Cartusiana) cartusiana Tryon, Man. Conch., vol. iii., p. 195, pl. 44.
1880 — sarvianis Bourg. in Servais, Moll. Esp., p. 52.
1837 Fratricola cartusianaella Held, Isis, p. 214.
1837 Bradybema cartusiana Beck, Index Moll., p. 19.
1852 Theba cartusianaella Leach, Syn., p. 69.
1833 Hygromia cartusiana Adams, Genera Moll., p. 214.

History.—Theba cartusiana was first noticed by Geoffroy in 1767 under the name of "La Chartreuse.

The binomial Helix cartusiana bestowed by O. F. Müller in 1774 probably on account of its being found in the vicinity of a Carthusian monastery, is the latinized form of Carthusian, and the change to earthiana made by subsequent writers was due to their impression that the letter k had been inadvertently omitted by him.

In 1803 Draparnand mistaking the H. cantiana Mont. for H. cartusiana applied the true cartusiana the name of Helix cartusianaella.

In 1814 Mr. Gibbs discovered the species in Britain, and sent specimens to Colonel Montagu, who in ms. applied the name Helix gibbsii to them; but it was not published as a British species until 1820, when Baron Férussac recorded it as British in the Journ. de Physique as Helix gypsi, an evident misapprehension of gibbsii.

With the present species I am happy to associate the late Mr. Richard Rimmer, F.L.S., of Dalawoodie, Dumfries, and am fortunate in being able through the kind interest and sympathy of Miss M. Henriette Rimmer to present the accompanying characteristic portrait.

Mr. Rimmer was an accomplished and enthusiastic conchologist, and the author not only of the popular manual "The Land and Freshwater Shells of the British Isles," but of several interesting special studies of the same subject, which appeared from time to time in the Journal of Conchology and other scientific magazines.
Plate VIII.

Distribution of *Theba cartusiana* (Müll.)

In the Counties and Vice-Counties of the British Isles.

### ENGLAND AND WALES.

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<tr>
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<td>Mayo, W.</td>
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<td>Waterford</td>
<td>Galway, E.</td>
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Probable Range.

Recorded Distribution.

Distribution verified by the Author.

Geological Distribution.
The long list of synonyms given above on the authority of responsible writers does not exhaust the list, the names *H. gregaria*, *H. pelliculata*, *H. clausialis*, and *H. incurvis*, all of Ziegler, the *H. iana* and *leptomphala Locard* and many others may be added, all indicating some slight local modification in the shell.

**Diagnosis.**—*Theba cartusiana* is most closely related to *T. cantiana*, but differs in the shell being of smaller size and more opaque when aged; the spire is more depressed, the apertural rib more developed, and the umbilicus much smaller and more contracted.

**Internally,** it differs by the much less degenerate stage of the dart-sac and its accessory gland, which in the present species retain the general outward aspect of those organs, while in *T. cantiana* they have dwindled into a long and slender cecum.

**Description.**—The animal has a somewhat slender body, obtuse in front, narrowly acuminate and somewhat keeled behind, of a yellowish-grey colour, becoming yellower dorsally, but more translucent and colourless in the rear; the whole upper surface is overspread by somewhat small irregularly-shaped and slightly darker tubercles, many speckled with opaque-white at their summits, which become elongate and sinuate in shape when the animal is fully extended; the dorsal grooves are indistinct and enclose a longitudinal row of narrow and almost linear tubercles; the remainder of the tuberculation on the anterior end of the body is directed obliquely forward and downward. Genital grooves almost imperceptible, especially on the left side; facial area simply tubercular; foot-margin or fringe narrow with fine blackish-grey linesation; foot-sole yellowish-grey, narrowly margined by a darker grey; ommatophores long and slender, when fully extended finely tuberculate, and showing the dark retractor along the whole length of their upper surface, and continuing for a space along each side of the dorsum; lower tentacles unusually long, with their dark retractors well marked and deeply pigmented at their apices, and at their bases a muscular divarication is perceptible through the skin; mantle variable in pigmentation, but usually yellowish, marbled and flecked with black, the margin brown or brownish; with the respiratory orificedarkly and broadly defined, especially above. The epinephalon is usually thick, solid, and of a dull opaque, eretaceous white.

The shell when containing the animal is on the upper side of a general pale leaden colour, with a brownish tinge on the uppermost whorls; the basal region is usually whitish, tinged faintly with brownish; the peripheral region shows very perceptibly the very elongate, pale yellowish renal organ at the commencement of the penultimate whorl, the upper margin of the organ being almost coincident with the point of junction of the upper lip of the aperture with the shell; the venation of the organ is quite visible through the shell, as are also the main ramifications of the pulmonary vessels on the body whorl near the aperture.

\[\text{Fig. 111.} \quad \text{Fig. 112.} \quad \text{Fig. 113.} \quad \text{Fig. 114.}\]

**Fig. 111.**—Frontal aspect, natural size; and **Fig. 112.**—Upper aspect of *Theba cartusiana*, enlarged (after Draparnaud).

**Fig. 113.**—Frontal aspect; and **Fig. 114.**—Upper aspect of *Theba cartusiana*, natural size (after Dupuy).

**Shell** globose, depressed, spire only slightly raised, but more convex basally; whorls 6, rounded but with a slight supra-peripheral angulation; of an opaque and somewhat opalescent milky-white colour, becoming brownish and more translucent as the aperture is approached, where this coloration is abruptly interrupted by the broad whitish cincture, representing the well-developed and whitish internal submarginal rib, as seen through the shell substance, the outer apertural margin is brown; the shell surface is smooth and glossy, with a few subobsolete striae, and also overspread with irregularly reticulate microscopic sculpture, and faint spiral

\[3/9/17\]
striation. Aperture broadly lunate, margins rufous brown and slightly expanded, but more dilated basally, and slightly expanded over the Narrowly perforate umbilicus.

Average size of British specimens: Diam., 12 mill.; alt., 7 mill. Average weight of British shells: 1.08 grains.

Internally, the kidney or precardial gland shows as a very elongate and recurved organ, bearing some resemblance to the blade of a scythe: it is of a pale yellowish brown, with its venation quite perceptible through the shell.

![Fig. 115](image1)

![Fig. 116](image2)

The reproductive organs are chiefly remarkable for the apparent retention of a dart-sac and accessory gland similar to that seen in certain Hygromia, but the dart-sac shows no signs of the presence of a dart, though in lieu of that weapon the distal portion of the sac has become elongated into a narrowly cylindrical cecum which, probably by eversion, functions as an excitative organ. The ovotestis is rather compact with a fairly long hemorrhoidite duct closely convolute and thickened towards its lower end; the albumen gland is elongately lingual form, distinctly concave on its inner face, and of a yellowish colour with sometimes a greenish tinge: the vesicula seminalis is elongately ovoid, rugose, and of a glandular character; the oviduct is of a transparent grey, distinctly sacculate, and the prostate is granulate, of an opaque creamy-white, broad, and conspicuous;

![Fig. 117](image3)

![Fig. 118](image4)

![Fig. 119](image5)

Fig. 115—Proximal portion of the alimentary canal of T. cartusiana, showing the oesophagus, salivary glands, crop, stomach, and the origin of the gut, x 3.

Fig. 116—Kidney or renal organ, also showing its close association with the heart, x 3.

The reproductive organs of Thers cartusiana (Mull.), Lewes, x 3, Mr. C. H. Morris.

Fig. 118—Proximal end of the reproductive organs of T. cartusiana more highly magnified.

Fig. 119—Enlarged portion of distal end of reproductive organs of T. cartusiana.

a.g. and a.gl. albumen gland; d. or d. degenerate dart-sac, nascent sarcobelium or excitative organ; e.f. epiphallus; f. flagellum; h. d. hemorrhoidite duct; m. gl. mucus-gland; o. ovo-testis; o. d. oviduct; p.s. penis-sheath; s. d. and s. d. sperm duct; s.f. spermatheca; v.d. vas deferens; v.s. vesicula seminalis.

The spermatheca is bluntly triangulate, and of an opaque white, with a fairly long and moderately stout stem; the vagina or free oviduct is fairly wide; the vaginal mucus glands are tinged blue, composed of two groups of simple, bifid, or even trifid ceca, 3-5 mill. long, while immediately beneath them are a degenerating dart-sac and accessory gland, which except for a digitiform caecal outgrowth from the distal end of the sac, outwardly present the normal aspect, and are very constant in size and shape, but at present no trace of a dart or gyposubium is detectable, the function of the lost organ being probably now performed by the vermiform distal outgrowth of the dart-sac, which may function as a sarcobelous
egersidium; the penis-sheath is oval in shape, with a peculiar twist at the distal end, which is continued as a moderately long and cylindrical epiphallus, and terminated by a short flagellum; the vas deferens is distinctly and strongly dilated at its junction with the distal end of the epiphallus.

Moquin-Tandon's description and figure of these organs differ from those here figured, showing a very long stem to the spermathecae, and only a long spindle-shaped vesicle to represent the degenerate dart-sac, etc., found in English specimens, leading to the belief that by some error the organs of the true cartusiana have not been figured or described, but possibly those of T. cantiana or some allied form, unless the large South European shell should prove to be a distinct intermediate species.

The figure of the genitalia reproduced by Simroth (Bronn's Tier-reich, iii., p. 198) from Schubert’s is also more in accord with that of Moquin-Tandon than with those given hereafter, but differs from that author's and the annexed figures in shewing an excessively elongated free oviduct or vagina between the mantle glands and the assumed excitatory organ.

The mandible or jaw is about 1½ mill. from side to side, and 36 mill. from the lower or cutting-edge to the upper margin, of an amber colour, but darker brown towards the cutting-edge, somewhat flatly arcuate, with blunt rounded ends, and bearing about eighteen broad, flat and somewhat divergent ribs, fairly regularly disposed over the whole anterior surface, and slightly dentilating the lower or cutting margin, but there is no perceptible trace of a median rostrum.

The radula is of the usual oblong shape, about 3 mill. in length and 1 mill. in width, and resembles that of Th. cantiana, except that the cusps of the marginal teeth are much more elongate in the present species. The organ is constituted by about 140 transverse rows of teeth, each row composed of about 71 teeth, arranged as usual in three series: the median, the admedian or laterals, and the marginals; the lateral series blending with the marginal teeth. The median series is formed by a single longitudinal row of tricuspid teeth, each bearing a stout mesocone, with a distinct ectocone at each side; the admedian or laterals are about twelve in number, bienspid in plan, and larger and stronger than the central rows; the marginals are about twenty-three in number and generally bifid; the cusps being long and comparatively slender, but towards or at the margin of the membrane the ectocone may become bifid.

The formula of an example from Lewes, collected by Mr. C. H. Morris, and photographed by Mr. W. Bagshaw from a preparation by Rev. E. W. Bowell was

\[
\frac{5}{2} + \frac{1}{2} + \frac{1}{3} + \frac{1}{2} + \frac{3}{2} \times 140 = 9,940 \text{ teeth.}
\]

Reproduction and Development.—Nothing is known of the amounts of this species, or any details of the preliminary coquettings leading up to conjugation, but according to Bouchard-Chantereaux and others the eggs are laid in April and May, and specimens were also found in September at Dover by the Rev. Canon Horsley, full of eggs, apparently ripe for exclusion, so that it is probable that egg deposition is continued intermittently through the summer and autumn months.

The eggs are globular and opaline, with a thin, membranous and slightly nacreous envelope; they are about 1½ mill. in diameter, and therefore very large for the size of the animal and almost as large as those of T. cantiana,
whose bulk is so strikingly greater; each batch is composed of from 40-80 eggs, which hatch in about a fortnight, and become adult towards the end of their first year. The shell when immature is said to be hispid, thin, and transparent, but gradually thickens, becomes more opaque, and the hairy investment lost as growth proceeds, the aperture being completed when full size is attained.

**Habits and Habitat.** — Although Moquin-Tandon describes this species as rather slow, the animals studied by me were very bold, active, and fearless, carrying the shell somewhat inclined when crawling, and capable of travelling two inches in one minute, or at the rate of a mile in about twenty-two days.

Though it may occasionally be found on rushes in marshy places, it usually frequents dry and arid, calcareous or sandy ground, clinging to the vegetation or to the grass stems, but at Granville, Manche, it was observed by Mr. F. H. Sikes to have an especial predilection for the dead nettle (*Loomium* sp.). Though chiefly confined to chalky soil and to the vicinity of the sea in this country, it is by no means restricted thereto in Europe, being found quite in the centre of the continent and on a variety of geological formations and under varied physical conditions, flourishing on dry and arid ground, but also prospering on marshy land; and living not only on the plains, but ascending the Pyrenees to a height of 3,000 feet, and in the Emilian Appennines may attain an altitude of nearly 3,600 feet.

During the day it adheres firmly by means of the epiphragm to the stems of plants and grasses, or other suitable objects, frequently fully exposed to the full influence of the hot summer sun, the closure of the aperture of the shell by the epiphragm preventing the evaporation of the natural moisture and consequent desiccation of the animal.

If removed from its position and the epiphragm necessarily broken, the animal promptly emerges from its shell, the hind part of the foot being first extruded with an energetic jerk, quickly followed by the head and body.

The heart pulsations would appear to be more active than in *Ashfordia granulata*, as a specimen in August 1894 showed 56 pulsations per minute at a temperature of 63° Fahr.

It appears to dislike strong winds, and this may account for its preference for the hollows of the downs, where it is somewhat sheltered from its violence, which in exposed places probably dislodges the shell from its fixation to the vegetation, and compels resort to concealment, as during high winds no shells are to be found in exposed positions, but on still days and in sheltered spots the animals remain affixed to the vegetation and fully exposed to the sun’s rays.

No direct observations on the food of this species have been published, but it is inferred that the plants frequented are probably fed upon.

During severe weather the animals bury themselves in the sand or earth, and according to the observations of Mr. Hillman apparently resort to similar protection against drought, as few or none can be found at such times.

**Enemies.** — Retowski has recorded that in the Crimea, Russia, this species is preyed upon by *Phospnaga hortigata*, a coleopteron of the family Silphidae, while *Zonites algirus* devours the animal quite to the apex of the shell.
DR. GERMAIN has also noticed that the animal is endowed with the power of giving off a very pronounced odour of "mushrooms" when irritated, which may possibly be some protection against certain of its enemies or may have some other signification.

**Protective Resemblance.** — In August 1894, Mr. Lionel E. Adams found at Sandwich, East Kent, numerous shells of this species clustered upon the withered stems of the hound’s tongue (*Cynoglossum officinale*), and so closely resembling in appearance the clusters of burrs or seed capsules of the plant that it was really difficult in the sunlight to distinguish one from the other.

**Geological Distribution.** — *T. cartusiana* is not known in deposits older than the Pleistocene; its remains in England show a diminishing or retreating species, as it is now scarce and local or quite unknown in districts where its remains demonstrate its former existence.

**Pleistocene.** — In France, it is recorded from the Upper Pleistocene deposits of the Somme Valley, and from the bone-brecia of Corsica by M. Locard.

It is also recorded by Dr. L. Germain from the loess of the Lyonnais, and of Chartreux, Lyons; also from similar deposits at Chaux and Collonges, Mont d’Or, Rhône, and at Bublanc in the Ain.

**Holocene.** — In Sussex W., it has been found by the Rev. W. A. Shaw in post-Pliocene drift thrown up by the moles from a depth of 2-3 feet on the open land on the north side of the South Downs, West Stoke, near Chichester.

In Sussex E., it has been recorded from the Neolithic hill-wash, Brighton.

In Kent E., it has been recorded from a section disclosed by the cutting of the road under the South Downs, behind Folkestone, and from a deposit at Dover, collected by the Rev. R. A. Bullen.

In Kent W., it has been recorded in an early Neolithic interment at Cuxton; and from Holocene deposits at Otford, Exedown, Greenhithe, and Northfleet.

In Essex N., it has been recorded from the railway cutting and brickyard to the west of Sudbury by the Geological Survey; and from shell marl, Bushey Leys, near Felstead, July 1888! by Mr. J. French.

In Suffolk E., it is recorded from the alluvial beds at Butley by Mr. Alfred Bell.

In Glamorgan, two specimens were found during the excavation of a Roman villa at Llantwit-Major (J. Storrie, Trans. Cardif Nat. Soc., 1888, vol. xx., p. 59).

In Spain, it has been found by the Rev. R. Ashington Bullen in a ten-feet thick deposit near the bridge over the railway, Manresa, Catalonia; and also collected by him from a hill-wash at Porto-Pi, near Palma, Majorca, Balearic Isles.

In Italy, Capt. G. B. Adami has found two specimens in the Lower Post Pliocene peat beds and numerous individuals in the upper layers at Polada, near Lonata, Lombardy; and Signor Valentini has found it in the "Travertin" of the Tronto Valley, Ascoli-Piceno, Marches.

**Variation.** — The slight local modifications frequently perceptible in the shell have been utilized by authors to split up the present species into a considerable number of species and varieties, many of which, as in *T. cantiana*, have very small value or importance, and which it is difficult and almost impossible to correctly allocate in appropriate groups, owing to the lack of definite characters in the descriptions, and thus leading to perennial disputes upon the true status of the different forms, which can only be definitely settled by a knowledge of their internal structure.

*T. cartusiana* varies considerably in size, the largest forms being strictly continental in range and usually flatter and paler than the smaller, more globose and deeper coloured British shells, and usually frequent moister and richer feeding grounds than the dwarfer varieties, which are generally believed to be stunted, owing to living upon more arid and less favourable places.
The differences of texture and colour of the shell are exemplified by the specimens from the sandhills of Sandwich, which, as observed by Mr. L. E. Adams, are all thinner and much darker in colour than the individuals living upon the chalk lands.

The traces of banding occasionally more or less clearly perceptible in this species are of the same origin and character, and admit of the same explanation as those of *Theba cantiana* and the *Hygromicus* generally; they are vestiges of an ancient band system, whose pigment has gradually become diffused and confluent, and is now slowly tending to obliteration. The white somewhat calcified supra-peripheral zone is the division between the upper and lower group of bands, such as is now represented by the space between bands 3 and 4 in the *Pentatania*.

**Variations in Form of Shell.**

**Var. conoidea** Branczik.


*Helix inoexia* Bourg., *in loc.,* Prod., 1882, pp. 72 and 316.

Shells with a somewhat raised spire. I have not seen the original description of this variety or its date of publication, but as it is the most suitable name and probably the oldest, I have adopted it.

The sub-var. *rubricollis* Kmn. is of compact shape, with elevated spire, and has rib and lip fawn coloured.

The sub-var. *eusephana* is described as shell conical in shape and very compactly and tightly coiled, usually of a yellowish tint, with the labial rib of a vinous-colour. *Diam.,* 14 mill.; alt., 10 mill.

The sub-var. *innoexia* has a somewhat conoid spire, the last whorl rounded and scarcely deflected, and aperture almost semicircular. *Diam. 15-16 mill.; alt. 9 mill.*

**Continental Distribution.**

**France**—All the shells found at Preste, Haute Garonne, in Aug. 1878 by Abbe Dupuy belong the variety which is equally globose above and below.

Sub-var. *inoexia* is recorded from the vicinity of Cannes and Nice, Alpes Maritimes, by Com. Caziot, and also from Valence, Drône.

**Italy**—Sub-var. *eusephana* was discovered in Naples by M. Bourgnignat in 1859.

**Austro-Hungary**—Sub-var. *conoidea*, Branczik, Travnik, Bosnia; F. H. Sikes. Sub-var. *eusephana* found on the shores of Lake Balaton, Hungary (Servain, l.c.). Sub-var. *rubricollis*, Travnik, Bosnia! (Standinger and Bang Haas).


The var. *depressa* Pascal is described as of similar size to type form, but very flat above, and with a somewhat prominent keel. The sub-var. *depressa* Caziot is described as resembling the type-form, but much more depressed, and not so high in the spire; the mouth is also more compressed and longer. *Diam.,* 12 mill.; alt., 6 mill.

**Fig. 133.**

**Var. depressa** is described as shell large, of a yellowish colour, whorls rapidly enlarging, and the last double the breadth of the penultimate, strongly striate, umbilicus more open. *Diam.,* 19 mill.; alt., 11 mill.

**Fig. 134.**

**Fig. 135.**

**Fig. 136.**

**Fig. 137.**
THEBA CARTUSIANA.

The occurrence of sub-var. ressmaani in Carinthia, Carniola, and Friul has, according to Herr Clessin, given rise to the statements of the occurrence of T. cartusiana in those regions, the depressed spire, however, infallibly shows its relationship to be with T. cartusiana.

The sub-var. sarriensis is figured by Comm. Caziot as a depressed form, and may perhaps be suitably placed here. It is said to be identical with the form figured as H. cartusiana by Prof. Hidalgo in his Catal. Iconogr. Moll. Espagne, ii. 249-251, and is stated by M. Pagot to be the common Spanish form of the species. A subsidiary form of H. sarriensis, which has been distinguished by Caziot as var. stagnensis, is of the same size, but differs by its more open umbilical eleft, its less rounded aperture, and less arcuate columella.

The sub-var. ventiensis is more depressed, the whorls increasing irregularly in size, aperture depressly semilunar and arched above.

The sub-var. almonis is described as large, very depressed, and smooth, of a somewhat opalescent whitish colour, tinged with reddish towards the aperture, which is well rounded. Diam., 20 mill.; alt., 10 mill.

Sub-var. almonis was described by Signor Statuti as a form of Theba cattiana Mont., but after a protracted and careful study of authentic specimens received from the author himself, I have removed it from association with that species and placed it with Theba cartusiana.

CONTINENTAL DISTRIBUTION.

France—Var. depressa Pascal, environs of Choisy-le-Roi, and d'Orly, department of the Seine, and Villeneuve St. George's, etc., Seine-et-Oise (Pascal, i.e.).

Sub-var. depressa Caziot is found on the orange trees of the Imperial Park, St. Philippe, near Nice; also in the fields on the banks of the Paillon, to the west of Fonts-Jerrier on the road from Esearene (Caziot, i.e.).

Sub-var. sarriensis is recorded from the observatory gardens of Mont Gros, and at the foot of hedges on the right bank of the Paillon, near Nice, Alpes Maritimes, by Comm. Caziot, who also records the sub-var. sarriensis-stagnensis Caziot from the alluvium of the Siagne, Alpes Maritimes.

Sub-var. ventiensis, very common about Nice, etc., Alpes Maritimes, by Caziot.

AUSTRO-HUNGARY—Sub-var. ressmaani is recorded from Carinthia, Carniola, and near Monfalcone, Goritz, by Clessin.

Italy—Sub-var. ressmaani is recorded from Friul, Venetia, by Clessin.

Sub-var. almonis lives on the grassy banks of the ditches among the vineyards in the valley of the historical River Almone near Rome (Statuti, i.e.).

Spain—Sub-var. sarriensis has been recorded from Barcelona and other places in Catalonia.

Asia Minor—Var. depressa found at Jaffa, Feb. 1904! by Mr. F. H. Sikes.

Var. major Pascal.

*Helix cartusiana* var. magna Porro, Mal, Comasca, 1888, p. 25.
*Helix cartusiana* var. major Pascal, Moll. Haute Loire, 1873, p. 38.
*Helix cartusiana* var. major Pirona, Moll. Friuli, 1865, p. 7.
*Helix cartusiana* var. major Jenner, Journ. of Conch., 1891, p. 363.
*Helix castrulais* Egger in schud., 1899.

The sub-var. major Pascal is 19 mill. diameter and 10 mill. altitude.

The sub-var. major of Pirona attains 17 mill. diameter. The sub-var. major Jenner is described as 15 mill. diameter. The sub-var. major of Westerlund is 18 mill. diameter and 9 mill. altitude.

The var. magna Porro is described as 13 mill. diameter.

The sub-var. glaustralis Zgl. is described by Westerlund as thinner, transparent, and whitish in colour, with an obliquely-rounded mouth, and is figured by Rossnässler as 16½ mill. in diameter.

ENGLAND.

Sussex E.—Sub-var. major Jenner occurs about Lewes, J. H. A. Jenner.

Kent E.—Sub-var. major Jenner, Lydden near Dover, 1902, G. K. Gade.

CONTINENTAL DISTRIBUTION.

France—Sub-var. major Pascal is recorded from St. Denis, department of the Seine, by Pascal; and sub-var. major Moquin from Bastia and Fango, Corsica, by Moquin-Tandon.
Itay—Var. magna is described by Porro from examples from Como, Portu, Lombardy. Sub-var. major Pirona is recorded by its author from Palun, Porto-giuro, Isola, S. Andrea, etc., in Venetia. Var. major, Rome, 1877, Mrs. Fitzgerald. Sub-var. ausliralis is ascribed to Italy by Rossinissler.

Austro-Hungary—Specimens, 21 mill.in diameter, from Buda Pest, Hungary, in the Sikes Collection, now in the British Museum. Sub-var. ausliralis is ascribed to Dalmatia by Dr. Paetel.

Greece—Sub-var. ausliralis is recorded by Dr. Westerland.

Var. parva Porro.

Shell smaller, spire more raised, mouth rounder, lip or peristome brown, with a milk-white labial rid, and a corresponding whitish transverse zone outside.


Helix olivieri Michaud, Compl. Drap., 1831, p. 23 (not of Ferussac).


Helix (Zevenia) carthusiana var. minor Moq., Hist. Moll., 1855, ii., p. 207, pl. xvi.


Helix carthusiana var. minima and minor Pir., Moll. Ecano, 1856, p. 132.


Helix leptomphala Bourguignat, in Locard, Prodr., 1882, pp. 72 and 206.

Helix stagnina Bourguignat, in Locard, Corp. Fr., 1894, p. 108.

Helix ventiensis var. minima Caziot, Moll. Monaco, 1910, p. 96, pl. iv., f. 51.

Helix inoxia var. minor Caziot, Moll. Monaco, 1910, p. 97.

Helix carthusianella var. minor Caziot, Moll. Monaco, 1910, p. 93, pl. iv., f. 22.

Sikes—Sub-var. carthusianella is described by Sikes.
a study of Michaud's description and his reference to the figure of Draparnaud as representing his species. It is, according to Dr. Gassies, the Helix incolata of Parreyss, which has been regarded as identical with H. onychina Rossn., but he confuses this form with var. rufihabris.

Inhabitats dry places in the maritime districts, frequenting the thistles and Eryngiums growing there.

**SUSSEX E.**—Lewes, Oct. 1899! T. S. Hillman.

**Kent E.**—Chalk hills, Folkestone, Nov. 1899! Mrs. Fitzgerald, Dover, Sept. 1913! W. E. Brady. Patrixbourne, a colony exclusively of this variety, averaging 7½ mill. in diameter, Lionel E. Adams.

**ENGLAND.**

**CONTINENTAL DISTRIBUTION.**

**France**—Alpes Maritimes, Aisne, Basses Alpes, Gard, Gironde, Hérault, Morbihan, Seine-et-Oise, and Vendée. Mornex, Upper Savoy! and Aix-les-Bains, Savoy! Rev. S. Spencer Pearce. Sub-var. minor of Caziot is recorded by Caziot from the left banks of the Var, Alpes Maritimes.

Sub-var. minima Caziot, Alpes Maritimes.

Sub-var. stagnina is common amongst the pines at the chateau of Palarea near Nice and in other localities in the Alpes Maritimes.

Sub-var. leptamphela is common in meadows on the banks of the river Var; also in pine woods at an altitude of near 2,000 feet on Mont Chauvé and other localities in the Alpes Maritimes. It is recorded by Dr. Westerlund from Toulouse, Hante Garonne, and Nantes, Loire Inferieure.

Sub-var. inoecia-minor is found at St. Vallier, and in the alluvium of the river Loup, Alpes Maritimes.

Sub-var. lamalouensis, Lamalon-lès-Bains, Hérault (Reynes, Lc.).

Sub-v. suurieinias-minor, alluvium of river Siagne, Alpes Maritimes (Caziot, Lc.).

Sub-var. ventienis is recorded from Nice and other places in the Alpes Maritimes by Comm. Caziot.

**AUSTRO-HUNGARY**—Buda-Pesth, Hungary! R. D. Darbishire. Helix incolata Parreyss, Transylvania.

Italy—Many localities in Emilia, Lombardy, and Venetia. A specimen, 6 mill. diameter, from roadside, near railway station, Erba, near Como, Lombardy, Rev. S. Spencer Pearce. Sub-var. minor Pirona, Tagliamento, etc., Venetia.

Sub-var. minimina Strobel is recorded from several localities in Emilia by Strobel.

Sub-var. arcensis is recorded from Lombardy at Belgioioso near Pavia by Pini; and reported from Como by Marquis Monterosato. From Pielmont Prof. Pollonera records it from near Turin, and the subsidiary form lavarensis from same province.

**Asia Minor**— Smyrna, specimens 7½ mill. diam. collected by Fritsch in 1874.

**VARIATIONS IN COLOUR OF SHELL.**

**Var. lactescens** Picard.

Helix cartusiaonica var. k lactescens Picard, Moll. Somme, 1840, p. 223.

Helix cartusiana var. alba Jenner, Journ. of Conch., 1801, vi., p. 363.

Helix cartusiana var. casta Monterosato ms.

The var. lactescens Picard, is described as shell milk-white and transparent, aperture of same colour, with a whiter rib. The sub-var. lactescens of Moquin-Tandon is of a transparent milky-white, without band.

The sub-var. alba is described as "pure milk-white, mouth and rib white."

The sub-var. casta conforms exactly to the description of Picard.

**SUSSEX E.**—Sub-var. alba, this beautiful variety was discovered at Ranscombe Bow, near Lewes, in 1889, by Mr. T. S. Hillman, and Mr. J. H. A. Jenner afterwards found specimens in 1890 in a neighbouring locality.

**ENGLAND.**

**CONTINENTAL DISTRIBUTION.**

**France**—Var. lactescens described by Picard from specimens found in the department of the Somme; recorded by Pascal from St. Denis, department of the Seine; by Locard from Lyons in the department of the Rhône, and at Miribel and Belley, department of the Ain; and by Dubnief from Hérault.

Sub-var. cauda Monterosato, Como, Lombardy! Marquis Monterosato.

Portugal—The larger opal-white variety recorded by Morelet from Oporto, and referred by Revento Helix cartusiana, really belongs to this species, as I was assured by M. Morelet himself.

The var. lutescens of Moquin-Tandon is described as yellowish.
The var. lutescens of Locard is described as shell yellowish, peristome brown interioiy, and reflected.

CONTINENTAL DISTRIBUTION.

Germany— Mentioned by Clessin as occurring, but without citing precise locality.

France—L'Isle Adam, Seine, and also on the banks of the Marne, Seine et Marne (Pascal, Moll. Haute Loire, 1873, p. 38). Dr. Gratcloups records this form as var. 2 from Dax, Landes; and Dubrevill from Hérault.

Italy—A flaxen-coloured form recorded from S. Cro, near Palermo, and the Madonie, Sicily, by Benoit.

Var. fuscens Pascal, Moll. Haute Loire, 1873, p. 38.

Helix cartusiana var. littoralis Stosich.

The var. littoralis may perhaps be regarded as a somewhat paler form of this variety.

Kent E.—A near approach to this variety was found by Mr. W. E. Brady at Seabrook near Hythe, Sept. 1913!

CONTINENTAL DISTRIBUTION.

France—L'Isle Adam, Seine (Pascal, l.c.); and Aix-les-Bains, Upper Savoy! Rev. S. S. Pearce.

Austro-Hungary—Sub var. littoralis, Monfalcone, Goritz (Marq. Monterosato).

Var. encye Servain.

The var. encye is very globose swollen, of a subcarneous violaceous tint, tending to bluish. Diam. 15 mill.; alt. 10 mill.

CONTINENTAL DISTRIBUTION.

Austro-Hungary—Banks of Lac Balaton between Fured and the peninsula of Tihany, Hungary.

VARIATION IN COLOUR OF APERTURE.


The var. rufulabris Jeffreys is described as shell smaller, with the inside lip and rib of a reddish-brown colour.
The sub-var. rufulabris Caziot is small, milk-white in colour, more globose and malleate. The sub-var. rufulabris of Pascal is smaller than the type, very thin, with a red apertural rib; and the sub-var. rufulabris of Girmain is described as a distinct species, differing from T. cartusiana by its uniformly smaller size, more globose form, more elevated spire, rounder mouth, and larger body whorl, though less
developed in diameter. The animal is also described as differing from *T. cartusiana* in being black with a whitish line on the neck, and white or yellowish marblings on the mantle, while in *T. cartusiana* the mantle is said to be white with black or more frequently yellow marblings.

The sub-var. *archimedea* is described as possessing a reddish labial rib. Diam., 13 mill.; alt., 10½ mill.

According to Dumont and Mortillet and others, this is an arid ground variety, differing from *T. cartusiana*, which congregates in moister places, by living in dry stony localities or on ground covered with brushwood; the deficient moisture and warmth imparting to the animal and shell a deeper tint, retarding the development and rendering the shell more globose, with rounder mouth and more elevated spire.

**ENGLAND.**

**Sussex W.**—Common about Littlehampton (Jeffreys, l.c.).


**Kent E.**—Folkstone, 1882! Mrs. Fitzgerald.

**CONTINENTAL DISTRIBUTION.**

**France**—M. Gratedoups ascribes it a distribution over almost all France; while M. Germain states that it has been reported from almost every department. I have noted records from Ain, Aude, Alpes Maritimes, Basses Alpes, Basses Pyrénées, Calvados, Champagne-Métropolaire, Dronne, Gers, Hautes-Pyrénées, Landes, Morbihan, Orne, Oise, Rhône, Seine, Seine-et-Oise, Savoy, and Upper Savoy, Var, Vaucluse, and Yonne.

**Switzerland**—Reported from Vevey, Canton Vaud, by Lient.-Col. Parry; and by Dumont and Mortillet for Lauterme and Geneva.

**Italy**—Rare in Piedmont in the alluvium of the River Po near Turin, Prof. Polomera; and collected at Menaggio, Lombardy, in Sep. 1886 by J. R. le B. Tomlin.

Sub-var. *archimedea* first found in the ancient Roman Amphitheatre, Syracuse, Sicily; it is rare in the fields about Palermo and the Madonie (Benoit, op. cit.).

**Spain**—Var. *rufulabris* recorded from Escalona, etc., Aragon, by Prof. Hidalgo.

**Var. leucoloma** Stable, Moll. Lugano, 1859, p. 54.


The var. *leucoloma* is described as smaller, and with an entirely white peristome or lip. The sub-var. *leucoloma* Taylor is small, peristome and rib white.

The sub-var. *albolabiata* has the peristome whitish or perfectly white.

**Kent E.**—Var. *leucoloma*, Beechborough, near Folkstone! Mrs. Fitzgerald.

**CONTINENTAL DISTRIBUTION.**

**France**—Sub-var. *albolabiata*, rare, Balagny, Oise (Baudon, l.c.).

**Italy**—Var. *leucoloma*, Lugano and Castagnola, Lombardy (Stabile, l.c.); and Fint records it as rather rare at Vareme and about Lecce in the same province. Stabile also reports it from the Bormida Valley, and Acqui, Piedmont.

**VARIATIONS IN MARKINGS OF SHELL.**


Body whorl with a rufous supra-peripheric spiral band, which is continued on the upper whorls and clearly visible about the suture line.

This variety is an atavie one, and essentially identical with the var. *albocincta* of *T. continua*; the rufous band is the original colour of the bands reduced to its smallest visible dimensions, and is placed as usual above the pale zonation, which formerly separated the upper and lower group of bands.

Westerlund gives no locality for this variety, but I have a specimen from Syracuse, Sicily, received from the Marquis Monterosato; and another, rather more sombre in colour, collected at Lewes, Sussex, by Mr. C. H. Morris.

**ENGLAND.**

**Sussex E.**—Lewes, associated with the usual form, Oct. 1916! C. H. Morris.
Continental Distribution.

France—The Rev. S. Spencer Pearce has an example collected in 1882 at Grande Chartreuse, Isère, which shows slight but distinct trace of spiral bands at the aperture which may be regarded as occupying approximately the positions of 2345 in the pentatesian formula.

Italy—Syracuse, Sicily! Marquis de Monterosato. Rev. S. Spencer Pearce has a shell from Erba, Lombardy! with a well defined band, but occupying a very limited space at the beginning of the penultimate whorl.


_Shell_ porcellaneous, with numerous translucent radiate markings; peristome entirely white, with a broad snow-white rib.

The sub-var. _diurna_ is described as white, with dark grey flammular markings, of a depressed shape, with an obliquely oblong aperture. Diam. 11/4; alt., 7 mill.

Continental Distribution.

France—Sub-var. _diurna_, Lyons, Rhône, Dr. Westerlund.

Italy—Viareggio, Tuscany, Marchioness Paulucci.

Var. bicolor Pascal, Moll. Haute Loire, 1873, p. 38.

_Shell_ half brown-colour and half milky-white, the shell of usual size, with a red or white internal apertural rib.

Kent E.—Seabrooke, near Hythe, September 1913! W. E. Brady.

Continental Distribution.

France—Fontenay-sous-Bois, Seine-et-Oise (Pascal, l.c.).

Monst. scalare Taylor, nov. monst.

_Shell_ with the whorls more or less dislocated.

Continental Distribution.

France—Millet has recorded a beautifully scalarid shell, found by the lime-kilns of Angers, department of Maine-et-Loire.

Monstr. sinistrosum Jaudouin (Grateloup, Cat. Moll. Fr., 1855, p. 53).

_Shell_ reversed or sinistrally coiled.

Only as yet recorded from Hungary and France.

Continental Distribution.

France—Recorded by Grateloup for Bordeaux, Girondos; and by Moquin-Tandon from the Haute Garonne, and Montpellier, Hérault.

Austro-Hungary—Recorded from Buda-Pesth, Hungary, by Julius Hazay.

Geographical Distribution.—_Theba cartusiana_ though especially southern and western in its distribution is represented in many European countries, but shows many of the characters of a retreating species, being quite absent from north-central Europe, but is found in England, Denmark, Holland, Belgium, Russia, Austria, France, Greece, European and Asiatic Turkey, Servia, Albania, Bulgaria, Romellia, Romania, Italy, Spain, Portugal, Switzerland, Egypt, and Palestine, and from the eastern and western regions of Germany.

In the British Isles it is apparently restricted to a stretch of the South Downs, extending from Hampshire to Kent, and is found sporadically in East Anglia in the living state as well as fossil in the Holocene deposits.

It formerly existed on the East Moors, near Cardiff, believed to have been imported with ballast, but it has also been found in the fossil state...
in deposits of Roman age, exposed during the excavations of a Roman villa at Llantwit Major, near Cardiff, by Mr. Storrie.

It has also been reported from the Yorkshire coast by Mr. T. Hagger; and from near Bath, North Somerset, by Mr. Thos. Rogers and Dr. C. W. Viner, who possessed specimens therefrom.

**Fig. 165.—Geographical Distribution of *Theba cartusiana* (Müll.).**

![Probable Range](image)

**Recorded Distribution**

**ENGLAND AND WALES.**

**Somerset N.**—Specimens labelled "Bath" existed in the collections of the late Mr. Thomas Rogers of Manchester, and Dr. C. W. Viner of Bath, and records exist of the occurrence of this species near Bristol.


**Kent E.**—Common on the sandhills about Sandwich, and on the chalk hills about Beechborough, Folkestone, 1876, Mrs. Fitzgerald. East Cliff and behind the castle, Dover, Aug. 1875, L. E. Adams. Plentiful near golf-links, Dover, July 1896; on the golf-links, Sandwich, Sept. 1900; the Park, Patrixbourne; and a large colony by the side of the canal, Hythe, Aug. 1909, C. E. Wright. Deal, Mr. Corrie and H. C. Leslie.

**Kent W.**—A large number of specimens from Sandwich were liberated about Chislehurst, but appear to have gradually died out (T. D. A. Cockerell, Journ. of Conch., 1884, p. 258).
Surrey—Banstead Downs (D. Cooper, Flora Metropol., 1836, p. 122). Kenneth McKeen has also recorded in the Transactions of the Croydon Nat. Society that *Theba cartusiana* has been found on Banstead Downs by H. T. Mennel and others.

Middlesex—Recorded in the Flora Metropolitana by D. Cooper for Hampstead Heath.

Bucks.—Recorded from near Hartwell House, Aylesbury, Apr. 1852 by E. J. Lowe.

Suffolk E.—A single dead but fresh specimen in good condition found at Little Glenham by Mr. G. T. Rope in March 1899. Rather plentiful on a chalky hedge-bank with a south-west exposure near Needham Market, Oct. 1902: A. Mayfield.

Suffolk W.—A dead shell found at Great Fakenham, Sept. 1908: F. H. Sikes; and another specimen picked up at the same place by Mr. A. Mayfield.


Glamorgan—A colony formerly lived on East Moors, Cardiff, about 1880, but has since disappeared; the ground is now built over, E. W. Wotton.

York S.E.—A specimen found at Hunmanby Gap, Filey, Aug. 1887, T. Hagger.

GERMANY.

Appears to be restricted, more or less closely, to the vicinity of the western and eastern frontiers, and has only been reported from Alsace, Baden, Lorraine, Nassau, Rhénish Prussia, Saxony, Silesia, Slavia, and Westphalia.

NETHERLANDS.

Holland—Heer Schepmann reports its discovery in North Holland in 1914.

Belgium—Several localities in West Flanders, and also reported from the Grand Duchi of Luxemburg with a doubtful record from Colomiers in the province of Liège.

FRANCE.

Though reported as found over the whole of France, this statement is not yet supported by actual records of its existance in every department. It has, however, been reported from fifty-eight of the eighty-six departments into which the country has been divided:—From the Agenais, Ain, Aisne, Allier, Alpes Maritimes, Ariège, Ardennes, Aube, Aude, Aveyron, Basses Pyrénées, Bouches-du-Rhône, Basses Alpes, Calvados, Champagne Méridionale, Charente Inferérieuse, Côtes-du-Nord, Côte d'Or, Drôme, Gard, Gers, Gironde, Haute Garonne, Hante Marne, Hantes Pyrénées, Hérault, Indre-et-Loire, Isère, Jura, Landes, Loire Inferérieuse, Lozère, Lot, Lot-et-Garonne, Maine-et-Loire, Manche, Meurthe-et-Moselle, Morbihan, Nièvre, Nord, Oise, Orne, Pyrénées Orientales, Rhône, Saône-et-Loire, Sarthe, Savoy and Upper Savoy, Seine, Seine Inferérieure, Seine-et-Marne, Seine-et-Oise, Somme, Tarn-et-Garonne, Var, Vaucluse, Vendée, Vienne, Yonne, and the Island of Corsica.

IBERIAN PENINSULA.

Spain—Recorded by Griells as inhabiting the whole of Spain, and precise records are available from every province except Leon and Murcia; it has also been detected by Rev. R. A. Bullen in a Holocene deposit at Majorca, Balcarie Iles.

The var. sorrieosis is smaller than the type form, with a rounder and almost oblique aperture; it is said by M. Fagot to be the prevalent Spanish form, and has been definitely reported from Barcelona and other places in Catalonia.

Portugal—The typical form and var. minor are recorded by Morelet and Prof. Nobre from Valborn, and the public cemetery and environs of Oporto in the province of Minho; Prof. Nobre also cites Lisbon and Setubal, Estramadura: Abrantes in Alentejo, and near Vila Nova de Gaia in Beira.

ITALY.

Probably diffused over the whole of Italy, definite records being accessible for Apulia, Abruzzi, Calabria, Campania, Emilia, Liguria, Lombardy, Marches, Piedmont, Romana, Tuscany, Umbria, Venetia, and the Islands of Sardina, Sicily, Capri, etc.

*H. sirenusana* Bourguignat is only an insignificant variety of *T. cartusiana*, and was based on specimens from Syracuse sent to him by Benoit.
SWITZERLAND.

M. Charpentier records it from hedges and from the banks of Lake Leman in the environs of Geneva, and from Canton Vaud, at Lausanne and Gèlrolles, Dr. Bollinger from Orbe, and M. Roffieu from Chillon and Gorge-du-Chauderon; Dr. Bollinger also cites it from several localities in Basel, Estavayer in Canton Fribourg, and Vaudmarcus in Canton Neuchâtel; while Stabile quotes Lugano, Canton Ticino.

AUSTRO-HUNGARY.

Well distributed over the various countries of the empire, being recorded for Austria, Banat, Bosnia, Carinthia, Carniola, Croatia, Dalmatia, Galicia, Goritz, Hungary, Herzegovina, Illyria, Istria, Moravia, Odenburg, Pesth, Pressburg, Slavonia, Styria, Transylvania, and Tyrol.

BALKAN PENINSULA.

Greece—Recorded from Thessaly, Epirus, and Peloponesus, and the Islands of Corfu, Cephalonia, Zante, Euboea, Crete, etc.; and as H. olivicvii Mich. from Crete, the Sporades, Cyclades, etc.

Albania—Recorded from Janina by Herr Clessin; and Avlona by von Martens.

Macedonia—Salonica! J. A. Hargreaves. Wodena, Dr. R. Sturany.

 Roumania—In rejectamenta of the river Maritza at Dorfe Kadikej (P. Hesse, Nachbl., 1874).

 Servia—Belgrade, Dr. Paetel.

 Roumania—Recorded from Babadagh and Matein in Dobrudjeha by Clessin.

 Bulgaria—Varna (Jickeli, Nachbl., 1874, p. 9).

 Turkey—Helix frequens is recorded by Dr. Pfeiffer as found throughout Turkey; and also recorded by Clessin. H. syriaca is cited from Derkos near Constantinople by Dr. Sturany.

DENMARK.

Zealand—The typical form and var. minor of Westerlund are recorded by Mr. Schlesch as found by Mr. Niels Petersen of Copenhagen in the vicinity of the fortress of Jaegersborg near Copenhagen, but it may be remarked that the accuracy of these records is doubted by many Danish malacologists.

RUSSIA.

Recorded from Tchernigov, Taurida, and Volhynia; also from the Caucasus and Novorossisk. Kouban Territory, Transcaucasia; the var. frequens from South Russia; and its subsidiary form obscura from Transcaucasia.

SIBERIA.

Recorded by Middendorff from Irkutsk; and by Gude from the Amur Valley.

NORTH AFRICA.

Egypt—Theba cartusiana, Helwan near Cairo! Mrs. Longstaff.

Helix syriaca, which is probably a variety of T. cartusiana, is recorded by Pfeiffer for Egypt.

Algeria—M. Bourgnignat records Helix frolinianna Bourg., which is probably merely a form of the present species; and Dr. L. Pfeiffer also records Helix syriaca as a denizen.

ASIA MINOR.

Asiatic Turkey—Trebizond, Erzeroum, and Baibout, in province of Trebizond; Priene near Smyrna in Adana; and at Brussa.

Syria—Recorded from Jaffa, Palestine, by Mr. F. H. Sikes; and as H. frequens by Dr. Pfeiffer from Syria.
The genus *Xerophila* (Greek, dry; φιλέω, to love) is a subdominant group, which in evolutionarily active countries is chiefly restricted to arid ground, but if by accident or design any of its constituent species are transported to primitive and manifestly weaker regions, they may monopolize them, and oust the competing native species.

This group is dedicated with the highest respect to Dr. Joaquin Gonzalez Hidalgo, the distinguished Spanish conchologist, and professor of malacology in the University of Madrid, in recognition and appreciation of his great services to science, and the many valuable works he has produced, not only upon the fauna of Spain, but upon the Philippine Islands and other regions.

Prof. Pilsbry and others have affirmed the alliance of the present group and *Hygromia*, as evidenced by their similarly simply-lipped shells, simple form of dart, and the frequent duplication of the dart sac. This opinion is not corroborated by the general character of the shells, which in *Hygromia* are usually of an uniformly dull brown and bandless, with a thickened periostracum, while in *Xerophila* the shells are characterized by their white or whitish calcareous substance and varied dark zonal banding—inacontestible evidences of a radically different environment and mode of life.

Internally these differences are emphasized in *Xerophila* by the perfect freedom of the reproductive organs from the right tentacular retractor, which in *Hygromia* passes between the male and female organs, while the stylophores or dart sacs possessed by the typical *Hygromia* are paired on each side of the vagina, and each pair arranged as a small inner and a larger outer sac, the outer one only being teliferous; whereas the stylophores of the typical *Xerophila itala* are of equal size, placed side by side, and develop a pair of slender, curved, and intercrossing darts, with a common lumen.

This arrangement in *X. itala* suggests that the ancestral form may have possessed a pair of teliferous sacs at each side of the vagina, one set of which has in *X. itala* quite disappeared, while the remaining set is at present in process of fusion; further progress in this degeneration is shown in *X. viregata*, which has now only a single dart, though its stylophore, by the occasional presence of an apical cleft, indicates that it was probably formerly similar to that of *X. itala*; while, according to Moquin-Tandon, the small and more primitive coast form (*X. viregata* var. *maritima* Drap.) invariably has the stylophore bluntly bilobed.
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OF THE
BRITISH ISLES.

JOHN W. TAYLOR, M.Sc.

Part 24 (pp. 113-160; and plates x and xi), Price 9 -.
Published December 8th, 1921. Rec'd Jan 18/22

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WITH the issue of **Part 24** we resume the publication of the "Monograph," though with slight modifications, necessitated by the inordinate increases in the cost of labour and material. Although the increase of cost to Subscribers is far from being adequate to meet the enhanced expenses in which we are involved by its publication, it is hoped that these inflated costs will be more or less quickly reduced to such a level as to relieve us from the strain of this unsatisfactory position, and expedite the completion of the work.

It has also been decided not to break the continuity of Maps illustrating the geographical range of the different species, not only for the sake of consistency throughout the work, but also because the new boundaries between the various nations, set up by the Allies, will probably eventually prove to be more or less tentative.

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With the respectful compliments
of the Author.

Prof. W. H. Geall

Sir W. Tayler
Plate XI.

**XEROPHILA ITALA (L.) and X. NEGLECTA (Drap.)**

*Xerophila itala* (L.) \( \times \frac{1}{2} 
Kewston, Cambridge, Mrs. H. G. Fordham.

*X. itala* var. alba (Moq.) \( \times 2 
Newquay, Cornwall, Mr. James.

*X. itala* var. vittrea (Wattelet.) \( \times 2 
Iona, Rev. G. A. P. Knight.

*X. itala* var. vitrea var. Taylor \( \times \frac{1}{2} 
Llandudno, Mr. J. R. & B. Tomlin.

*X. itala* var. rubra (Bandon) \( \times 2 
Island of Mull, Mr. A. Somerville.

*X. itala* var. bicolor (Pascal) \( \times 1/4 
Mont St. Catherine, Rouen.

*X. itala* var. inticecra (Moq.) \( \times \frac{1}{4} 
Evington, Leicester, Mr. Quiller.

*X. itala* var. monoszona (Pascal) \( \times 2 
Coleraine, Mr. Lionel E. Adams.

*X. itala* var. bizonalis (Pascal) \( \times 1/4 
Eastbourne, Mr. A. G. Stubbs.

*X. itala* var. fasciata (Moq.) \( \times 1/4 
Narin, Donegal, Mr. R. J. Welch.

*X. itala* var. coalita (Pascal) \( \times 2 
Eastbourne, Mr. A. G. Stubbs.

*X. itala* var. hypoizona Taylor \( \times 2 
Tunby, Mr. A. G. Stubbs.

*X. itala* var. leucopis (Moq.) \( \times 2 
Durness, Mr. A. H. Watson.

*X. itala* var. lentiginosa (Moq.) \( \times 1/4 
Gl. Blasket, Kerry, Mr. A. W. Stefex.

*X. itala* var. instabilis (Jefferys) \( \times 1/4 
Three Island, Rev. J. E. Somerville.

*Xerophila neglecta* (Drap.) \( \times 2 
Luddesdown, West Kent, Mr. A. S. Kennard.

J. W. Taylor, del. ad nat.  
Taylor Bros., Leeds.
The light thrown upon the relationship and affinity of the various forms by the more precise and intimate investigations of the present day, leads us to doubt the truth of the allocation of many species formerly associated together as simple variants of a common specific type, and though continental authors have discriminated between many forms of this and other groups in a much more analytical way than is usual in this country, this action was usually based chiefly or entirely upon shell characters; yet some of their proposed species have already been justified by a demonstration of certain differences in their organization as compared with that of the species to which they have hitherto been referred.

The various species of the group have been carefully studied by the Marquis di Monterosato, who has devised sectional names, variant of Xerophila, for the reception of the various types; thus he proposes Xerophila for X. itala and X. plumphonensis; Xerocineta for X. neglecta; Xeroleuta for X. obtia; Xerogyna for X. bathyomphala and X. spade; Xerofriga for X. nubigena, etc.; while Westerlund established a group as Pseudoxerophila for X. instabilis Zieg., and allied forms, characterized by the shells bearing fine spiral striae and rows of punctiform impressions.

The reproductive organs show a well-developed penis and epiphallus, which is furnished with a strong retractor, and terminated by a short subulate flagellum; the stylophore may be incompletely bifid, reduced to a simple sac, or in extreme forms entirely lost or modified into an organ of analogous function: the gypsoleum of dart may be paired, single, or even wanting: the mucus glands are 8–25 in number; and the male element is transferred by means of a long, slender, and serrate spermatophore.

The mandible is wide and arcuate with many more or less prominent, flattened, diverging, transverse ribs, which denticulate the cutting margin.

The radula is of the usual type, with symmetrically trifid median teeth, asymmetrically bifid laterals, and trifid or quadrifid marginals.

The species of this genus are extremely variable and especially numerous in the Mediterranean region, where the species are inextricably interwoven. The genus is, however, quite rare in North Central Europe, where the chief evolutionary area is assumed to have been located.

According to Prof. Pilsbry, though the genus has been recorded from the Lower Miocene strata, there are few undoubted representatives before the advent of Pleistocene time.

**Fig. 167.—Stonehenge, Salisbury Plain, in 1898, where Xerophila itala, X. virgata, etc., are abundant (photo, by the late Mr. J. Madison, Birmingham).**
Xerophila itala (Linne).

1674 Cochlea cinerea, fasciata, Erigeronum Lister, Phil. Trans., vol. ix., p. 99, no. 105, pl. 6, f. 12.
1733 Nerita integra, Striata Klein, Method. Ostrac., p. 6, no. 11.
1767 La grand Ruban Geoffroy, Coq., p. 47, no. 13.

1833 (Xenidus) erigeronum Fitzinger, Syst. Verz., p. 100.
1837 Xerophila erigeronum Held, Isis, p. 913.

HISTORY.—This is another species which was first discriminated and named, unfortunately polynomially, by Dr. Martin Lister, though Linne was the first author to apply a binomial designation as was established many years ago by Mr. Sylvanus Hanley, who in his examination of the Linnean Collection, now in the possession of the Linnean Society of London, detected the distinguishing numerals 598, which is the serial number of this species in the 10th edition of the Systema Nature, inscribed in Linne's well-known handwriting upon one of the specimens therein, which thus becomes the type of the species.

Some confusion arose later in reference to the precise numerals inscribed on the type shell, and conflicting statements were published, but this uncertainty was, we hope, finally set at rest by Mr. Edgar A. Smith.

There are four specimens of this species in the Linnean Collection, all below the normal size and all very similar in aspect. The type specimen is a tetrafasciate shell bearing the numerals 598, and showing the band arrangement in a faded and faint greyish-fawn colour.

I have pleasure in associating with the present species the late Prof. Ralph Tate, F.G.S., founder of the Belfast Natural History Field Club, and afterwards Professor of Natural History in the University of Adelaide, South Australia. He was the author of an excellent popular manual on our British land and freshwater mollusca published in 1866, and also prepared the invaluable Appendix to the revised editions of Dr. S. P. Woodward's famous classical work, "A Manual of the Mollusca."

Though other names have from time to time been added to the synonymy of this species, it is doubtful how far they can be accepted, as there are so many intermediate linking forms in existence and few or any of the pro-
posed synonyms are supported by any information as to the internal structure of the doubtful forms, so that implicit confidence cannot be placed in the accuracy of such references, although the light recently thrown on the relationship of various forms by the more rigidly precise investigations of modern scientists, lead us to doubt the strict identity with the present species of X. instabilis, X. obtus, X. candidus, etc.

The Helix ericetorum Nilsson is not our X. itala, but according to Dr. Gwyn Jeffreys is a very strongly striate shell, allied to our X. caperata; while Prof. von Martens has confirmed that the Swedish shells are identical with X. striata Schmidt. A specimen named Helix nilssoniana Beck, from Wurzburg, Bavaria, exhibited in November, 1912, at a meeting of the Leeds Conchological Club, on behalf of Mr. J. H. Ponsonby-Fane, was judged by its shell, a very finely but distinctly and regularly striate form of X. virgata or a closely-allied species.

The Helix ericetorum Drup. is likewise, judging by the figures, not referable to the present species, but appear to represent X. neglecta, while the figure of his Helix caperata var. b has been considered to be a characteristic representation of X. itala. This confusion as suggested by M. Picard, is probably due to errors of the engraver.

Helix obtus, Helix instabilis, and H. candidus of Ziegler, and other forms have been described as synonymous with X. itala, but sufficient differences have been demonstrated in several of these cases to sustain their specific claims. H. candidus, according to Herr Hesse, is very distinct in structure, and this divergence is especially shown in the love-dart. H. obtus is described as more narrowly umbilicated, and as possessing two long straight darts; while H. instabilis is made the type of a new sub-genus by Dr. Westerdend on account of the fine spiral striæ and rows of punctiform impressions on the shell.

Mr. Step ("Shell Life," p. 359) expresses his belief in the great probability of this and other unlikely species being evolved from X. virgata.

**Diagnosis.**—Xerophila itala is well distinguished from the allied species in this country by its subdiscoidal shell, wide umbilicus, and tubular whorls.

**Internally,** it stands absolutely alone amongst our teliferous British species in possessing paired darts or gyspobela within what is now a practically simple though distally bifid stylophore or dart-sac.

**Description of Animal.**—Scarborough specimens collected by Mr. J. A. Hargreaves in September, 1917, had long, slender, and almost colourless bodies, but of a slightly darker greyish tint anteriorly; the whole upper surface was tuberculate, with only slightly perceptible dorsal grooves, which enclosed a longitudinal row of elongate tubercles, but no trace of facial or lateral grooves were detected; the mantle was colourless, with numerous whitish specks; and the respiratory orifice was margined above, and on the right side, with white; the foot-sole was of a pale and uniform yellowish tint, with no perceptible trifasciation, but showing a narrow though indistinct foot-fringe, which was faintly lineolate; the ommatophores were slender and elongate, showing through their outer covering the pale grey retractors; the eye-specks black and dorsally placed on the elongately bulbarous extremities; the lower tentacles were slender and semi-transparent and the retractors only slightly pigmented.

Though the aspect of the animal may usually be as above described, yet the mantle in the albine forms is frequently of a dark leonine hue, of which shade the animal generally partakes, and intermediate forms connecting these extremes may also be found.

The presence of manganese in the tissues of mollusks is now being investigated by Prof. Baycott, who finds that the average quantity of this substance in the tissues of X. itala to be 0.0007 per cent. of the total weight of the animal.
The shell is very depressed and almost discoid above, but more convex and biconvex below; of a glossy, semi-opaque cretaceous substance, and of a greyish-
white or pale greyish-fawn colour; the whorls are six in number, cylindrical and regularly increasing in size, the last somewhat dilated towards the aperture, with usually one broad dark spiral band above the periphery and several more slender ones beneath; the sculpture is somewhat irregular and plicate above, with finer intermediate stripes and numerous minute irregularly shaped pittings scattered over the surface; the spire is only slightly raised, and terminates in a brown and more or less pellucid apex; the aperture is oblique, almost circular and slightly expanded; the outer lip is slightly reflected towards the columnella and abruptly inflected above, with a slight internal submarginal rib or thickening; suture distinct; imbricate very wide and open, exposing all the interior of the spire.

Diameter, 17 mill.; altitude, 8 mill.

The internal structure shows a pale buff kidney or renal organ, of a somewhat elongate shape, tapering and curved like a broad bladed seythe. Moquin-Tandon describes this organ, under the name of "glande precordiale," as of a nearly opaque yellow colour, and elongately twisted like a horizontal co, while the heart within the somewhat fusiform pericardium is pressed to the concave proximal margin; the ventricle is large and of an opaque grey; and the atrium is noticeably smaller, transparent, and colourless.

The alimentary system displays an oesophagus which is very long, somewhat twisted, and uniform in thickness, the large yellowish-white salivary glands embracing the anterior third of its course, and discharging their secretion by a pair of short ducts; the crop is voluminous and elongate, and at its distal extremity is abruptly bent back upon itself and continued as the usual three tracts, or courses of the gut, the rectum in its course passing close to the heart. The digestive gland or liver is usually of a light brown colour, and the hepatic arterial vessels are quite colourless.

In Mr. Ashford's original drawing of his dissection of a specimen of this species from Epsom, the distal extremity of the crop or stomach shows an asymmetrical pair of globose expansions, beyond which the stomach gradually diminishes in amplitude, and passes into the normal gut.
The cephalic musculature displays a very wide and strong pharyngeal retractor, the whole breadth of which is attached to the buccal bulb.

The tentacular and oral muscles arise from the same root and are fused together for a moiety of their total length, when the stout branch to the ommatophore of each side diverges, the muscle to the right ommatophore being quite free from the sexual complex; the muscles serving the lower tentacles and the oral area are usually five on each side, and are not perfectly symmetrical, the stout outermost strand on each side of the body retracts the lower tentacles, while the remaining four are distributed to the lips and mouth-region generally.

The reproductive organs display an elongate white ovotestis; the Hermaphroditic duct is very sinuous and convoluted; the albumen gland of variable dimensions, according to the season, and separating into lobes after maceration in water; the vesicula seminalis is reniform, of a clear yellow, with fine blackish specks; the oviduct is distinctly and very closely sacculate; the prostate or sperm duct is comparatively broad; spermatheca irregularly ovoid in shape and greyish-white in colour, borne on a moderately long and slender stem; penis-sheath short and somewhat clavate, continued as a long, twisted and tapering epiphallus, and terminating in a short subulate flagellum; the vaginal mucus glands are some what irregular in number, and described by Moquin-Tandon as 4–10 on each side, verticillate, and inserted very high on the vagina; they are 5 to 8 millimetres long, slightly flexuous, and of a white colour tinged with greyish, but in British specimens are most usually 4–6 mill. in length, and 7–8 in number on each side.

The stylophores or dart-sacs are formed externally of a pair of similar and simple sacs, whose lower parts are blended and fused to the vagina; the free distal ends are ovate, bluntly pointed, greyish-yellow in colour, and speckled with brown. The sacs may, however, be inequally developed, and at times one may be more or less atrophied. Internally there is only a single lumen, which is bidual distally, each section or lobe bearing a tubercle resting upon the fundus of the sac, and supporting the base of its dart. The papillary common outlet of the darts may be sometimes perceived through the investing tissues, with the points of the two darts projecting from it.
The darts or gyspobela are two in number, 4–5½ mill. in length, and are comparatively large for the size of the animal. They have a curved and sometimes a strongly twisted hollow shaft, usually terminating when mature in a compressed or flattened apex or point, the amount of compression varying, but the lateral edges do not develop into true blades. The base of each dart is without annulus, and no wider than the shaft, and rests upon the tubercle at the distal ends of the bilobed sac.

When freshly extracted the shaft is always somewhat transparent, the central cavity being filled with liquid, retaining numerous air bubbles which disappear a few minutes after extraction, after which the darts assume an opaque white aspect. The twin darts are usually but not invariably of equal size and the same degree of curvature, while their concave surfaces always face each other, and their free-pointed ends cross in their natural positions at rest within the sac, and would continue to further diverge on their extrusion.

Darts are almost invariably present in adult specimens, leading to the view that the spicula are not invariably lost during the preludes to conjugation, or that otherwise they are speedily renewed.

The jaw is quite crescentic in shape, about ½ millimetre from side to side, and half millimetre in altitude; of a somewhat rufous-fawn colour, darkening in the thicker and overlapping parts, and bearing about eight transverse and somewhat divergent ribs, which are unusually broad and prominent especially medially, and project beyond the cutting margin, and still more strikingly on the upper border; there are also, sometimes, one or more slightly indicated ribs at one or both extremities of the jaw, and one or more perceptible lines or thickenings parallel with the upper and lower margins.

The radula is of the usual oblong shape, about 3 millimetres in length and 1 millimetre in breadth, composed of 120 or more transverse rows of somewhat similarly sized teeth, which are slightly convergent to the median line of the radula; each transverse row of teeth is composed of a central longitudinal row of tricuspid teeth, each formed of a strong central cusp, with a supporting ectocone on each side, flanked by about twelve admedian or lateral teeth, which are mostly

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**Fig. 176.** Enlarged details of the teliferous organs of *Xerophila itala* L.

**Fig. 177.** Enlarged sectional view of the stylosphere, showing the bilobation of the sac, and the darts in situ, × 4.

**Fig. 178.**—More highly enlarged view showing the basal attachment of the dart to the fundus of the sac; from a dissection and sketch, by the late Mr. Charles Ashford.

**Fig. 179.**—Maxillary or jaw of *Xerophila itala* L., × 20. Chipstead, Surrey, from a preparation by Dr. E. W. Howell.
bicuspid, and constituted by the mesocone and an ectocone; the marginals are about twenty in number, and also mostly bicuspid, but the ectocone gradually increases in importance as the margin of the lingual membrane is approached until it almost equals the mesocone in size.

The formula of the radula of a Chipstead specimen prepared and photographed by Dr. E. W. Bowell is

$$\frac{5}{2} \times \frac{1}{2} + \frac{1}{4} + \frac{1}{3} + \frac{1}{2} = 120 = 7,800$$ teeth.

Reproduction and Development.—Few observations on the modes of reproduction have been made, but it is probable that the male element is transferred during conjugation by means of a filiform and serrate spermatophore.

Mr. Stubbs in the latter part of January, 1900, found a large colony on a sheltered sunny bank with a southern aspect, near Hertford, in active movement, and many of them in sexual conjunction, so that it is probable that in favourable seasons this act is continued more or less intermittently throughout the major portion of the year.

The late Dr. Kobelt has affirmed from direct observation in his terrarium that only one love-dart is extruded and used during the amatory prelimines leading up to conjugation.

M. Bouchard Chantereaux records that _X. itala_ lays its eggs from August to November; they are from 40–60 in number, agglomerated together in small clusters, and are about 1½ mill. in diameter, of a spherical shape, and of a dull white colour, due to the numerous crystals of carbonate of lime in the envelope.

Egg deposition has been frequently observed in Ireland by Mr. R. A. Phillips, both in the spring and autumn months, who remarks that the animal prepares a nidus by excavating a hole in the ground, about half-inch deep, and buries its body therein when depositing the eggs, which are probably afterwards covered with the earth.

The eggs hatch in about three weeks, the young shells being said to be uniformly horn coloured, becoming gradually more opaque and banded as they increase in size, and are adult towards the middle of the following year, the bulk of them usually dying off during their second hibernation.

Habits and Habitat._—_Xerophila itala_ is a very sluggish and timid creature, shrinking within its shell at the slightest alarm. It is an eminently gregarious species, frequenting thistles, furze-bushes, etc., sunny and exposed grassy moorlands and pastures, or dry slopes and eminences.

_X. itala_ is most plentiful on chalk or limestone soils, especially on the dunes, cliffs, and barren slopes of our coasts, but is also found on sandy or clayey soils, as well as in old quarries, broken ground, etc. The shell being more calcareous or more horny in accordance with the nature of the ground. Though frequenting the driest localities, it has the habit, in common with _Theba autumna_ and a few other species, of ejecting a comparatively large quantity of apparently pure water when roughly handled, and it is vouched for by Dr. Jeffreys and others that continued rains destroy great numbers of them.

It is a subdominant, or is perhaps more correctly described as a conditionally dominant, species, which is more or less restricted to comparatively inhospitable ground, and this apparent subdominance is displayed at Tenby, Pembrokeshire, where Mr. A. G. Stubbs found that _X. itala_ was driven off when the occupied ground was invaded by _H. pisana_; while
Mr. R. A. Phillips has remarked upon the absence of *X. itala* from the sandhills at Rush, near Dublin, where *Helix pissa* is found, though abundant on neighbouring sandhills where *H. pisana* is not present.

In Ireland and elsewhere it has been frequently observed in association with *X. virgata*, but in Northern France its companion on the dunes is said to be *Helix nemoralis*, and never *H. virgata*, which more frequently consorts with *H. hortensis*.

The shell is usually carried horizontally, but sometimes is borne at an angle of 45 degrees, while at the moment the shell is jerked forward in crawling it may be elevated to an angle of 80 degrees, or even more, as the shell is momentarily nearly vertically poised.

It affects exposed places, and is known to ascend beyond 5,500 feet, at which altitude it was found by Dr. Scharff, near Mürren, Canton Berne; in the Pyrénées it is recorded by Dr. Fischer as dwelling in the zone of *Helix nemoralis* at altitudes between 5,000 and 6,600 feet, but in the Alps it usually lives in altitudes ranging between 4,000 and 5,000 feet or slightly above the zone of cultivation. In the British Isles we have no records for altitudes exceeding the 1,000 feet, at which height it is recorded for Staffordshire.

**Food.**—The food of this species has not been systematically observed or recorded, but the late Mr. Baillie, of Brora, found that at the Kyle of Tongue, Sutherlandshire, the *Lotus* was their favourite food: but during showery weather, in July, 1883, he observed hundreds of them busily feeding on the decaying seaweed a little above high-water mark.

Mr. R. Standen, at Whitepark Bay, Ireland, where it is exceedingly abundant, found it in myriads after a damp night feeding on rabbit-droppings with which the scanty herbage of the sandhills is strewed.

On the continent, Dr. Hartmann records it as living amongst the Wild Thyme (*Thymus serpyllum*).

**Hibernation and Aestivation.**—In the continued dry weather of the summer months, the adults are stated to bury themselves in the earth, but the immature shells may often be found adherent to the vegetation, more especially to the long stems of the Couch Grass (*Triticum repens*). The summer epiphragm is very thin and more or less creased, transparent, iridescent, and glistening, with a large oval cretaceous spot above the respiratory orifice, but specimens collected by Dr. W. E. Clarke in May, 1889, at Tarascon, Bouches-du-Rhône, all formed a thick opaque-white epiphragm.

According to most observers, it usually retires for hibernation in this country about November, varying according to the season, hiding at the roots of grass and other vegetation or becoming ensconced in some suitable crevice or shelter, but this action is not invariable, as it has been found in mid-winter adherent to the stems of thistles and other plants even during periods of keen frost. The epiphragm at these times is usually though not invariably thick, opaque, and white.

**Parasites and Enemies.**—Like other species it is used as food by many birds, mammals, etc. The whimbrel (*Numenius phaeopus*), the rock dove (*Columba livia*), the cream coloured courser (* Cursorius europaeus*), and thrushes (*Turdus*) eat this species, according to Yarrell and other authors; while field mice feed upon them, according to the observations of Mr. C. E. Wright.
In the insect world it is preyed upon by the coleopterous *Dritis flavescens*, and *Oecylus oleus* is also accused by M. de Saussaye with destroying and feeding upon the species; while Herr von Linstow has described as *Ceraria evictorum*, a candeate parasite developed from sporocysts found in this species.

A sarcoptagous and possibly saprophagous Dipteron, *Sarophaga nigri-retris* Meiigen, is recorded by Dr. E. W. Bowell as bred from a number of dead and moribund *X. itala*, collected on the common, by Chipstead Station, Surrey. Dr. Keilin never obtained this parasite from *X. itala* at Cambridge, though common there on other species.

**Protective Resemblance.**—The ochreous var. *latceus* has been noted by Mr. Davy Dean as almost undistinguishable upon the dried grass amongst which it may be found, while the ordinary whitish form assimilates closely with the calcareous ground on which it is usually found.

**Economic Uses.**—According to Moquin-Tandon, this species is regarded as edible in France, and he especially mentions its use as food by the people of Avignon, Vaucluse.

In the British Isles, as in Sussex, and Bundoran, Donegal, the village children and others gather numbers of this and other species, threading them upon twine, and thus making necklaces and bracelets for their own adornment or for sale to tourists and others.

Mr. Swanton believes this use of the shells is a survival of an ancient custom, and speculates whether such bored shells have ever been found on prehistoric sites.

**Geological Distribution.**—*Xerophila itala* is apparently not reliably known below the deposits of Pleistocene age. The fossilized Irish specimens of this species are stated to present quite a different facies to the shells usually found in this country, the spire being more produced and the spiral banding more distinct and pronounced.

**PLEISTOCENE.**—In England, it is listed by Mr. W. J. L. Abbott amongst the fossils found in the Chalkliam fissure, West Kent. In Kent East, in a pre-Neolithic deposit, Barton Court, Dover, Rev. R. A. Bullen. In South Essex, Mr. B. B. Woodward cites it from Pleistocene river-drift at Gray's; and Mr. J. P. Johnson records a form intermediate between *itala* and *virgata* from Uphall Brickyard, Hfford.

In Middlesex, Kennard and Woodward record it as present in the "Myles Collection," at the British Museum, as obtained from the sands exposed by the excavations in St. James Square, London, S.W.

In Norfolk, W., it is recorded by Kennard and Woodward from the later layers of the Pleistocene or early Holocene deposits at Grimes Graves, near Weeting.

In Cambridgeshire, Mrs. McK. Hughes describes it as common in the deposits at Grantham, Barrington, Barnwell Abbey, and Barnwell railway-station; and Kennard and Woodward remark that the Barnwell Abbey shells are "rather small and are decidedly flat, while those from Barrington are distinctly higher in spire."

**FOREIGN DISTRIBUTION.**

In France, it is recorded by M. Locard from deposits of Mid-Pleistocene age at Celle, Seine-et-Marne; by M. Faget from the grey clays of the Quaternary period at Hers, Haute Garonne; by Dr. Germain as rare in loess at Neyron, Ain, as well as in the marls of Monche and Gerland, Rhône; by Bonillet as common at bottom of the ancient lake of Sarliève, near Clermont, Puy-de-Dôme; by Caziot and Maury from the Pleistocene deposits about Nice, Alpes Maritimes; by Dr. Bouly de Lesdain from the Pleistocene dunes of Ghyvelde, Nord; and M. Locard from the quaternary beds about Lyons, Rhône.

In Dalmatia, M. Bourguignat reports this species as *H. vulpigerissa* from the quaternary deposits of Sinj.

In Greece, M. Hilber has also recorded the same form from this country.
XEROPHILA ITALIA.

ENGLAND.

Holocene.—Records for these comparatively modern deposits are more numerous. In Cornwall W., in blown sands, Towan Head, J. P. Johnson; and from beneath a lacustrine deposit at Perranzabuloe by the Rev. R. Ashington Bullen.

In Dorset, under floor of arena of Roman Amphitheatre, called “Mannbury Rings,” Dorchester, the specimens generally undersized; H. St. George Gray.

In the Isle of Wight, from the lacustrine beds at Totlands Bay (Forbes); and by Bristow from sub-aerial beds, St. Catherine’s Down.

In Hants South, it was recorded by J. T. Kemp from tufa on river bank, near Waterworks, Southhampton.

In Sussex West, it was found by Rev. W. A. Shaw in a deposit at West Stoke, in Sussex East, from chalky rainwash, full of Neolithic flakes, overlying Palaeolithic rubble drift, to the east of Brighton, J. P. Johnson, 1900. Deposit exposed by cliff-wastage at Cow Gap Cliff, Beachy Head, Eastbourne, Rev. S. S. Pearce.

In East Kent, it was collected by Rev. R. A. Bullen from a deposit overlying the rubble drift at Barton Court, Beckland, Dover, and from a neighbouring deposit, in which a fragment of a Roman tile was found.

In West Kent, it is recorded by A. S. Kennard from a rainwash at Darent, excavated in 1894, and as common in an early Neolithic interment at Cuxton. It has also been found at Loughton, beneath a tumulus in Stanley’s Quarry, and by Mr. F. J. Bennett at Allen’s Farm.

In Surrey, in chalk-pit, Woodcote Park, Epson, July 1916: W. E. Cutler; and from a depth of 3 feet in a holocene deposit, Reigate, Lionel E. Adams.

In North Essex, it is recorded by J. French from the shell-marl of Felstead.

In Middlesex, Dr. H. Woodward, records it from the shell-marl at the excavations for the East London Waterworks Reservoirs at Walthamstow; and it has also been found by Mr. W. J. Lewis Abbott in loamy clay at the Tunnel Cement Works, West Thurrock.

In Oxford, it is recorded from Caversham by Kennard and Woodward.

In North Lincoln, it is recorded by Mr. C. S. Carter as common in a hillwash in a Romano-British excavation in the chalk at Backwell near Louth.

In South-east Yorks., it was found by Mr. Mortimer in Barrow (No. 277) of the Bronze age, in Willie Howe Plantation, Sleuthamere, the specimens being preserved in the Mortimer Museum, Hull.

IRELAND.

In Antrim, Mr. R. J. Welch found this species quite common, washed out by a small stream from an exposed old land surface, now overlaid by about 15 feet of blown sand at the east end of Whitepark Bay.

In Donegal, Mr. Welch found A. italică commonly in the exposed earthy layers of an old land surface on the dunes at Narin, and also found examples in a greyish sandy old land surface at Rosapenna, and in the later “shell-pockets” as well as in an old “kitchen-midden” of uncertain age. The species was also common among some remains of an old land surface at Tranrossan, Rosguill peninsula, while at Carrickfinn, Mullaghglass and Pollan bay it was found commonly in “shell-pockets,” and less frequently at landward under similar circumstances. A. italică is also common in a deposit exposed in an ancient dun at Horn Head, discovered by Dr. Chaster and Mr. C. E. Wright, while Mr. Welch records it as present in myriads in a rainwash in an old dun on Tramore sandhills.

Mr. A. W. Stelfox found it common in a rainwash in the sand dunes at Inishmaan, and also obtained examples from a deposit of blown-sand and bands of black-earth representing local deposits at the mouth of the Bay river, Falcarragh.

In West Mayo, Mr. Welch found two specimens of XEROPHIILATA ITALICA beneath a deposit of sandy peat in a marsh at Doonaghy, Achill Island, and Dr. F. Corner found this species on the bed of a dried-up lough in the same island. Mr. Welch has also found examples in a section beneath a “kitchen-midden,” exposed along the shore of the harbour on Clare Island.

In West Galway is the famous deposit at Dogs’ Bay, Roundstone, discovered by T. Glover, of Manchester, and first described by R. D. Darbishire. It is described as an old sward, which showed as a black band in the section of the sand hills, but this is correctly represented by a grey layer of earthy sand, and A. italică is common therein. On Inishbofin, it was found in a comparatively recent sand-dune deposit in course of formation, and also in an earlier layer by Mr. A. W. Stelfox.

In Clare, Mr. Welch found specimens of the present species in a rainwash of uncertain age at the Catacomb Caves, Edenvale; and Miss Diana Parkinson has detected it in the comparatively modern cranage deposit at Clareen.

In Kerry, it is recorded by Mr. Stelfox from a blown-sand deposit by Dingle Harbour, and also in a by no means modern deposit at Ferriter’s Cove, Sneem.
XEROPHILA ITALIA.

In France, M. Dollfuss cites it from deposits of Roman age at Lyons-la-Forêt, Eure; and Caziot and Manry from the tufaceous beds exposed in the railway cutting near the Imperial Hotel, Nice, Alpes Maritimes.

Variation.—Xerophila itala is a member of a very difficult and complex group whose component members are so intimately linked together, structurally and conchologically, that until a thorough examination of the various doubtful forms has been made, it will be quite impossible to accurately determine their precise status.

Dumont and Mortillet have observed that the character of the shell varies in harmony with the features of the environment, the shell tending to become uniformly whitish, more calcareous and thicker in substance in arid places, fully exposed to the sun, but when living in shady places the shell tends to become less calcareous and more horny in character with the banding less distinctly marked. Dr. Paul Fischer found that in the volcanic region of Auvergne this species, like Helix nemoralis and H. Hortensis, is characterized by pellucid and excessively thin shells.

The size of shell is very variable, ranging in diameter from about 8 millimetres to 25 millimetres or even more; the dwarfing is doubtless largely due to the hardships of their life conditions and the meagreness of the available food supply, while the larger forms are the result of more favourable conditions of life, though M. Beaudouin has especially remarked that in the Côte d’Or the larger specimens are more particularly found in very arid places, while the smaller forms dwelt among very varied surroundings.

The effects of altitude and the modifications of other features of the environment upon the shell of X. itala have also been studied by M. Debeaux, who affirms that in the valley of Barèges, Hautes Pyrénées, where the soil is naturally richer in soluble lime than the higher slopes formed solely of primitive rocks, the shells attain a good size (diam. 18 mill.), but are always thin and fragile, and the bands though present are quite pellucid.

On the Pic de Midi du, at about 1,400 feet above the valley, the shells diminish in size, attaining only a diameter of 10—12 millimetres, while on the still higher altitudes of 4,800 feet and upwards to 6,000 feet, all traces of banding are lost, the shells are still further dwarfed, only attaining a diameter of 8—10 millimetres, and are thin and delicate and of an uniform “pale white.”

The pigmentaion of the shell differs in its shade and intensity of the ground colour, from white, through yellowish-fawn to very deep brown; and Mr. C. E. Wright mentions a very beautiful rosy-pink form, which he found at Roundstone, Galway. The bands also vary from being perfectly transparent through greyish or yellowish to brown, or rose-pink, etc., to almost black. The spiral banding generally shows a broad dark band above the periphery and several slender lines beneath, but these vary so much in number and character that scarce two specimens are exactly alike; the bands may also by transverse coalition and disruption present a radiate aspect on the upper side, this, according to Mr. Ashford, being the normal form in King’s Co., Ireland; and Mr. A. W. Stelfox in June 1918 found a similarly marked and almost purely albina variety to be the prevailing form on Great Blasket Island, off the coast of Kerry.

The modifications of shape are chiefly those from a flat or greatly depressed spire to an elongate form, with the whorls almost dislocated as in var. Disjuncta of Turton.
XEROPHILA ITALIA.

VAR. CHARPENTIERI MOQUIN-TANDON.


The var. *charpentieri* MOQU.-TAND. is described as a little less depressed with an umbilicus in conformity.

The sub-var. *pyramidata* Bandon is extremely convex and pyramidal, and tends to become scalariform.

The sub-var. *morbihana* is distinguished from the type by its more conical form, its convex, quite cylindrical whorls, narrower umbilicus, and its dilated, thickened, and yet sharp peristome. The shell is also usually white and somewhat glossy, but is sometimes fasciated.

The sub-var. *servierensis* Germain is more elate, conico-convex above, with narrower umbilicus, finely and regularly striolate. Diam., 11 1/2 mill.; alt., 8 1/2 mill.

The sub-var. *instabilis* Jeffreys is described as shell smaller, of a darker colour and sometimes streaked or spotted; spire more raised; umbilicus narrower.

The sub-var. *alta* Cazinot is not described or figured, the name being probably regarded as descriptive.

The variety from Iona, recorded by Dr. Jeffreys as var. *instabilis* Ziegler, is probably not that form, but until a knowledge of its internal structure is available, had perhaps best be included under this head.

Living specimens referred to the var. *instabilis* Jeff., collected in the Isle of Tiree, by Rev. J. E. Somerville, examined in 1889, did not exhibit the body much beyond the shell when crawling, the back and sides were very dark bluish black, the body tubercles distinct but not crowded, tentacles moderately long and slender, dark grey in shade, becoming paler distally; foot sole yellowish, foot fringe with transverse lineations. Possibly it may be shown to be structurally different from *X. italica* when carefully examined.

**British Distribution.**

England—Specimens with a more or less elevated spire have been recorded from Winchester, Hampshire; Eastbourne, East Sussex; Durham Downs, Gloucester; Clevedon, North Somerset; Porthwayan Quarries, Shropshire; Skegness, North Lincoln; Birtwith, Mid-West Yorkshire; and Kirkmichael, Isle of Man.

Scotland—Fife: Isle of Eigg, North Eobdes; Killoran Bay, Colonsay, South Eobdes; Isles of Iona and Tiree, Mid Eobdes; also on Barra and Butt of Lewis, Outer Hebrides; and sub-var. *instabilis* is cited by Dr. Jeffreys from Mull, and Iona, and was found on Tiree Island by Rev. J. E. Somerville.

Ireland—Phoenix Park and Malahide, co. Dublin; Clara, King's co.; Achill Island, West Mayo; Glenagall, Clare, and Stradbally, Kerry.

The sub-var. *instabilis* Jeff. is recorded from Connemara, Galway, by Jeffreys.
XEROPHILA ITALIA.

FOREIGN DISTRIBUTION.

France—The var. charpentieri is cited by Moquin-Tandon on the authority of M. Charpentier, from the steep banks of the canal, Toulouse, Haute Garonne; by M. Henri Cardot as found rarely at Hantrye, Ardennes; from St. Jean de Luz, Basses Pyrénées, by Mr. F. H. Sikes; and by M. Locard from Lyons, Rhône.

Sub-var. securiferae recorded as rare on stems of Farniculium, Roche-Servière, Beaulieu, Maine-et-Loire, by Dr. L. Germain.

Sub-var. alta is described as found to the north of the Nice Observatory, and at Grasse, Alpes Maritimes by Comm. Caziot.

Sub-var. nordisana is known from Morbihan; Comm. Caziot records it from Auxerre in the Yonne; and Dr. L. Germain from Angers, Maine et Loire.

Belgium—Var. charpentieri, Rochefort, Namur, recorded by M. J. Colbeau.

Var. seythropae Westerlund.


This variety shows characters not altogether in harmony with Xerophila itala, and may prove to be distinct. It is a much smaller shell, and much more narrowly umbilicate than is usual in X. itala; the spire is also more exerted, the whorls 5½ in number, and the margins of the aperture much more widely separated. Diam., 10 mill.; altitude, 6 mill.

Fig. 187. — X. itala var. seythropae Westl., x 1½. Aran Isles, Galway, Sept. 1892. Dr. Schauf (named by Dr. Westerlund).

It was described as a variety of Helix laevis, but it is not improbable that the var. seythropae may prove to be a distinct form.

Galway W.—Aran Isles; R. F. Schauf.

Var. planorbis Picard.


Helix crassata var. N. Pfeiffer, Monog. Helic. Vivent, 1848. vol. i., p. 163.


The var. planorbis Picard has a shell perfectly flat, like a Planorbis, the apex being only slightly risen, and may be variously handled, the suture follows the keel-line almost or quite exactly.

The sub-var. virgulorum Bourg. is described by Comm. Caziot as shell very depressed, with a funnel-shaped umbilicus, and a narrow circular aperture. Diam., 12 13 mill.; alt., 6 mill.

Fig. 188.—Xerophila itala var. planorbis Picard. Watlington, Oxfordshire. Mr. A. H. Pawson.

BRITISH DISTRIBUTION.

Oxford—The var. planorbis inhabits an elevated pasture, at Howe Combe, Watlington, July 1867; A. H. Pawson.


Pembroke—Pembroke, 1885; Chas. G. Barrett.

Cheshire—Chester, 1886; J. R. le B. Tomlin.

Fife—Leves, Elie, Aug. 1886; T. Scott.

FOREIGN DISTRIBUTION.

France—The var. planorbis was described from specimens found in the Somme, and Granger records a depressed variety (var. subalternata) from Bilascon, Basses Pyrénées.

The sub-var. virgulatum is recorded by Abbé Letacq from the plain of Alençon, department of the Orne; by Comm. Caziot as found at an altitude of 2,400 feet to the north-west of St. Vallier-de-Thiey, Alpes Maritimes; and by Dr. L. Germain for Durtal, Maine et Loire.
Var. devians Westerlund.


The var. *devians* has the shell widely unbulicated, the last whorl expanded at the aperture, which bears a strong inner rib. Diam., 13-18 mill.; alt., 8 mill.

**BRITISH DISTRIBUTION.**

England—Var. *devians* is recorded by the author as existing in the fasciante form at Clevedon, North Somerset.

France—Var. *devians* is, according to Dr. Westerlund, found at Agen, Lot-et-Garonne, in the unicolorous white form.

Germany—the *fasciata-minor* form is recorded from Saalfeld, East Prussia.

Var. minor Picard.


*Helix ericetorum* var. *tardyi* Bourg., Cat. gén. France, 1892.

The var. *minor* Picard is described as “shell half-size of type form, spire convex, and banding somewhat intense”; sub-var. *minor* Pfeiffer as 11 mill. diam. and 5½ mill. alt.; sub-var. *minor* Moquin as “much smaller than type, but of same form”; sub-var. *minor* Dunm. & Mort. as 8-9 mill. diam.; sub-var. *minor* Bourg. as shell small, usually zoned, diam. 12-14 mill., alt. 6-7 mill.; sub-var. *minor* Westerlund as 9-11 mill. diam. and 5 ½ mill. alt.; and sub-var. *minor* Caziot as having 5½ whorls and a diam. of 12 mill. and an alt. of 5 mill. The sub-var. *minor* Germain is half the usual size, thin, yellowish-brown colour, with clear, fawn semi-transparent bands.

The sub-var. *intermedia* Gassies is described as smaller than the type form, the smallest dimensions being given as 7 mill. diameter. The var. *intermedia* of Dunm. et Mortillet (Moll. Savoie, p. 59) is a much larger form, varying from 11-14 mill. in its smallest diameter.

Sub-var. *minima* Kickx, from Brabant, Belgium, is probably the very small form.

The sub-var. *tardyi* Bourgignat is characterized by the expansion of the umbilicus and of the termination of the last whorl. Diam., 8 mill.; alt., 3½ mill.

The *Helix ericetella* Lousseanne is regarded as a var. *minor* of *italia* by Des. Bandon and Kobelt, but is considered distinct by M. Locard and Dr. Germain. M. Locard saying it is distinguished from *X. itala* by “its more depressed shape, especially towards the last whorl, its thinner shell, more regular cingulum, narrower umbilicus, rounder aperture and reflected peristome.”

This stunted and dwarfed form, which Moquin-Tandon and Dupay regard as a northern variety, has been verified from very numerous localities in this country and abroad, and may probably be met with wherever the species is plentiful. The smallest specimens I have seen—about 8 mill. in diameter—were found by the Rev. S. Spencer Pearce at Wheatley, near Oxford, and are probably var. *minima* Kickx.

**BRITISH DISTRIBUTION.**

England—This variety has been seen and verified from West Cornwall, Somerset, North Wilts., Hampshire, Sussex, East Kent, Surrey, Middlesex, Berks., Oxford, Suffolk, Norfolk, Cambridge, Northampton, West Gloucester, Warwick, Stafford, Salop, Lincoln, Nottingham, Derby, Cheshire, Yorkshire, Durham, Westmorland. The sub-var. *minima* has been found at Lewes, East Sussex, by Mr. C. H. Morris, and by the Rev. S. Spencer Pearce at Wheatley, Oxford.

Scotland—Fife, South and Mid Flandes, and West Sutherland.

The sub-var. *minima* has been found at Durness, Sutherland, by Mr. A. H. Pawson.

Ireland—Londonderry, Antrim, West Mayo, West Galway, and North Cork.
GERMANY—Reported from Nieder Rauenfingen near Cassel, by Mr. P. W. Munn; from Nassau by Prof. von Martens: and from the Eifel, South Rhineland, by Dr. Bötger.

BELGIUM—Recorded from Namur at Hastière by van den Broeck; and by M. Jules Colbeau from Rochefort.

Sub-var. minor is recorded from Biez, Brabant, by M. Colbeau.

FRANCE—Reported from the Basses Pyrénées at St. Jean de Luz! and Hendaye! by Mr. F. H. Sikes; and from Eau Bonnes! by Dr. Scharf; in the Hautes Pyrénées it is recorded from Mont Pégaur, Cantasses, by Dr. P. Fischer; and from Gavarnies, at 4,500 feet altitude, by Mr. F. H. Sikes; from the Côte d’Or at Champdôtre by Capt. Wattebled; from the Somme, near Amiens, by M. Vaniot; from Chemilly, Nieve, by M. Brevière; from Angers, Maine-et-Loire, by Dr. L. Germain; from the mines of Vendôme Castle; and at Bury near Blois; in Loir-et-Cher, as well as from Indre-et-Loir, at Loches; and on banks of River Loire at Amboise, by Mr. F. H. Sikes; from Champigny, St. Maur, etc., in department of the Seine by M. Pascal. It is also recorded from Morbihan by Tadé; the Oise, by Dr. Bandon; and by Dumont and Mortillet from Savoy.

Sub-var. tardyi Bourg. is recorded only from St. Claude, Jura.

Sub-var. intermedius Gassies is recorded from the Aisans.

SWITZERLAND—Recorded from cantons of Basel, Schwyz, Unterwalden, and Uri.

SPAIN—Has occurred at Santander to Liènt.-Col. Parry, and was found by Dr. W. Eagle Clarke in May, 1889, at Camillo, Andorra, at an altitude of 5,700 feet.

ALGERIA—M. Bourguignat records this from Cap de Garde, near Bône.

Var. major Moquin-Tandon.


Helix eructorium var. major Bourguignat, Mal. Alen., 1861, p. 257.


Helix eructorium var. major Westerlund, From, Palearkt., 1889, p. 328.

The var. major Moq.-Tand. is described as much larger (25 mill. diam. by 12 mill. alt.) but of type form; the var. major Dum. & Mort. is not less than 18 mill. in diam.; the var. major Bourg. is of a dull whitish colour, and is 20 mill. in diam. and 12 mill. in altitude; the var. major Locard is 17 mill. in diam. and 10-12 mill. in altitude; and the var. major Caziot is figured as about 19 mill. diam. and 8 mill. in altitude.

SUSSEX W.—Var. major D. & M. is recorded by Mr. W. Jeffery from Alc scanning chalk pit and from roadside cuttings, though chalk, at Up Park and Kinshy Vale.


Kent E.—Dover, C. E. Wright, 1913.

SURREY—Woldingham Chalk Downs, in bleakest situations. K. McKean, 1883.

Northampton—Var. major Westl., a specimen 22 mill. in diameter from limestone quarry, Blisworth, Oct. 27, 1894, L. E. Adams.

Salop—Porithywaen Quarries, 1863, W. Whitwell.

Pembroke—The Burrows, Tenby! W. H. Boland.

IRELAND.

Limerick—Common about Limerick, attaining a diam. of 20 mill. H. Fogerty.

Kerry—A specimen (20 mill. in diam.), found at Ardport by Mr. A. W. Stellox.

FRANCE—The var. major is recorded from the Oise by Dr. Bandon; by Pascal from Mont Valerien, Seine-et-Oise; by Locard from the Rône at La Caratte near Lyons, also from the Ain at Miribel and Volognat; by Millet (25 mill. by 12 mill.) from Maine-et-Loire, and referable by their shape to the var. planorbis Picard; by Caziot for the department of the Yonne; from Châtillon-sur-Seine, Côte-d’Or, by Beaudoin; and as H. cingulatum var. major from Durtal, Maine et Loire, by Dr. L. Germain.

BELGIUM—Recorded from Chokier by Piév; from Hastière, Namur (20 mill. diam.) by M. van den Broeck; and from Lombaertzyde, West Flanders (20 mill. diam.) by M. Colbeau.

ITALY—Specimens, 18-20 mill. diam. recorded from Bresea, Lombardy, by Spinelli.
Var. vitrea Dumont & Mortillet.

Helix ericetorum var. vitrea Wattledes, Jour. de Conch., 1889, p. 325.

The var. vitrea Dum. & Mort. is described as white, quite vitreous and transparent; the var. vitrea of Wattledes is transparent and of a whitish colour.

SCOTTISH DISTRIBUTION.

Ebudes Mid—The sub-var. vitrea of Wattledes, the Island of Iona! Rev. G. A. Frank Knight.
Main Argyll—Roadside, Acheran, Lismore! A. Somerville.

FOREIGN DISTRIBUTION.

France—Var. vitrea D. & M., banks of River Arve, near Geneva, Savoy, Dum. & Mort., i.e.; sub-var. vitrea Wattledes, rare at Champigny, Jura, Wattledes, i.e.; and Dr. Debeaux records white and excessively thin shells from Barents, Hautes Pyrénées.

According to Dr. P. Fischer, in the volcanic region of Anvergne, the X. itala and certain other species are remarkable for their pellucid and excessively thin shells.

VARIES IN COLOUR OF SHELL.

Var. alba Moquin-Tandon.

Helix ericetorum var. b Charpentier, Moll. Suisse, 1837, p. 12, pl. 1, f. 18.

The var. alba Moq.-Tandon, is described as entirely white.

The sub-var. concolor of Picard comprises a totally white form, but also embraces a reddish-white variety, from which I have separated it.

The H. ericetorum var. b of Charpentier, which he describes as "tota alba," and as frequent in the neighbourhood of Bex, Switzerland, I have ventured to assume should be referred to var. alba.

Though it is by no means certain that any of these authors had the truly albina variety in view when describing this form, yet I have assumed them to have had knowledge of it, and that it was the form indicated.

The var. alba of Jeffreys is probably referable in part to the var. concolor D. & M. The true albina variety though uncommon is widely dispersed in this country, and also occurs on the continent, as has been firmly established by the efforts of Mr. F. H. Sikes and Dr. W. Eagle Clarke, but the foreign records are all more or less uncertain as to their precise nomenclature.

Mr. J. G. Milne mentions a small colony of the var. alba on Achill Island, near Dungort, in West Mayo, whose range was limited to an area of dry white sand, without noticeable vegetation.

BRITISH DISTRIBUTION.

England and Wales—Its occurrence has been verified from Buckinghamshire, Berkshire, Cambridge, Carmarthen, Cornwall West, Denbigh, Derby, Devon North, Dorset, Durham, Essex North, Gloucester, Hants North, Hereford, Hertford, Kent, Leicester and Rutland, Lincoln North, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Pembroke, Radnor, Salop, Somerset North, Suffolk East, Sussex West, Yorkshire, and Isle of Man.

Scotland—It has been verified for Mid Ebudes, Fifeshire and West Sutherland.

Ireland—It has been found in Londonderry, Antrim, Donegal, Dublin, King's County, Mayo, Galway, Clare, North Cork, and Kerry.

FOREIGN DISTRIBUTION.

France—Recorded from St. Jean de Luz, Basses Pyrénées! by Mr. F. H. Sikes; from Grasse, Alpes Maritimes, by Moquin-Tandon; and from the dunes of Dunkirk, Nord, by Dr. Fanny de Lescain. It is also on record from the Gironde, Hautes Pyrénées, Landes, Oise, and Seine.

Switzerland—The var. b of Charpentier is noted as frequent about Bex, Canton Vaud.

Spain—Found by Dr. W. Eagle Clark in May, 1889, at 5,700 feet altitude at Canillo, Republic of Andorra!
Var. concolor Dumont & Mortillet.


*Helix erinorum* var. *albescens* German, Moll. Maine et Loire, 1862, pp. 121, 122.


The var. *concolor* Dunn, & Mort. is whitish; the sub-var. *concolor* Picard p. p. is reddish-white, and links up with Pascal’s sub-var. *bicolor*.

The var. *albescens* German is described as shell uniformly whitish or whitish-grey; the sub-var. *albescens* Moquet is described as milky-white.

The sub-var. *bicolor* Pascal p. p. is described as without bands or spots, white and fulvous, the latter becoming stronger towards the aperture. The var. *concolor* is probably also the *Helix obliterata* of Hartmann, and is not uncommon throughout the range of the species.

**BRITISH DISTRIBUTION.**


**Kent**—Sub-var. *bicolor* Pascal was found by Mr. R. Cairns in this county.

**Sussex** E.—Sub-var. *bicolor* Pascal p. p. is recorded from near Lewes and Seaford by Mr. J. H. A. Jenner.

**West Galway**—Sub-var. *lutescens*, Aran Isles! The specimens in my collection, received direct from Dr. Scharff, are referable to the var. *albescens* of *X. itala*.

**FOREIGN DISTRIBUTION.**

**France**—Sub-var. *lutescens* is recorded by M. Pascal from Bois de la Bernardine, Haute Loire, and from the Bois de Vincennes, Champigny, Choisy-le-Roi, Aubervilliers, Mont Valerian, etc., in the Seine et Oise.

Sub-var. *albescens* German is recorded from Angers, Maine et Loire.

**Var. lutescens** Moquin-Tandon.


The var. *lutescens* Moquin-Tandon is described as uniformly dusky yellowish; the sub-var. *lutescens* Bandon (1862) is of an uniform dull yellow; the sub-var. *lutescens* Vaniot is yellowish without bands; the sub-var. *lutescens* Wattebled is uniform yellowish-white.

The var. *lutescens* Bandon (1841) is described as Rufous-white, and is not strictly referable to the variety previously described by the author under the same name.

**GEOGRAPHICAL DISTRIBUTION.**

This variety is a fairly common form in this country wherever the species exists. It is also reported from France and Belgium.

**Var. rubra** Bandon.


The var. *rubra* Bandon is of an uniformly dark red-brown colour.

The sub-var. *obscura* Moq. would probably be best placed under this form. It is described as dark reddish, with brown banding, and large brown markings.

This variety has not been observed as yet in England, but Mr. Steifox has found a variety with a distinct reddish-purple tinge at Dogs’ Bay, Connemara, Galway.

**SCOTTISH DISTRIBUTION.**

**Eburnes S.**—A sub-var. of an almost uniform medium brownish colour, found by Mr. A. Somerville in the west of the Island of Mull, in August, 1894.

**FOREIGN DISTRIBUTION.**

**France**—Var. *rubra*, rare on the limestone hill of St. Laurent, Mony, Oise (Bandon, !.) and recorded from Lente in the Drôme by M. Gustav Sayn.

Sub-var. *obscura* is cited from La Bresse and Belley in the Ain, and the environs of Lyons by Locard; also from Grasse, Alpes Maritimes, by Moquin-Tandon.

10/9/21
VARIATIONS IN THE BANDING OF THE SHELL.

This group is intended to embrace all banded shells of this species, taking cognizance of the modifications in the number, position, pigmentation, degree of development or disintegration of the bands, and their various modes of fusion.

Var. *fasciata* Gassies.

**ONE BAND ABOVE PERIPHERY, ONE OR MORE BELOW.**


**Two or More Bands Above Periphery, One or More Below.**

*Helix trisulcata* var. *fasciata* and *elegans* Moquin-Tandon, loc. cit.

Bands super peripheral only.

*Helix trisulcata* var. *monocorum* Moquin-Tandon, loc. cit.

Bands infraperipheral only.

*Helix trisulcata* var. *coarctata* Pascal, loc. cit.

Bands radiate.

*Helix trisulcata* var. *immaculata* Moquin-Tandon, loc. cit.

Bands coalescent.

**Shells** with one or more spiral bands, which may be distinct, coalesced, or variously broken up.

**One Band Above Periphery, One or More Beneath.**

The var. *trivialis* Moquin-Tandon is described as possessing a single band above the periphery and one or more beneath, and is here regarded as the typical form of the species. The sub-var. *bizonalis* Pascal has one broad band above the periphery and a second which is narrower and occupies the centre of the last whorl.

![Fig. 196.](image1)

![Fig. 197.](image2)

Many authors have not described the arrangement of the bands, and they therefore cannot be classified under the most appropriate heading, which is probably that of *var. trivialis*. The sub-var. *fasciata* Grunow and the sub-var. *sexfasciata* Millet are both stated to possess six combinations, but their arrangement is not indicated. The sub-var. *fasciata* of Bandon is stated to possess one to four bands, but no further information is available.

The sub-var. *fasciata* Dum. and Mort. is defined as possessing very feebly pigmented somewhat transverse bands, and will perhaps be most appropriately classified with the sub-var. *griseescens* Collinse, and forming a link or passage with the var. *cornua* Lourie.

**Two or More Bands Above Periphery, One or More Beneath.**

The var. *fasciata* of Moquin-Tandon is described as possessing many slender brown bands continuous above, and is here accepted as the type of *fasciata*, as that author was the first to precisely define the band arrangement, which distinguishes this form from var. *trivialis*.

The sub-var. *elegans* Moquin-Tandon has several narrow bands above the periphery which are alternately continuous lines or composed of spots.
Bands Supraperipheral Only.

The var. monozona Pascal has only a single narrow band above the periphery, unicolorous and unbands below.

Bands Infraperipheral Only.

The var. hypozona Taylor var. nov. has no bands above the periphery, but one or several below.

The sub-var. lentiginosa Moquin-Tandon has the deep brown bands broken up into spots and blotches and arranged in a radiate manner.

The sub-var. coalita Pascal has broader bands than ordinary which are coalesced at the mouth.

The sub-var. leucozona Moquin-Tandon has the shell rufous, the peripherial zone white, and usually many bands beneath.

The sub-var. obliterata Picard has the shell whitish, with very pale and scarcely perceptible bands; it is the var. β of Draparnaud.

The sub-var. deleta Moquin-Tandon has pale and somewhat indistinct reddish markings above and brown bands beneath.

The sub-var. albida Pascal is faintly banded.

The sub-var. grisescens Colbeau, with narrow, faint, ill-defined banding.

Geographical Distribution.

The var. trivialis Moq. and the loosely described sub-varieties fasciata of Gassies, Millet, and Bandon are common and widely distributed, as are the forms albida Pascal, grisescens Colbeau, deleta Moq., obliterata Picard, and fasciata Dun. et Mort. in a much lesser degree.

The sub-vars. coalita Pascal and leucozona Moquin-Tandon are local forms, but often plentiful where they are found.

The sub-vars. monozona Moq. and bizonalis Pascal are by no means common forms, though on record for Eastbourne, Tenby, Cambridge, and other places in England and Wales as well as for France.

The sub-vars. elegans and fasciata of Moquin-Tandon are quite rare in this country, though the var. fasciata has been found at Newquay, Cornwall, by Mr. J. H. James; at Gotherington, Gloucestershire, by the late Dr. J. W. Williams; Roundstone, Galway, Ireland, where it was found in Aug. 1889 by Mr. G. W. Mellors; and also from Dublin, where it was obtained in April 1887, by Dr. Scharff; but in France both forms are recorded from the Aun and the environs of Lyons by Locard. The var. fasciata has also been found near Bordeaux by Dr. Scharff.

The sub-var. hypozona has been collected at Tenby, Pembrokeshire, in Oct. 1890 by Miss F. M. Hele, and in 1895 by Mr. A. G. Stubbs.

The sub-var. lentiginosa, Great Blasket Island, Kerry, June 1918! Mr. A. W. Stelfox; there are also several other records of its occurrence in the British Isles in a more or less characteristic state, but truly distinctive specimens are far from frequent.
Var. hyalozonata Cockerell.


**Shell** pure white with translucent bands or markings.

This is a local and interesting albino form of the species, but it occurs more or less sporadically throughout the range of the species, and occasionally occurs within a limited area, associated with *virgata* and other species sharing the same peculiarities, implying that the local influences have probably contributed to its evolution and perpetuation.

The var. *lentiginosa* when in the albino transparently marked form may be known as *hyalozonata-lentiginosa*. This variety is the common form about Clara, King's Co., Ireland.

**BRITISH DISTRIBUTION.**

In England, it has been recorded or is known from West Cornwall, East Sussex, Bucks., Cambridge, Northampton, West Norfolk, South Lincolnshire, Cheshire, Mid-West Yorks., and the Isle of Man.

In Scotland, it has been found in Main Argyle, South, Mid, and North Eludes. In Ireland, it is known from Menth, Dublin, King's County, Clare, and East and West Galway.

**FOREIGN DISTRIBUTION.**

France—Collected by Dr. W. Eagle Clarke at Tarascon, Bouches-du-Rhône.

Var. cornea Locard.


The var. *cornea* is small and horn-coloured, with four transparent zonules.

The sub-var. *subpellucida* is described as possessing translucent brown banding, through which the body of the animal appears black, and links with var. *hyalozonata*. It is also the var. *subhyalozonata* of Wright.

The sub-var. *minor* of German is by its other characters referable to the present form. It is described as thin, yellowish-horn tint, with clear fawn-coloured semi-transparent bands, and forms a connecting link with var. *lutescens* and var. *subpellucida* Jenner.

**BRITISH DISTRIBUTION.**

England—Sub-var. *subpellucida* is recorded by its author from Wilmington Hill, near Lewes, Sussex; and reported by Mr. E. J. Elliott from Stroud, Gloucester.

**FOREIGN DISTRIBUTION.**

France—Var. *cornea* is recorded from Savoy by Westerlund; and Bourguignat records a small horny variety with four transparent zonules from Aix-les-Bains.

The sub-var. *minor* of German is found near Angers, Maine et Loire.

**MONSTROSITIES.**

Monst. sinistrorsum Jeffreys.


**Shell** coiled sinistrally.

**BRITISH DISTRIBUTION.**


Northampton—One specimen, Weldon, 1909, C. E. Wright.

York N.E.—A specimen, the var. *albescens* in colouring, found at Scarborough, was in the collection of the late Mr. P. B. Mason.


Donegal—Several specimens obtained by Mr. J. R. le B. Tomlin from Bundoran.

**FOREIGN DISTRIBUTION.**

Europe—There is a specimen in the British Museum labelled "Europe."

France—Moquin-Tandon records three specimens: one from Tarbes, Hautes Pyrénées; one from Cerdet, Pyrénées Orientales; and one from Laponie de Lécris.

Belgium—One specimen, the var. *virgiscens* in colouring, collected near Namur in 1855 by M. Jules Colbeau.

Austria—One recorded by Rossmassler from the rampart-ditches of Vienna.

Bulgaria—One specimen, the var. *vulgcrissima* in form, recorded by M. Monsson from Varna.
Monst. _disjuncta_ Turton.

*Helix elegans* Brown, Worm. Mem., ii. p. 528, pl. 21, f. 9, 1818.
*Helix disjuncta_ Turton, Conch. Dict., p. 61, pl. 16, f. 63, 1819.

**Shell** scalariform and of a pyramidal form.

The remarkable shell upon which this variety was founded was at first referred to _H. arbutorum_ by Baron Férussac, which view was to some extent shared by Dr. Turton, but who, however, declined to regard it as a distinct species, though afterwards, in his "Manual," he referred to it as _Helix virgata_. Specimens more or less closely resembling the typical shell have been recorded from time to time by various authors, and have generally regarded the specimens as most probably referable to the present species.

**British Distribution.**

Northampton—Harrington, Aug. 1904, Rev. W. A. Shaw.
Cheshire—Banks of River Dee, Chester, Oct. 1886, J. R. le B. Tomlin.
Yorks. S. W.—Sandal Castle Hill, Joseph Helden.
Dublin—The original specimen "was found in a field beyond Kilmainham Jail, near the Turnpike of Golden Bridge, Dublin, by Mr. Edward Stephens" (Brown, Worm. Mem., 1818, p. 528).

**Foreign Distribution.**

France—Var. _scalaris_, Dax, Landes (Grateloup, l.c.).

Monst. _subscalaris_ Baudon.

*Helix ericetorum m. subscalare_ Cockerell, Naturalists' World, Sept. 1888, p. 73.

The _m. subscalaris_ Baudon is described as having the last whorl detached from the rest of the shell.

The _m. subscalare_ Cockerell is described as "partly subscalariform."

**British Distribution.**

Derbyshire—Narrowdale, near Hartington, May 1919: J. and W. Hill.
Isle of Man—Whitestroand Bay, Peel, Aug. 1892, W. Moss.

**Foreign Distribution.**

France—The _m. subscalaris_ is recorded from Park of Chateau de Mello, Oise, by Dr. Baudon; by M. Gustav Sayn from Rousset-en-Vercors in the Drôme; and by M. Beaudoin from Chatillon-sur-Seine, Cote d'Or.

Geographical Distribution—_Xerophila itala_, which is regarded by Dr. Scharff as originating in the Lusitanian regions of South-west Europe, is, according to our present knowledge, diffused over the greater part of the British Isles, though scarce or apparently absent from large areas in Scotland, Ireland, and Wales.

_X. itala_ has been recorded as diffused more or less throughout Southern Europe, but it would appear possible that this may not be so, but that the species is represented in the Iberian peninsula by _X. pamplonensis_, etc.;
and in Italy by *X. ammonis*, *X. apennina*, etc.; while in the East it is replaced by *X. derbentinus* and other species; and that all these may be regarded as earlier forms and more primitive in their organization and evolutionary status than the more dominant North Central European species, but these and other doubtful points cannot be finally and quite definitely decided until the internal structure of the various species has been thoroughly studied.

It was recorded for the Orkneys by Mr. T. S. Traill in 1830, but its occurrence there has not been confirmed by later writers.

On the continent it is said to be very widely diffused, being recorded from France, Belgium, Bohemia, Holland, Spain, Italy, Bulgaria, Roumania, Servia, Greece, Switzerland, Austro-Hungary, Russia, Transylvania, and Transcaucasia, but it is rare on the North German plain.

The true *X. itala* does not appear to occur in Scandinavia, and we have no precise records of its existence in Portugal.

In Asia it is recorded from Syria by Férussac, and by Prof. E. Forbes from several points in Pamphylia, Asia Minor. According to Westerlund, it was erroneously recorded by Gebler from Barnaul, Siberia.

In Africa, it is recorded for Algeria by Bourguignat and others.

In South Australia and New Zealand it is recorded as now locally plentiful, probably introduced amongst seeds, etc., from Europe, although the shells are in my opinion more precisely referable to *X. obesa*.

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Fig. 207.—Geographical Distribution of *Xerophila itala* (Linué).

![Map showing geographical distribution of *Xerophila itala*.]

**GERMANY.**

*Xerophila itala* is found more or less locally almost throughout Germany, but chiefly in the west, including Alsace, Bavaria, Baden, Brandenburg, Cassel, Franconia, Hanover, Hesse, Hesse-Darmstadt, Holstein, Kurhessen, Lippe-Detmold, Lorraine, Luneberg, Mecklenburg, Nassau, Osnabruck, Pyrmont, Renss, East, West, and Rhenish Prussia, Rhineeland, Saxe-Coburg, Saxe-Weimar, Saxony, Silesia, Suabia, Thuringia, Westphalia, Wiesbaden, and Wurtemburg.
XEROPHILA ITALIA.

NETHERLANDS.

Holland—Reported from Bloemendaal, North Holland, by Prof. E. von Martens.

Belgium—Recorded from Brabant, West Flanders, Hainault, Liége, Limburg, Namur, Luxembourg, and the Grand Duchy of Luxembourg.

FRANCE.


SWITZERLAND.

Charpentier states that this species is common throughout Switzerland, and it has been specifically recorded from the cantons of Aargau, Appenzell, Basel, Berne, Geneva, Glarus, Grisons, Lucerne, Neuchâtel, St. Gall, Schwyz, Unterwalden, Ticino, Vaud, Valais, and Zürich.

AUSTRO-HUNGARY.

Recorded from Austria, Bohemia, Carinthia, Carniola, Croatia, Dalmatia, Galicia, Goritz, Hungary, Styria, Transylvania, Tyrol, and Vorarlberg.

IBERIAN PENINSULA.

Spain—Reported by Prof. Hidalgo and others from various localities in Andalusia, Aragon, Asturias, Basque Provinces, Catalonia, Galicia, Guipuzcoa and Santander.

Portugal—Cited for Portugal by Prof. von Martens and Dr. Scharff, but without mention of precise localities.

ITALY.

Only known from the northern provinces and Sicily. The recorded areas are Abruzzi, Emilia, Lombardy, Marches, Piedmont, Rome, Tuscany and Umbria.

BALCAN PENINSULA.

Roumania—Reported from Bucharest, June 1914, by Mr. L. E. Adams.

Bulgaria—Recorded by Kreglinger for this region, and reported by Mr. Adams from Rustéchuk and Sophia. The var. vulgarissima is cited from Varna by Jickeli.

Greece—The form H. cinctiorum var. greeca has been recorded from the Morea at Nauplia, and from Tripoliizza to Patras, as well as from Phoeis, the Ionian Islands and the Archipelago.

Bosnia—Westerlund records the var. trivialis from Sarajevo and Zenica.

Servia—Reported from Belgrade, June 1914, by Mr. L. E. Adams.

Turkey—Cited by Prof. von Martens and Dr. Scharff, but without definite locality records.

SCANDINAVIA.

Norway—Though a single specimen of this species is in the "Sars' collection, said to have been found at Bryglo, near Christiania, this, according to Prof. E. von Martens, is not a "fresh" shell, but has been made the basis for including it as a Norwegian species, although the occurrence has never been confirmed.

Sweden—Though recorded by Nilsson as not uncommon in the Island of Oeland, the form found there is not strictly referable to the present species, but to a species allied to our Helix coperata and named H. nilssoniaca by Maln and others.

Denmark—According to Steenberg, this species has not been found in Denmark for a half-century; the recorded localities being Zealand and North Jutland.

In Zealand, five shells were found by Lassen on a sandy hill between Bistrup and Stavnsholt; ten or twelve others on a sunny hill between Fredericksdal and Birkerød; and two specimens by Steenstrup from Bakkerne near Farum.

In North Jutland, it is recorded by Steenberg as having occurred at Aalborg, the specimens now in the Strandgaards collection.
XEROPHILA ITALA.

RUSSIA.

Reported by Prof. von Martens from the government of St. Petersburg, Tauria, and Caucasia; and by Krynicki for South Podolia, South Tauria, Georgia, and Transcaucasia.

SIBERIAN SUB-REGION.

Tomsk—Recorded by Gebler as occurring at Barnaul, but Westerlund believes the specimens to have been Hygroma hispida L.

ASIA MINOR.

Syria—Férrussac (Tabl. Syst., 1822, p. 43), records this species for Syria; and Prof. Forbes cites the species as inhabiting the Travertin plains of Pamphylia, also the plains of the Yailah basin, the tertiary plains of the Valley of Xanthus, and the Plain of Phineka.

NORTH AFRICA.

Algeria—Pourguignat cites this species as rare in Algeria. It has been found at Constantine by Raymond; at Cap de Garde, near Bône, by Boudel; and at Metilili by Marès.

AUSTRALASIAN REGION.

South Australia—Dr. Cox, of Sydney, first observed and recorded in 1891 the occurrence of this species amongst "grass tussocks" at Levens, York Peninsula, probably imported with English grass, which was cultivated there for a few years. The species has now spread over hundreds of square miles, and in 1912 was so exceedingly abundant that the herbage in places was white over with the countless millions of their shells, while there is a marked tendency to spread westwardly to Coney Point and scarcely any progress eastward towards Warooka. Judging by the specimens examined by me, the species would in my opinion be more precisely defined as X. obtus.

New Zealand—Mr. F. W. Wotton records that in 1892 there was a thriving colony of X. itala at Wellington, North Island, the species being unwittingly introduced from England with grass seed some five or six years previously. The shell sent to me by Mr. Wotton is, however, precisely the same form (X. obtus) as those recorded above from South Australia.

Fig. 298.—Whitepark Bay, near Giant's Causeway, Antrim, where Xerophila itala is abundant and of large size (photograph by Mr. R. J. Welsh).
Distribution of Xerophila itala (L.)

In the Counties and Vice-Counties of the British Isles.

**ENGLAND AND WALES.**

**CHANNEL.**
- 1 Cornwall N.
- 2 Cornwall E.
- 3 Devon S.
- 4 Devon N.
- 5 Somerset S.
- 6 Somerset N.
- 7 Wilts N.
- 8 Wilts S.
- 9 Dorset
- 10 Isle of Wight
- 11 Hants S.
- 12 Hants N.
- 13 Sussex W.
- 14 Sussex E.
- 15 Kent E.
- 16 Kent W.
- 17 Surrey
- 18 Essex S.
- 19 Essex N.
- 20 Herts.
- 21 Middlesex
- 22 Berk.
- 23 Oxon.
- 24 Bucks.

**SOUTH WALES.**
- 41 Glamorgan.
- 42 Brecon.
- 43 Radnor.
- 44 Carmarthens.  
- 45 Pembroke.
- 46 Cardigan.
- 47 Montgomery.
- 48 Merioneth.
- 49 Carnarvon.
- 50 Denbigh.
- 51 Flint.
- 52 Anglesey.

**WALES.**
- 63 Denbigh.
- 64 Flint.
- 65 Flint.
- 66 Flint.
- 67 Flint.
- 68 Flint.

**THAMES.**

**CHANNEL.**
- 1 London.
- 2 Kent.
- 3 Hants.
- 4 Sussex.

**SCOTLAND.**

**W. LOWLANDS.**
- 72 Inverness.
- 73 Kirkcudbright.
- 74 Wigtown.
- 75 Ayr.
- 76 Lanark.
- 77 Arran.
- 78 KINROSS.
- 79 Peebles.
- 80 Roxburgh.
- 81 Berwick.
- 82 Rhoda.
- 83 Haddington.
- 84 Kirkcudbright.

**E. LOWLANDS.**
- 85 Fifes.
- 86 Stirling.
- 87 Peebles.
- 88 Midland.
- 89 Perth N.
- 90 Forfar.
- 91 Kincardine.

**NORTH WALES.**
- 92 Aberystwith.
- 93 Irish.
- 94 Rhoda.

**WALES.**
- 95 Glamorgan.
- 96 Denbigh.
- 97 Flint.
- 98 Conwy.
- 99 Anglesey.

**NORTH.**
- 100 Galloway.
- 101 Wigtown.
- 102 Dumfries.

**E. SCOTLAND.**
- 103 Berwick.
- 104 Roxburgh.
- 105 Kirkcudbright.

**IRRISH.**
- 106 Donegal.
- 107 Sligo.
- 108 Mayo.
- 109 Leitrim.
- 110 Mayo.
- 111 Sligo.

**CONNAUGHT.**
- 112 Galway.
- 113 Mayo.
- 114 Galway.

**ULSTER.**
- 115 Down.
- 116 Armagh.
- 117 Monaghan.
- 118 Tyrone.
- 119 Donegal.
- 120 Donegal.
- 121 Fermanagh.
- 122 Fermanagh.
- 123 Fermanagh.

**LOWLANDS.**
- 124 Renfrew.
- 125 Ayr.
- 126 Lanark.
- 127 Wigtown.
- 128 Kincardine.

**HIGHLANDS.**
- 129 Highland.
- 130 Ross.
- 131 Sutherland.
- 132 Ross.
- 133 Ross.

**LOWLANDS.**
- 134 Dumfries.
- 135 Kirkcudbright.
- 136 Dumfries.
- 137 Kirkcudbright.
- 138 Kirkcudbright.

**HIGHLANDS.**
- 139 Highland.
- 140 Highland.
- 141 Highland.

**IRELAND.**
- 142 Mayo.
- 143 Mayo.
- 144 Mayo.
- 145 Mayo.
- 146 Mayo.

**CONNAUGHT.**
- 147 Mayo.
- 148 Mayo.
- 149 Mayo.
- 150 Mayo.

**ULSTER.**
- 151 Down.
- 152 Down.
- 153 Down.
- 154 Down.

**LOWLANDS.**
- 155 Galloway.
- 156 Galloway.
- 157 Galloway.
- 158 Galloway.

Probable Range.
Recorded Distribution.
Distribution verified by the Author.
Geological Distribution.
**Sub-Genus Heliomarces Moquin-Tandon.**

**Xerophila neglecta** Draparnaud.

1837 *Xerophila neglecta* Held in Isis, p. 913.

**HISTORY.** — *Xerophila neglecta* was first discriminated, described, figured and named by Prof. Draparnaud about 120 years ago, and was very generally accepted as a valid species, although Dr. Heynemann regarded it as a somewhat narrowly umbilicated form of *X. itala*; while Comm. Caziot places this species along with more than a score of others as the type of a new group *Neglectiana*, arranging them into two sections.

Dr. J. E. Gray more than seventy years ago, recorded that this species had been admitted into the British list by Dr. Gwyn Jeffreys, who regarded it as a variety of *Xerophila virgata*. It has, however, been recently rediscovered in this country by Mr. A. S. Kennard, who in September, 1915, found specimens at Luddesdown, a village on the chalk formation, near to Cobham in West Kent, where it still exists.

The precise locality is a remote spot about three-quarters-of-a-mile from, and south-west of the village church, and is a grassy bank, about six feet high, which is really a gap in a road-side hedgerow. The species apparently continues to be restricted to the original spot, and judging from the dead shells to be seen around, must have existed there for many years.

I have pleasure in associating this species with the late M. Arnould Locard, of Lyons, one of the most distinguished and typical of the enthusiastic group of continental analytical conchologists, who have for so many years intensively studied and minutely differentiated the shells of France and other countries.

Moquin-Tandon figured the mandible, but little or no further progress was made until Prof. Boycott and Dr. Bowell examined the organization of the species, and it is to their studies that we are indebted for what little we know of its internal structure.

**Diagnosis.** — *Externally, Xerophila neglecta* may be distinguished from *X. itala* by its smaller size, more elevated spire, the greater expansion of the last whorl, and narrower umbilicus. It also differs in the greater solidity of the shell, the much thicker apertural rib, and the usually rich brown peristome.

From *X. virgata* it is readily separated by its much more expanded umbilicus and its usually more depressed shape.
XEROPHILA NEGLECTA.

Internally, X. neglecta differs from X. itala by possessing one dart only, and by its distinctly bifid stylophore it is separable from X. virgata.

Original Description.—Helix neglecta, H. testa subdepressa, albâ ant fuscæcente, fasciata; peristomate solubiâ rubro, margiñato.

Description of Shell.—Shell somewhat depressed, convex beneath, and the spire somewhat produced, whorls $\frac{3}{4}$, of an unicolorous opaque whitish or yellowish tint, or with one broad brown or fawn coloured band above the periphery, and several which may be distinctly defined or more or less broken up and concolent below; the apex is smooth and glossy, horn coloured or blackish; the upper whorls closely and distinctly striate, which become less distinct on the body-whell, with stronger and coarser ribs and collateral ribs at short but not regular intervals; the APERTURE is oblique rounded oval; the PERISTOME reddish-brown or fawn coloured; the internal subhinge of the paler or whitish; the UMBILICUS is moderately wide and open, exposing the whole of the spire. Diam., 14 mill.; alt., 10 mill.

The EPIPHRAGM is somewhat thin, transparent, and iridescent, more or less creased, and with innumerable calcareous particles intermingled in its substance.

Description of Animal.—The Animal is described as about 18 mill. long, and 4 mill. wide, thin and slender in form, and of a translucent yellowish-white, darker dorsally, and overspread with close-set rounded tubercles; DORSAL GROOVES distinct and enclosing a row of large oval black speckled tubercles; OMMATOPHORES about 8 mill. long, translucent grey, bulbous at the extremities, with distinct eye-spots near the summits, labial tentacles wide apart and obliquely directed; the TENTACULAR RETRACTORS are visible through the transparent integument as longitudinally subdorsal bluish bands, arising from the base of each ommatophoral tentacle; the MUZZLE is rather long, and the labial-lobes small. The fecal lobe is large and triangular, and the columnellar lobe is very narrow and crescentic.

The REPRODUCTIVE ORGANS show a distinctly secalente OVIDUCT and a well-marked PROSTATE or sperm-duct; the SPERMATHECA is somewhat large, acuminately clavate or club-shaped, and according to M. St. Simon greatly resembles in shape that of X. cephalotes, and is borne on a long and slender stem or duct; the VAGINAL MUCUS-GLANDS are comparatively long, about 12 in number, some showing a tendency to dichotomize; Mollin and Tandon describes a large specimen as possessing 14 small and grey mucous glands, of which 8 were on one side and 6 on the other; the PENIS-SHEATH is of a moderate length, and tapering distally where the retractor muscle is allied; the EPHALUS is long, about three times the length of the penis-sheath, thickest medially, and is probably in its natural position somewhat coiled or twisted; the FLAGELLUM is short and pointed; VAS DEFERENS is fairly long, and enters the epiphallus distally.
XEROPHILA NEGLECTA.

The stylophore or dart sacs are basally united, but distinctly bifurcate distally, they are placed on one side of the oviduct, but only the outer and more muscular sac contains a dart, which is of a simple, slightly curved aciculare type; the inner sac has slighter walls, and recalls the accessory dartless sacs of Hygromia fusca.

The mandible or jaw is somewhat crescentic in shape, slightly more than a millimetre in width, and about a fifth of a millimetre in altitude, with a noticeable, rounded, central rostrum or beak; there are about eight principal rather prominent and well separated transverse ribs, which do not perceptibly reach the lower or cutting edge, but very strongly denticate the upper margin; each of these principal ribs usually show one or more subsidiary thickenings, and give a special aspect to the mandible. The whole mandible is of a fawn colour, and shows a darker line near to and parallel with the upper margin, which probably indicates a line of attachment to the buccal membrane.

The radula or odontophore is nearly 3 millimetres long, almost a millimetre wide, and is said to possess about 94 transverse rows of teeth, each row composed of a median symmetrically bicuspid tooth, about ten admedian or lateral asymmetrically bicuspid teeth, which tend to develop or retain indications of an endoconic elevation, and about twenty usually bicuspid marginals, which are still more asymmetrical, and towards the margin of the membrane may display an endoconic cusp on the membrane.

![Fig. 214.—Mandible or jaw of Xerophila neglecta Drap. x 20. Luddesdown, Kent. From a preparation by Dr. E.W. Bowell.](image)

Fig. 215.—Representative teeth from the radula of Xerophila neglecta Drap., also showing the relative position of the cutting points of the next transverse row of denticles, from Luddesdown, East Kent, prepared and micro-photographed by Dr. E.W. Bowell, x 300.

c. central or median tooth; a. admedian or lateral teeth; m. marginal teeth or uncini.

The formula of the radula of a specimen from Luddesdown, prepared and photographed by Dr. E.W. Bowell, is

\[ \frac{20}{4} + \frac{10}{2} + \frac{1}{5} + \frac{19}{2} + \frac{20}{3} \times 94 = 5734 \text{ teeth.} \]

Food and Habits.—Mr. A.S. Kennard records that nearly all the specimens were found high up on the grass stems, resembling in this the habit characteristic of X. gigaxii.

It is a very shy creature, retiring within its shell at the slightest cause. M. Draparnaud states that the animal has a voracious appetite, while Mr. Kennard records that it feeds freely upon lettuce and carrot while in captivity.

Geological Distribution.—So far as ascertained it is only known fossil by Prof. Pantanelli's Italian record from the Post-Pliocene Travertin at Colle, near Siena, Tuscany.

Variation.—The variation in this species has received little attention abroad, where it does not appear to be very well known, and as it has only been rediscovered in this country a few years ago and is apparently still restricted to the very limited original area where it was first found, we have naturally little knowledge of the modifications it may be liable to in this country.
On the continent several authors have drawn attention to certain divergences from the normal form which have been noticed, and have in several cases applied definite names, varietal or otherwise to them.

I enumerate the ten chief variations, and have reproduced the available information in reference to them.

**VARiATIONS OF FORM.**

**Var. subneglecta** Bourguignat.


*Helix subneglecta* Servain, Moll. Spain, 1880, etc., p. 143.


The var. *subneglecta* Bourg. is described as having a more risen spire, a less open umbilicus, and more cretaceous and thicker shell. Diam., 7-11; alt., 5-7 mill.

The sub-var. *fagoti* Westl. is described as having a convex spire, an open umbilicus, the body-whorl absolutely angulated at the periphery; aperture oval, and the margins not approximating.

Westerlund (Extram. Moll., 1878, p. 93) cites a variety with a subconical spire, but does not apply a definite name.

**FOREIGN DISTRIBUTION.**

**France** — The var. *subneglecta* is recorded from Chateau d'If, Bonches du Rhône, by Bourguignat; from Montpellier, Hérault, by Dubrueil; and from various places in Alpes Maritimes by Comm. Caziot.

The sub-var. *fagoti* is recorded by Dr. Westerlund from Villefranche, Aveyron.

**Italy** — The var. *subneglecta* is recorded from Genoa, Alessio, Porto Maurizio, etc., Liguria, by Pollonera and Monterosato.

**Algeria** — The var. *subneglecta* is recorded from Bône and Alger by Westerlund.

**Var. depressa** Taylor.

Spire depressed.

Westerlund describes a form with depressed spire, but did not apply a definite name or give the locality where found.

**VARiATIONS OF SIZE.**

**Var. major** Westerlund.


The author does not state the locality where found.

**Var. minor** Moquin-Tandon.


The var. *minor* Moq. is described as "much smaller." The sub-var. *minor* Westl. is described as 8-9 mill. in diam., and 5-5 1/2 mill. in alt.

**BRITISH DISTRIBUTION.**

**West Kent** — The shell in my possession from Luddesdown, near Cobham, scarcely exceeds the dimensions of the variety.

**FOREIGN DISTRIBUTION.**

**France** — On left bank of Paillon, Alpes Maritimes, Comm. Caziot; and Dupuy figures a specimen 9 mill. diam. from Grasse.

**Var. albina** Moquin-Tandon.


The var. *albina* is described as "shell entirely white."

**FOREIGN DISTRIBUTION.**

**France** — This variety is recorded from Grasse, Alpes Maritimes, and Toulouse, Haute Garonne, by Moquin-Tandon; and from Montpellier, Hérault, by Dubrueil.
Var. lutescens Moquin-Tandon.


The var. *lutescens* Moq. is described as of a "dull uniform yellowish tint."

**FOREIGN DISTRIBUTION.**

**France**—Recorded from Grasse, Alpes Maritimes, by Moquin-Tandon.

Var. fuscescens Moquin-Tandon.


The var. *fuscescens* is described as being a brownish shell, with maculations above the periphery, and interrupted bands or white maculations beneath.

**FOREIGN DISTRIBUTION.**

**France**—Recorded from the Sorèzois, Tarn, by Draparnaud.

**VARIATIONS OF BANDING OF SHELL.**

This section embraces the variations in number and also the different modes of their fusion and disruption.

Var. vulgaris Moquin-Tandon.

*Helix neglecta var. a* Draparnaud, Hist. Moll., 1855, p. 108, pl. 6, f. 12.


The var. *vulgaris* Moquin-Tandon, which represents the var. *a* of Draparnaud, is described as shell white, with one brown band above the periphery, with several fine and distinct or more or less confluent or interrupted brown bands beneath.

**FOREIGN DISTRIBUTION.**

**France**—The var. *a* is recorded by Draparnaud from Lauronte, Tarn et Garonne, where it was collected by Baron d'Audebard de Fermsac.

The var. *vulgaris* is recorded by Moquin-Tandon from Grasse, Alpes Maritimes, and Toulouse, Haute Garonne.


The var. *bifrons* is described as shell uniformly yellowish or whitish above, with brownish bandings below.

**FOREIGN DISTRIBUTION.**

**France**—The var. *bifrons* is recorded from Montpellier, Hérault, by Dubuueil.

**VARIATIONS IN COLOUR OF BANDING.**

Var. ochroleuca Moquin-Tandon.


This variety is described as whitish, with a nankeen yellow or rufous band above the periphery and several of the same tint beneath, all more or less transparent.

**FOREIGN DISTRIBUTION.**

**France**—The var. *ochroleuca* is recorded by Moquin-Tandon from Grasse, Alpes Maritimes, and Toulouse, Haute Garonne.

Var. papulosa Moquin-Tandon.


This variety is described as rufous-white, with two rows of irregular brownish spots above the periphery, and some indistinct or interrupted bands beneath, and is closely related to the var. *γ* of Draparnaud.

**FOREIGN DISTRIBUTION.**

**France**—The var. *papulosa* is recorded from Toulouse, Haute Garonne, by Moquin-Tandon.

**Geographical Distribution.**—The range of habitation of *X. neglecta* is probably, as yet, very imperfectly known and will not be elucidated with certainty until the internal structure of the animal inhabitant as well as those of its close allies have been fully examined.
XEROPHILA NEGLECTA.

Its distribution as far as known is chiefly through Southern and Central Europe, its apparent metropolis at present being South-Western France. The British record is far from any other known habitat of the species.

Fig. 216.—Geographical Distribution of Xerophila neglecta Drap.

Probable Range Recorded Distribution

BRITISH DISTRIBUTION.

Kent West—Luddesdown near Cobham, first found there in September 1915! by Mr. A. Santer Kennard.

FOREIGN DISTRIBUTION.

GERMANY.

This species has been reported from Danna, near Mosbach, Baden; from Harz Mountains, Saxony; from Nassau, and from Suhlfield, East Prussia.

FRANCE.

Reported from the following provinces or departments, chiefly in the centre and south:


SPAIN.

Reported from the east provinces and more precisely from Barcelona in Catalonia.

ITALY.

Reported from Abruzzi, Liguria, Romano, San Marino, Tuscany, Umbria, and the Isles of Sicily and Sardinia.

AUSTRO-HUNGARY.

Dalmatia—Recorded from Dalmatia by Schrockinger.

GREECE.

Reported from Peloponnesus, Thessaly, Euboea, and Cyclades.

RUSSIA.

Taurida—Retowski records H. neglecta for the Crimea.

ASIA-MINOR.

Syria—Recorded from Syria by Dr. J. E. Gray.

ALGERIA.

The var. subneglecta recorded from Bone and Algiers by Dr. Westerlund.

Fig. 217.—Autograph of Mr. A. Santer Kennard, the discoverer of X. neglecta in Kent.
Xerophila virgata (Da Costa).

1692 Cochlea alba leviter umbilicata pluribus fasciis circumdata, clavatula productae, Lister, Hist. Conch., tab. 59, f. 56.

1702 Cochleola alba fasciata Cantabrigiensis, umbilicato para, Petiver, Gazoph., tab., 17, f. 6.

1788 Xerophila virgata Da Costa, Brit. Conch., p. 79, pl. iv, f. 7.
1801 — subalbida Poiret, Cop. de l'Aisne, p. 83.
1805 — variabilis Draparnaud, Hist. Moll., p. 84, pl. v, ff. 11, 12.
1805 — maritima Draparnaud, op. cit., p. 85, pl. v, ff. 9, 10.
1840 — (Heliomenes) virgata Gray's Turton, British Shells, p. 160, pl. iv, f. 31.
1855 — hardygalensis Grateloup, Catal., p. 5.
1837 Xerophila variabilis Held, Isis, p. 913.
1837 Theba virgata et maritima Beck, Index, pp. 12, 14.
1834 Theba virgata Lanch, Synopsis, p. 68.
1892 Xerolauta variabilis Monterosato, Moll. isole adj. Sicilia, p. 23.
1892 Xeromovia lineata Monterosato, op. cit.
1892 Xeromovia monstra Monterosato, op. cit.

HISTORY.—Xerophila virgata was first noticed and named polymonically by Dr. Martin Lister in 1692, while the first binomial designation was that bestowed by Da Costa, whose species is certainly not Helix pisana as stated by Moquin-Tandon.

It has been assumed that the present species may be the Helix zonaria of Linne, a view which was accepted by his eminent contemporaries Da Costa and Pennant.

I have pleasure in associating with the present species Prof. Paul Pelseneer, D.Sc., etc., of Brussels, Belgium, one of the very foremost of our truly scientific conchologists and the author of many valuable treatises upon the structure, development, and phylogeny of many molluscan groups.

There are eight undoubted specimens of X. virgata preserved in the Linnean Collection now in the possession of the Linnean Society of London, but no data exists in regard to them, and Mr. Sylvanus Hanley, who published a very exhaustive and excellent analysis of the shell collection of Linne, was apparently unaware of their presence in the cabinet.
This species is very variable in the size and shape of its shell, also in its ground colour, and in the disposition and colour of the banding, and has, therefore, been split up into a great number of species, most of which have no structural basis and very many are probably slight and quite unimportant modifications.

Dr. Pilsbry and others regard *X. variabilis* of Draparnaud as specifically distinct from *X. virgata* Da Costa, while others, including Moquin-Tandon, claim that the *Helix maritima* of Draparnaud is more or less entitled to separate acceptance. Dr. Pilsbry also considers that *H. burdigalensis* Gratetoup, *H. grumnonensis* and *H. lanteretina* of Bourguignat, *H. mendranoii* Servain, *H. salentina* Bl., and *H. striata* Brard should be regarded as synonyms.

**Diagnosis.**—Externally, *Xerophila virgata* differs from *Helix pisana*, with which it is frequently confused, by its smaller size, more prominent spire, wider umbilicus, and by the absence of the finely incised spiral lineation so characteristic of that species.

From *X. caperata* it differs by its shallow and irregular striation, so different from the distinct and more regular rib-like striae of that species; it is also more globose in shape, and has a narrower umbilicus.

From *X. itala* it may be easily distinguished by its more globose shape and narrow umbilicus.

Internally, it differs from *H. pisana* by the complete freedom of the right tentacular retractor from the sexual complex, by the much simpler character of its gypsobelum or love-dart, and by the more numerous transverse ribs upon the mandible.

From *X. caperata* and *X. heripenesis* it differs in its more bulky stylophore, which is sometimes cleft at the apex, as well as by the longer stem to the spermatheca, which has also a smaller terminal sac or vesicle.

From *X. itala* it is separated by having only one love-dart instead of the two found in that species.

**Description of Shell.**—Shell subglobose, spire somewhat raised and conical, base convexly rounded; of an opaque whitish or yellowish colour; rather solid and glossy, with fine but somewhat irregular striae and a few scattered malacions. Whorls 5-6 in number, rounded at the periphery in adults, though sharply keeled in the young, and increasing gradually in size, but inflected on approaching the mouth, the whorls being separated by a distinct suture, and ornament with darker spiral banding, which typically consists of a broad zone above the periphery and seven more slender ones beneath as in Dr Costa's figure. Umbilicus narrow but deep. Aperture obliquely innate; peristome simple, with a thickened internal submarginal rib, which may be whitish or tinged with reddish-brown, and approaches most closely at the basal margin of the aperture, which is slightly dilated over the umbilicus. Diameter, 20 mill.; altitude, 8 mill.

The epiphragm is delicate, transparent, colourless and somewhat iridescent, with a small circumscribed opaque-white area, opposite the respiratory orifice, and formed by a dense deposit of calcareous particles. The epiphragm is attached basally close to the margin of the aperture, but the line of fixation gradually becomes more internal, until at the junction of the outer lip with the penultimate whorl it may be sunk 3-5 mill. within the aperture of the shell corresponding to the position of the internal rib.

The winter epiphragm is described as being often thicker, opaque, and whitish.

**Description of Animal.**—Numerous specimens collected in August, 1917, at Hunmanby, Yorkshire, by Mr. G. Fisher, had a somewhat elongate body, blunt in front, the tail keeled and tapering behind, and projecting well beyond the shell when crawling. The body was closely tuberculate, of a somewhat translucent greyish creamy-white, or even quite colourless behind and below the position of the tentacular retractors; the pigmentation, which varied from pale grey to
intense black, was thus limited to the muzzle and to the dorsal and sub-dorsal areas; the DORSAL GROOVES were indicated by a longitudinal mid-dorsal row of elongate pigmented tubercles, but there were no perceptible traces of the facial, lateral, or pedal grooves; the MANTLE was invariably intensely black with a violet tinge; the OMMATOPHORES were moderately long, colourless and transparent, and overspread with minute grey granulations, the retractor muscles being more or less deeply pigmented and visible through the transparent skin and traceable along the sub-dorsum to their junction with the retractors of the anterior tentacles of their respective sides; the EYE-SPECKS are quite black and sub-apical, being less laterally directed than in certain other species; the ANTERIOR TENTACLES are comparatively long and similar in aspect to the ommatophores; the FOOT-SOLE is elongate, of an uniform creamy-white, and without perceptible longitudinal fasciation or division.

The average amount of manganese present in the tissues of X. virgata is stated by Prof. Boycott to be 0.001 per cent. of the total weight of the animal.

INTERNALLY, the organization is in general conformity with that of its allies, but the KIDNEY is very elongated and pointed at one end and has been likened to a scythe-blade.

The NERVOUS SYSTEM is largely concentrated in the NERVE-COLLAR or brain-ring, as in the normal Helichthidan type, the cerebral pair are closely approximate and somewhat elongate, but not tufted, with thickened junction, which obscures the commissure; the cerebro-pedal and cerebro-visceral centres are stout and fairly elongate, pedal pair and visceral ganglia being fused into one mass, the pleural ganglia being indicated by a thickening of the connective cords and feeble pigmentation; the pedo-visceral complex is pierced by the aorta, while the buccal bulb is protrusible beyond or can be drawn within the cerebro-pedal ganglia.

The REPRODUCTIVE ORGANS present a lingualiform gelatinous ALBUMEN GLAND, of a greyish colour with a greenish tinge, the ceca of the OVOTESTIS are white and lobulate, the HERMAPHRODITE DUCT is attenuated at each end, but thickened medially; the VESICULA SEMINALIS dark grey, the blind end paler and spotted; the OVUDUCT sacculate, of a dull yellowish-grey or yellowish-brown; SPERM DUCT

white and granular; SPERMATHECA usually subtriangular, but often elongate in shape, of a reddish-flesh colour, though occasionally whitish and slightly spotted; the stem or duct fairly long and stout, but thickened basally and without diverticulum. MUCUS GLANDS two on each side, each gland being variously divided into 6/10/21
2, 3, 4, 5 unequal terminal branches; the penis sheath short and narrow, but dilated basally, separated by a distinct flexure from the long and fusiform more or less twisted and whitish epiphallus; the flagellum is short and subulate; the penial retractor attached near the point of junction with the epiphallial tract.

![Image of reproductive system](image)

**Fig. 224.**—Reproductive system of *X. virgata* (Da Costa), Christchurch, Hants., × 2.

- *a.gl.* albumen gland; *d.t.* stylophore or dart-sac; *ep.* epiphallus; *fl.* flagellum; *m.gl.* mucus glands; *ot.* ovotestis continued as the hermaphrodite duct to the vesicula seminalis at its junction with the ovispermogland; *p.s.* penis-sheath; *r.d.* sperm-duct; *s.p.* spermatheca; *v.d.* vas deferens.

**Fig. 225.**—Ovotestis and hermaphrodite duct, showing the cecal arrangement, × 9.

**Fig. 226.**—Vesicula seminalis, showing its connection with the hermaphrodite duct and with the ovispermogland, × 9.

The stylophore or dart-sac is a large and broadly oval sac, fused throughout most of its length to the vagina; it is yellowish-white in colour, and occasionally presenting the atavistic feature of a notched or cleft apex, suggesting a probable mode of origin of the accessory sac from a degenerating dart sac.

Internally, the inner sheath of the sac tapers to an acute point, and the dart is difficult to dissect therefrom. In continental *X. variabilis* and *X. maritima* this bifurcation of the dart sac is much more frequently present than is usual in English specimens, but is by no means invariably found.

![Image of Gypsohelum](image)

**Fig. 227.**—Reproductive organs of *X. variabilis* Drap. (after Schuberth).

**Fig. 228.**—Gypsohelum of *X. variabilis* Drap., greatly enlarged (after Schuberth).

**Fig. 229.**—Gypsohelum or Love-dart of *X. virgata* Da Costa, × 12.

**Fig. 230.**—Section through the apex of the Gypsohelum of *X. virgata* Da Costa, × 12.

**Fig. 231.**—Enlarged view of the flanged apex of the Gypsohelum, × 20.

The Gypsohelum or love-dart is from 2-3 mill. in length, and is the sole British representative of a peculiar type remarkable for its heavy shaft, which increases gradually from point to base, and furnished with two thin, transparent, simple edged, angulated blades, the angulation occurs near the apex, and from it the two
edges converge rapidly to the point. Below the angulation they gradually diminish and blend with the stem of the dart, about half-way down the weapon. In immature darts the blades only extend one-third or one-fourth the length of the dart, and at a still earlier stage no blades are visible. The shaft is usually marked transversely with coarse irregular bands or ridges, resembling lines of growth placed at irregular distances from each other, and varying in depth of whiteness. The base is the widest part of the shaft, but there is no abrupt expansion.

The figure from Schubert of the gyspobelum of Xerophila variabilis shows a very different weapon, whose accuracy should be confirmed.

The spermatophore resembles a spirally twisted filament of silk; it is about 18 mill. in length, and forms about two whorls with a row of upwardly directed marginal denticles on the anterior half, and is evidently moulded in the twisted epiphallus, the flagellum being too short to account for more than 2 or 3 mills of its length. In drying the spiral part quickly hardens and distorts the spermatheca, and sometimes the duct or stem is also contorted by the slender, thread-like, coiled posterior end which hardens immediately when exposed to the air.

The alimentary system is of the triodromous type, the osophagus is long and encircled about midway of its length by the salivary glands, whose ducts are long, slender, and white; the crop is elongate, usually brown in colour, and blends with the stomach, which terminates the osophageal tract; the gut forms the usual reversed S-like coil before entering the straight rectal tract.

The mandible or jaw is of a more or less crescentic shape, and of a fawn colour, the ends are rounded and thinner than the medial portion. It is about 1½–2 mill. wide, with 5 to 10 prominent transverse ribs, which are usually confined to the medial portion, the ends being generally smooth and free from ribbing, which usually denticulate the upper and lower margins. Intermediate and slightly developed ribs are sometimes present on the jaws of the older animals, and in some the ribs only crenulate the lower or cutting margin. Mouquin-Tandet describes the jaw of H. variabilis as bearing from 16–20 ribs, and that of H. lineata as having 7 to 9 only.
The radula is 2½ mill. long and 1½ mill. wide, of the usual type of ground snails, with ill-developed or absent endocones; the median row of teeth are tricuspid, the laterals are bicuspid, having only the mesocone and the ectocone, and this is said to continue quite to the margin of the membrane, but speaking from my own observations of a few years ago, the marginals gradually become tricuspid by the requirement of a third cusp due to the splitting of the ectocone.

The formula of a Chipstead specimen, prepared and photographed by Dr. E. W. Bowell, is
\[ \frac{19}{2} \times \frac{11}{2} + \frac{3}{3} + \frac{11}{2} + \frac{19}{2} \times \frac{120}{2} = 7,320 \text{ teeth.} \]

**Phylogeny and Ontogeny.**—That the more primitive state of the *Xerophila* was possibly tetrabelous, and constituted by paired, double dart-sacs, is suggested by *X. italic* still retaining two sacs, though in a transitional semi-combined form, with a couple of darts still present therein.

In *X. virgata* the dart apparatus is normally reduced to the simple single sac and its contained dart, but we find that under special conditions or towards the limits of its geographical range there is apparently a distinct tendency to atavism, shown by the retention of a more or less definite bilobation, implying a former more complete separation of the sacs.

According to Moquin-Tandon, this bilobation is not unfrequently met with in the stunted and recessive var. maritima Drap. of the French coasts, and the same peculiarity was observed by the late Mr. C. Ashford in some specimens of the same variety from Corfe, Dorset. The same careful worker detected the similar atavic character in some *X. variabilis* from the Island of Malta; while specimens collected by Mr. J. Bliss, M.P., in December, 1920, at San Stefano, near Constantinople, and examined by Dr. E. W. Bowell, all showed the same retention of this primitive feature.

To further strengthen this hypothesis it would be desirable to compare the organization in this respect of other specimens of the species from remote localities, and dissections should also be made of adolescent animals in which indications of the former presence of double dart-sacs would probably be more frequently detected than in the mature mollusk.

**Reproduction.**—Though the preliminary coquettings leading up to conjugation have not been observed or published regarding this species, yet it is well established by many observations that the breeding season is during the late summer and autumn months, and that the male element is transferred in the form of a delicate, serrate and twisted spermatophore.

M. Bouchard-Chantereaux, who has so carefully studied the life-history of this and many other species, says that it breeds in September and October, but there are many reliable observations of pairing as early as August, and this process is continued up to October, and even November in this country.

The eggs are stated by Bouchard-Chantereaux and Gassies to be 40–80 in number, white, slightly transparent, more or less spherical in shape, and
varying from 1 mill. to 1½ mill. in diameter. They are deposited just beneath the surface of the soil in a trough excavated by the muzzle of the animal; they hatch in 15–20 days after deposition, the shells when hatched and for some two or three months afterwards are horn coloured. According to Gassies observations in the south of France, they become full grown at the end of the following year, but Bouchard-Chantereaux says that in the north of France they attain their full size during the second year, though reproducing their species towards the end of the first.

In their early and adolescent stages they differ from the adult in showing a distinct peripheral keel, which usually becomes obsolete before full growth is attained.

M. Gassies records the voluntary nuptials of Helix pisana and Xerophila variabilis during a period when the air was charged with electricity, the resultant progeny of the H. pisana being completely albine, while those of X. variabilis had deeply coloured shells, though the parent was of the usual fasciate variety.

**Food.**—In captivity Dr. Gain found this species to be more fastidious in its choice of foods than many others, as out of 98 different foods offered 58 were absolutely refused, while six others were only nibbled after two or three days starvation. Only four kinds of food—swede, radish-root, Melica sylvestris, and Boletus edulis—were greedily devoured, though ten others were freely eaten, and nineteen less freely.

In a state of nature it has been observed in this country to frequent or feed upon the ragwort (Senecio jacobea L.), black knapweed (Centaurea nigra L.), yarrow (Achillea millefolium L.), sea thrift (Statice maritima Müh.), thistles (Carduus L.), hemlock (Conium maculatum L.), alexanders, etc.; while about Lyons, France, it has been noted by Dr. Riel as especially attached to Arctium lappa and Onopordum acanthium L.

Mr. Hargreaves has especially remarked on its noticeable preference for the decaying foliage of yarrow, ragwort, and alexanders (Smyrnium olusatrum), and that on the stems of thistles and hemlocks they are sometimes clustered as thickly as the Helix pisana at Tenby.

In Ireland Mr. R. Standen and others observed this species feeding upon the rabbit-droppings, which so thickly strew the sandhills, etc.

A carnivorous propensity has been recorded by Prof. R. Tate, who affirms its habit of feeding upon Coccinelle and other small insects, while Mr. T. Vernon Wollaston has recorded that the present species in company with others were confined in the same receptacle with a number of beetles, which were all devoured in a fortnight's time, though green food was available.

Like the generality of species frequenting dry places, this species can endure long abstinence from food. Mr. A. Hartley has kept specimens in captivity entirely without food for fourteen months, and even this can probably be considerably exceeded.

**Habits and Habitat.**—This is an eminently gregarious species, usually seen in the daytime adhering in clusters to the stems and leaves of the different food plants, and, according to Staff-Surgeon Jones, are capable of withstanding a considerable amount of solar heat, far more than even Helix pisana; a continuance of dry hot weather will, however, compel it to seek shelter by self-burial at the roots of the plants until the advent of rain, when the snails suddenly appear in thousands, and have contributed to the belief in "showers of snails."
As a xerophilous species, it is remarkable as sharing with *Theba cantiana* and certain other species the habit, when roughly handled, of ejecting from its mouth one or two drops of a clear tasteless fluid like water.

Though not strictly geophilous, it seldom climbs so high on trees as those observed by Mr. L. E. Adams, which were at a height of ten feet or more up the trunks of the beech trees, and Mr. Hartley has observed them at Southport, where they climbed to the very top of the houses.

Its preference is for the short grass of the open downs, and it is most abundant on the sea-coast, and on limestone, chalky, or sandy soil, though far from being confined to them. Moquin-Tandon remarked upon the preference of *Helix maritima* for the coast, and apparently views this as indicating a different species, overlooking that this habitat may be a cause of the variation.

Dr. Riel, of Lyons, has recently investigated the analogy between halophile areas and waste or arid ground far removed from the influence of the ocean, and shows that the characteristic plants are similar in both these different areas; while the non-marine mollusca, naturally accustomed to live under maritime influence, are demonstrated to prosper admirably when transferred to waste ground far removed from the sea.

They are not very active, but fairly bold, but do not usually extend the anterior parts very far beyond the shell when crawling. One specimen while under observation crawled 1½ inches in one minute, or a mile in 29 days 8 hours.

It is said to be very sensitive and averse to wind, and can only be found during windy weather with great difficulty, while very persistent drought or consistent heavy rains are almost equally inimical.

**Hibernation.**—In this country *A. virgata* usually does occupy hibernating quarters, although isolated instances of its hardihood are recorded, and the habit of hibernation is not accepted by some observers.

It has been stated to be very late in waking from its winter dormancy, and Mr. J. A. Hargreaves from his long experience of this species at Scarborough, affirms that it is never obtainable until the approach of summer, and sometimes is even as late as August. It is, however, probable that the growing young are about, and that July and August are the periods of their approach to full size, while the older ones in a great measure have died off during the winter months.

During hibernation it has the habit of burying itself mouth upwards level with the soil, exactly as other species do, but it is easily revived by warmer spells, and then moves about in search of food.

**Uses.**—*A. virgata* is regarded as edible in certain parts of France and in other countries. A large form is, according to Mr. L. E. Adams, always to be found on sale in the Algerian markets. The var. *variabilis* is very generally eaten by the peasantry at Montpellier, and throughout the ancient province of Aquitaine, and the var. *lineata* in other parts of France.

**Parasites and Enemies.**—This species has many enemies amongst the birds, which evidently regard it as a desirable food. The rock dove (*Columba livia*), the stock dove (*Columba oenas* L.), and pigeons generally eat this species freely. The peewit (*Vanella cristata*), the wheatare (*Saxicola oenanthe* L.), and pheasants also find it nutritious. The fieldfare and redwing search during the winter months for and feed upon *A. virgata*, and the starling will also eat them, especially in winter,
It is found, though not abundantly, at "thrust stones," indicating it as occasionally eaten by the thrushes, as it is by blackbirds also.

Perhaps the sheep are the greatest destroyers of this species, which is said to be sought for by them, as the sheep have been noticed to frequent and graze at those places where the shells are most plentiful; this diet is believed to give to the South Down mutton its peculiar and prized flavour.

Mice are also stated to make it an article of food at Northampton, according to Mr. C. E. Wright.

*Melinda*, a group of flat-bodied, blue dipterons flies which in their larval stage are recorded as parasitic upon, devouring and eventually destroying X. *virgata* and other species.

*M. royiata* Robineau-Desvoidy, which is common about Cambridge, deposits its eggs from May to August, in or near the respiratory orifice of *X. virgata*, to which species it is apparently restricted, as *H. hortensis*, *X. itala*, and other species, plentiful around, were not infested. The larve on hatching bore into the kidney, feeding upon its substance and juices, and afterwards devouring the liver and other organs. Before the larve is full grown, the snail dies, becomes a decomposing liquid mass, and forms the final meal of the larve, after which it forsakes the shell of its victim, and burrows in the earth to pupate, the fly emerging in about a fortnight, the whole life cycle occupying about a month.

Other larvae of the same species (or of *M. gentilis* Robineau-Desvoidy, an allied species, which have been obtained by Dr. E. W. Bowell from *X. virgata*) may for a time exist in the same shell, but they are eventually destroyed and fed upon by the survivor, as only one larve attains maturity in each shell.

The *Melinda* larve are, however, themselves liable to be destroyed not only by the larve of certain lehenmon flies, which are especially parasitic upon them, but also by the sarcophagous and possibly saprophagous larve of *Sarcophaga crassipennis* Paul, a dipteron which Dr. Keilen believes invades and devours the remains of any snail which has been previously parasitized and killed by the *Melinda*.

**Geological Distribution.**—The maps showing the fossil distribution of this species as known to me, will show how few are the observations that have been made upon this aspect of the subject, and will certainly emphasize the desirability of caution in drawing any final conclusions from such scattered data, if at all conflicting with the more numerous and palpable evidences presented by geographical distribution.

It has been remarked by Kennard and Woodward that the large coarsely striated form of *X. virgata* prevailing in the south-east of England and on the opposite continental coast is quite unrepresented in Ireland, the recent shells as well as those of the Irish deposits being identical with those of the west of England.

**Pleistocene.**—In Kent East, it is recorded from the fluvitile deposits at Faversham by Prof. Morris.

In Essex South, it is cited from the drift in Sam Green's pit, Ilford, by Mr. J. P. Johnson; and is also recorded from the freshwater marls of Chelton.

In Cambridge, it is recorded from the drift at Barnwell by Mr. Johnson, and as common in the gravels at Barrington near Cambridge by Mrs. McKenny Hughes.

In Worcester, it is recorded from the freshwater deposits of Crophorne near Pershore by Prof. Morris.

**FOREIGN DISTRIBUTION.**

In France, *Helix variabilis antiqua* is reported from beds in the Mediterranean basin by M. de Serres, and this species or "an analogous fossil" from the deposit at Dax, Landes, by M. Grateloup; while Dr. Paul Fischer has recorded it from the bone-breccia bed of the cavern of Bagères de Bigorre, Hautes Pyrénées; Caziot and Maury report *H. maritima var. fabroniana* from the Valley of the Var, Alpes Maritimes; and M. Caziot also records it from the Upper Pleistocene bone-breccia at Toga near Bastia, Corsica.
In **Italy**, *H. variabilis* is recorded from Post-Pliocene Travertin at Colle, Staggia, and Chiusalino near Siena in Tuscany by Dr. Fantanelli.

In **Algeria**, *X. variabilis* is recorded by M. Bourgnignat as fossil about Calle, also at Cap de Garde, near Bône, and on the island of Rachgoun at the mouth of the river Tafna.

**ENGLAND.**

**Holocene.**—In West Cornwall, it is recorded by Rev. R. A. Bullen from the stratified sand at a depth of 4–7 feet below the lacustral deposit at Perranzabuloe. Collected in blown sand on Towan Head by Kennard and Warren; from Riviere Towan near Camborne, and also from an ancient kitchen-midden, with broken marine-shells, in an old gravel-pit at Hayle, by Mr. Johnson; while Mr. W. D. Roebuck found it abundantly in the cliffs west of Lizard Point.

In North Devon, the var. *submaritima* of Jeffreys was found in the raised beach at Taunton by F. J. Partridge.

In North Somerset, it has been found by Mr. Swanton in a holocene deposit on Brean Down, Weston-super-Mare.

In Dorset, it has been found in the ejecta of mole-hills and rabbit-warrens on downs above Durdle Door and behind Swanage-head by Rev. R. Ashington Bullen.

In North Wilts., the type form and var. *albicola* found in superficial deposits at Avebury by Mr. H. St. George Gray.

In East Sussex, it has been found in a Neolithic hill-wash, Brighton, by Mr. Johnson; and by Rev. S. Spencer Pearce in a holocene deposit at Cow-Gap Cliff, Beachy Head, Eastbourne.

In the Isle of Wight, it was found in saberial beds, and in a Neolithic rain-wash at St. Catherine's Down by Bristow and Kennard and Warren.

In East Kent, it has been collected from a deposit overlying the rubble-drift at Barton Court, Backland, Dover, by the Rev. R. Ashington Bullen.

In Lincoln North, it was found at Greetwell in 1906 by Mr. J. F. Mussham.

In South-west Yorkshire, it was discovered by Dr. Corbett in the deposit of lacustrine marl at Askern near Doncaster.

**IRELAND.**

In West Galway, it was found in the "black band" of the celebrated deposit at Dogs' Bay, Roundstone, by Mr. R. D. Darbishire.

**FOREIGN DISTRIBUTION.**

In **Spain**, the Rev. R. Ashington Bullen records from the Island of Majorca, *Helix variabilis* and var. *maritima* from a hill-wash at Porto Pi near Palma; and the var. *maritima* in coast deposits at Alcudia.

The same author also records *Helix virgata* and var. *maritima* in a deposit near the railway bridge at Manresa near Barcelona, Catalonia.

In **Algeria**, *X. variabilis* is recorded by M. Bourgnignat from the recent limestones at Fouka, and about "Fort de l'Eau" near Alger, as well as in the modern deposits near Kolâa and Tipaza.

**Variation.**—More than 150 varieties of this species are catalogued, but amongst these, there are certainly many exact duplications or synonyms and numerous others which are approximately identical, but authentically named specimens are difficult to obtain.

Many scientists who cultivate the study of the Xerophiles in France regard as species numerous shells which exhibit far less differences than British conchologists consider necessary to entitle them to specific status, and, furthermore, the structural peculiarities of the animal, if any, are in the majority of cases, quite unknown and disregarded.

The most satisfactory method to adopt in this group until structural differences have been demonstrated, would be to regard very closely related shells as simple varieties of the older forms around which they cluster; this course would keep prominent the relationship, while emphasizing the differences, when these are not in themselves sufficiently striking to absolutely warrant elevation to specific rank,
The effects of a different environment is often strikingly displayed in the shell. The uniformly dull white shell is induced by continued exposure to ardent sunlight on dry and arid ground, such shells are regarded as essentially characteristic of hot desert regions, the thick whitish shell reflecting the heat to which it is exposed, and therefore tending to more effectually conserve the essential moisture of the animal inhabitant.

Pigmentation attains its extreme development in the var. nigrescens, in which the whole surface of the shell is very dark and more largely composed of animal matter. In its most characteristic state it may easily be mistaken for Hygromia hispidula. This form is connected with the dull white form by the varieties rufula, latescens, etc.

**VARIATIONS IN FORM OF SHELL.**

**Var. conica** Germain.

_Helix plicata var. conica_ Germain, Feuille jeunes Nat., p. 102.

**Shell** very conical in shape. Well marked shells of this variety have an altitude quite equal to or even exceeding their diameter.

The var. conica is described as being as broad as high, very markedly conical, quite convex below, suture somewhat deep. **Diam.**, 10 mill.; **alt.**, 9 mill.

The sub-var. major Bourguignat. The type figure is very conoid and shows a diameter and altitude of 15 mill.

The var. E of Gassies is very conical, but zoned as in the typical _X. variabilis_. The var. F of Gassies is also very conical, of a fawn or yellowish-grey in colour with an interrupted paler keel-line. The var. D of Gassies is described as "conical, white, peristome very thick." The very thick peristome, as well as the character of the pigmentation, are, however, characters not necessarily correlate with form variation.

**BRITISH DISTRIBUTION.**

In England, it has been noted at Weston-super-Mare, Somerset, by Mr. J. Madison; at Bridport, Dorset, by Mr. Deakin; at Blaxhall, Suffolk, by Mr. G. T. Rope; and at Dymchurch, Kent, and Filey, Yorkshire, by Mr. W. E. Brady.

In Wales, it has been found at RhyL, Flintshire, by Mr. W. H. Roland; at Colwyn Bay, Denbigh, by Mr. Brady; and at South Cliff, Tenby, Pembroke, by Mr. A. G. Stabb.

In Ireland, it was collected by Mr. P. H. Grierson at Barmouth, Louth, and Ennystymon, Clare; and by Mr. A. W. Stelfox at Earawalla Point and Dogs Bay, Galway, the latter very characteristic specimens.

**FOREIGN DISTRIBUTION.**

In France, Dr. Gassies has found the varieties he describes in the Agenais, but especially notes the var. F as found on a bank of lacustrine marl of 3rd century age at St. Julien de Fargues, Landes; and the var. conica Germain is recorded as rare at Puy, near Dieppe, Seine Inférieure.

In Algeria, M. Bourguignat records his _H. lineata var. major_ from Alger.

**Var. subglobosa** Jeffreys.

_Helix virgata var. inflata_ Westerland, Faunaen Palæart., 1859, p. 166.
_Helix virgata var. variabilis & turgida_ Blanc, and Westl., Westerland, op. cit.
_Helix virgata var. variabilis & varia_ Westerland, Faunaen Palæart., 1859, p. 166.
_Helix virgata var. dilatata_ Sikes, ms.

The var. subglobosa is more globose, last whorl larger in proportion to the rest.

Dr. Jeffreys included in his description of this variety the not necessarily correlated characters of "smaller, with a double band above the periphery," which I have excluded.
The sub-var. *inflata* Westerlund has a greatly swollen and variously landed shell, with a red brown submarginal rib. Diam., 20-22 mill.; alt., 14-15 mill.

The sub-var. *turgida* Il. and Westl., is described in exactly the same terms as var. *inflata*, except that the peristome is stated to be light-brown and the inner marginal rib whitish. Diam., 20 mill.; alt., 13 mill.

The sub-var. *tumida* Westerlund is a very large form, but is similarly characterized by its shape, but has somewhat radiate zigzag markings, and a bright lilac aperture; the lip is broad and red-brown in colour. Diam., 30 mill.; alt., 22-23 mill.

The sub-var. *variata* Westerlund (which is synonymous with *H. variabilis* var. *turbina* of Cañuel) has the penultimate and body-whorl much swollen and rapidly increasing in size; the body-whorl being tumidly rounded. Diam., 18-20 mill.; alt., 15-20 mill.

The sub-var. *dilatatata* Sikes has the last whorl more dilated, the base more convex, the umbilicus somewhat larger, and the aperture less oblique and loftier than in type shells.

**BRITISH DISTRIBUTION.**

**England**—The var. *subglobosa* Jeffreys is recorded by its author from St. Mawes, near Falmonth, Cornwall; by Miss Hele from the sandhills, Weston-super-Mare, North Somerset; from the vicinity of Swanage, Dorset, by Mr. William E. Brady; from Winchester Downs, Hampshire, by Mr. J. R. le B. Tomlin; from Folkstone, East Kent, by Mrs. Fitzgerald; from Charing, West Kent, by Canon Horsley; from Lowestoft, Suffolk, by Mr. J. E. Mayfield; from Cooper’s Hill, Gloucester, by Mr. E. Simpson; and from Durham Downs, Bristol, by Mr. J. W. Cundall.

**Wales**—Reported from Pembroke at Penally and Black Rock, Tenby, and from Flintshire at Vorty, Rhyl, by Mr. G. S. Tye.

**Ireland**—Recorded by Dr. Jeffreys from Bantry Bay, Kerry.

**FOREIGN DISTRIBUTION.**

**Italy**—The sub-var. *inflata* is recorded from Italy at Taranto, Apulia, by Dr. Kohelt; and was collected by Mr. F. H. Sikes at Pompeii in 1909.

The sub-var. *tumida* is recorded and figured from Bari, Apulia, by Dr. Kohelt. The sub-var. *turgida* is recorded from South Italy.

The sub-var. *variata* is cited by Dr. Kohelt from Calatafini and Messina, Sicily.

**Var. depressa** Requien.


**SHELL depressed.**

The var. *depressa* of Requien is a descriptive name. The sub-var. *de pressa* of Bourguignat is described as of moderate size with a depressed spire and a diameter of 16-17 mill., and an altitude of 12-13 mill. The sub-var. *depressa* of Westerlund is depressed or quite flat, umbilicis wider and less overspread by the reflected lip; size variable, the ratio of altitude being about two-thirds of the diameter.
The var. B of Gassies is said to be more discoid than type; the var. C is discoid and greyish; and var. G is described as depressed, etc.

The sub-var. lauta is globosely depressed. Diam., 14-18 mill.; alt., 9-13 mill.

**BRITISH DISTRIBUTION.**

**England**—The var. depressa is recorded from Barnstaple, Devon, by Mr. F. J. Partridge; from Swartraton, Hampshire, by Rev. W. L. W. Eyre; from Carisbrook, Isle of Wight, by Mr. G. K. Gale; from Oxford by Mr. A. H. Jowett-Murray; from Tenby, Pembrokeshire, by Miss F. M. Hele; from Canwick, Lincoln, by Mr. J. F. Mussham; this last specimen was 18 mill. in diameter and 10 mill. in altitude, and had the markings ascribed to var. picturata.

The sub-var. subaperta is recorded by Dr. Jeffreys from Bath, Somersetshire; from the Downs, near Winchester, by Mr. J. R. le B. Tomlin; at Folkstone, Kent, by Mrs. Fitzgerald; at Ambrosden, Oxford, by Mr. Lionel E. Adams; and by Mr. J. Blackburn, at Boston Spa, Yorkshire, in Sept. 1886.

**Wales**—Mr. F. W. Wotton has found var. depressa on East Moors, Cardiff.

**FOREIGN DISTRIBUTION.**

**France**—It is recorded from the environs of Paris by M. Pascal; from Bordeaux, Girond, by Dr. Scharff; reported from Née, Alpes Maritimes, by Prof. T. D. A. Cockerell; and by Requien for several places in Corsica.

The sub-vars. B, C and G are all reported from the Agemais by Dr. Gassies.

The sub-var. lauta Lowe is found on all the oceanic and Mediterranean shores of Western Europe, and was originally described from Madeiran specimens, and has been noted in France from the Aline, Bouches-du-Rhône, Gard, Var, and Vaucluse. The sub-var. durtalensis is recorded by Dr. Germain from Durtal near Angers, Maine-et-Loire, and from Rochelle, Charente Inférieure.

**Spain**—The sub-var. lauta is recorded from Alcudia, Island of Majorca, by the Rev. R. Ashington Bullen.

**Var. carinata** Jeffreys.


*Helix obtusa var. 1, de L‘Hôpital, Moll. Caen, 1889, p. 22.

The var. carinata Jeffreys is described as "compressed above, periphery strongly keeled," adding the subsidiary character "shell yellowish-white," which is not an essentially correlate feature. The var. carinata Pictura has the "last whorl acutely carinate."

The sub-var. subcarinata Moq. is described as last whorl flatter, and subcarinate; the var. subcarinata Bourg., has an obsolete keel on the last whorl, which disappears at the aperture; the var. *H. lineata* var. I de L’Hôpital has a more risen spire, is of a white colour, and the last whorl often subcarinate.

The sub-var. obsoleta Ziegler is described by Pfeiffer as small and white, with a blunt keel, and may be doubtfully placed under this head. It is the *H. virgata* var. 7 of Dr. Pfeiffer.
XEROPHILA VIRGATA.

The specimens upon which Dr. Jeffreys founded the variety were found at Winfrith (erroneously spelt Wingfrith by Dr. Jeffreys) near Wareham, Dorset, by Mr. J. E. Daniels, of Epsom, about 1855, who, writing in Nov. 1875, says:—"It is now upwards of twenty years since I found them. I should rather have called them 'subcarinate'; nevertheless, the keel was well marked, and the variety was entirely confined to one bank a few years long."

**BRITISH DISTRIBUTION.**

England—It has since been noted at Bratton St. Maur, Dorset; by Mr. E. W. Swanton; at Yarmouth, Isle of Wight, by Mr. C. Ashford; at Folkestone, Kent, by Mrs. Fitzgerald; at Eastbourne, Sussex, by the Rev. S. Spencer Pearce; at Thorpe, Norfolk, and Lowestoft and Mendlesham, Suffolk, by Mr. A. Mayfield; at Islip, Oxon, by Mr. A. H. Jowett-Murray; in Yorkshire, at Bridlington, by Mr. W. E. Brady, at Pontefract, by Mr. J. Wilcock, and Bank-Field, Cottingham, by Mr. J. W. Carter.

**FOREIGN DISTRIBUTION.**

France—Moquin-Tandon quotes the var. subcarinata as living on the French and Corsican coasts, and especially cites Port Vendres in Pyrénées Orientales. Pascal cites var. subcarinata from about Paris.

The *H. lineata* var. 1 of de L'Hôpital is cited for Ste Paix near Caen in the department of Calvados by its author.

Italy—Var. carinata Pirona is recorded from Udine, Venetia, by its author.

Algeria—The var. lineata-subcarinata Bourguignat is recorded from Bône and Oran by Bourguignat.

**VARIATION IN SCULPTURE OF SHELL.**

Var. striatula Bourguignat.


Shell with stronger and better-marked transverse striæ, approaching certain varieties of *Helix subverberionalis*.

It is not improbable that this form may, on a critical examination of its structure, prove to be a distinct species; it approximates to specimens named *H. nilssoniana*.

**BRITISH DISTRIBUTION.**

Sussex E.—A distinctly and regularly striate shell resembling *X. coperata* found at Rye by the Rev. S. Spencer Pearce.

**FOREIGN DISTRIBUTION.**

France—Ax, Ariège, July 1887! Dr. W. E. Clarke.

Algeria—Recorded from Bône by Bourguignat.

**VARIATION IN SUBSTANCE OF SHELL.**

Var. crassilabrum Bourguignat.


Shell with the peristome greatly thickened by the extension and development of the submarginal rib, which may be white, rosy, or fawn-coloured. As subsidiary characters, it is noted that the shell is usually small and of an uniform whitish tint.

The *H. variabilis* var. D of Gassies is described as "conical, white, peristome very thick."

It has not yet been recorded for the British Isles.

**BRITISH DISTRIBUTION.**

**FOREIGN DISTRIBUTION.**

France—The var. D of Gassies is recorded from the Agenais by its author.

Algiers—The var. crassilabrum is recorded from the environs of Bône by M. Bourguignat.

Var. pellucens Shuttleworth.

*Helix pellucens* Shuttleworth in coll. Blanner.

*Helix pellucens* Requin, Con. Corse, 1815, p. 16.


Shell extremely thin and subtransparent.

**BRITISH DISTRIBUTION.**

Isle of Wight—Freshwater, 1886! J. W. Wood.

Pembroke—Galtar near Tenby, 1895! A. G. Stubbs.

**FOREIGN DISTRIBUTION.**

Corsica—Recorded by Moquin-Tandon for Biguglia near Bastia, St. Florent, and Bonifacio.
Var. variabilis Draparnaud.

**VARIATIONS IN SIZE OF SHELL.**

*Helix variabilis* Draparnaud, Hist. Moll., 1885, p. 54, pl. v., ff. 11, 12.

*Helix lincata* var. 2 *variabilis* de l'Hôpital, Mol. Cour. 1830, p. 22.


*Helix virgata var. major* Taylor, Journ. of Conch., 1883, p. 29.

*Helix variabilis var. J. Gassies, Mol. Agenais, 1841, p. 79.

**Shell** larger, attaining 20 mill. or more.

The var. *variabilis* Drap. is figured by its author as about 20 mill. in diameter. The sub-var. *virgata-variabilis* Westerlund is described as 20 mill, in diameter, and 14-15 mill. in alt. The sub-var. *lincata-variabilis* de l'Hôpital is depressed, with a larger umbilicus. Diameter, 20 mill.; alt., 10 mill.

The sub-var. *lauta-maxima* Bourguignat is described as usually whitish, but frequently banded; diameter, 23 mill.; alt., 18 mill. The sub-var. *lincata-maxima* Bourg. is 19 mill. diam., and 16 mill. alt.

**England.**—The variety is recorded from several counties mainly in the south and west of England, the largest British specimen known was found by the Rev. S. Spencer Pearce in cultivated fields at Holywell Cliffs, Eastbourne, Sussex, and measured fully 25 mill. in diameter. In Dorset, the late Mr. Clement Reid found shells 8ths of an inch wide at Allipuddle; the late Mr. J. C. Mansel-Pleydell collected similar specimens at Panecnawlie; Dr. Jeffrey's records that the largest shells of this species seen by him were collected by Mr. W. Thompson near Weymouth; and Rev. Canon Norman found very large shells in the Isle of Portland. In East Kent, Rev. Canon Horsley has collected very fine examples at Margate; and Mr. L. E. Adams has recorded finding shells 20 mill. in diameter in stubble-fields near Lydden. Specimens of similar size have been found in several other areas.

**France.**—The “large variety” of *H. variabilis* has been found in the Alpes Maritimes at Nice, by Col. Wilmer, and at Monaco by Dr. Viner; the var. *J.* in the Agenais by Dr. Gassies, and the *H. lincata var. variabilis* is recorded from Caen, Calvados by de l'Hôpital.

**Italy.**—The var. *major* Pirona is from Friuli, Venetia, and the sub-var. *tumida* Westerlund from Bari, Apulia, if correctly assigned to this species, are the largest specimens known. Signor Mascarin records a specimen 26 mill. by 19 mill. from S. Elpidio and Fermo in the Marches. The sub-var. *inflata* is recorded from Taranto, Apulia, by Dr. Kobelt, and from Pompeii, Campania, by Mr. F. H. Sikes. The sub-var. *turgida* is from Southern Italy, and is also recorded by Dr. Kobelt.

**Algeria.**—Mr. Bourguignat records *H. lauta-maxima* from Bone, Province of Constantine, and *H. lincata-maxima* from Hussein Dey near Alger, and Man-sourah near Tlemcen.

**Dalmatia.**—Herr Clesin records specimens from Zara, 20 mill. in diameter.
Var. maritima Draparnaud.


_Helix maritima_ Drap., Hist. Moll., 1804, p. 50, pl. v, fig. 9, 10.


_Helix var. minor_ Bourguignat, op. cit., p. 222, pl. 23, fig. 20—21.

_Helix var. minor_ Bourguignat, op. cit., p. 226, pl. 23, fig. 10, 11.

_Shell_ much smaller than typical form, and usually with a more elevated spire, and more deeply pigmented bands.

The original description by Draparnaud of his _Helix maritima_ var. _a_ is "Anny._

_Anfino fasciis confertiis intermeptis subtilis notato, et supra fascii maritini continuato."

The var. _b_ is described as "Testa fasciis confertiis intermeptis, aut maculis radiatibus pulcher perfusi."

The var. _maritima_ Drap. is the stunted maritime form, but is not confined to that environment, being found also in the less favourable localities inland. Draparnaud's figures 9 and 10 represent not the type form but his var. _b_, and show this form as being 11 mill. in diameter and about 10 mill. in altitude.

According to Comm. Caziot, of Nice, one of the most critical conchologists of the present day, no shell has been more misunderstood by French authors, even Moquin-Tandon and Dupay are stated to have erroneously figured as this form a shell of the _Xerophila_ group. The figures reproduced herefrom from Draparnaud of _H. maritima_ var. _b_ are the only ones he published to represent his species, and we are now entirely dependent on the descriptions and these figures for our appreciation of its peculiarity, as the actual type-specimens have disappeared from his collection now located in Vienna Museum.

The _Helix maritima_ is also usually considered to be the _Helix lineata_ of Olivi, but this is denied by several French conchologists who have specially studied the question, affirming that Olivi's description is too meagre, and that the six cited illustrations differ somewhat in their characters.

The sub-var. _minor_ of Piona is described as 10—12 mill. in diameter. The sub-var. _viniabilis-minor_ Bourguignat is 12 mill. in diameter; the _lineata-minor_ 8—9 mill.; while the _lenta-minor_ and _moesta-minor_ are each 11 mill. diameter. The sub-var. _minor_ Taylor is 61 mill. in diameter, and might form a sub var. _minima._

The sub-var. _submaritima_ Jeffreys is described as much smaller, more deeply coloured (often with a violet tinge), and spire raised. Diam., 8 mill. ; alt., 61 mill.

The sub-var. _burdigalensis_ is stated by Morelet to be a modification of _Helix maritima_, and exactly similar to Algerian specimens of Draparnaud's species.

This variety is diffused along the down, etc., especially near the sea-coast, and has been observed to have the habit of covering the tips of the short bare grass of the chalk-downs at Freshwater, Isle of Wight, but is not confined to such places. It is similarly distributed throughout Southern and Western Europe, North Africa, and Western Asia.

_FOREIGN DISTRIBUTION._

France—The var. _maritima_ is recorded from Gard, Hérault, Loire Infinière, Manche, and Somme.

The sub-var. _moesta-minor_ is recorded from Mentone, Alpes Maritimes.

The sub-var. _burdigalensis_ from Cestas near Bordeaux, Gironde.

Italy—The _H. lineata_ is recorded from Viareggio, Tuscany; from Venice, Venetia, and from the Island of Sardinia.

Spain—The var. _maritima_ is recorded from Carmona, near Seville, Andalusia, by the Rev. R. Ashington Bullein.

Greece—The var. _maritima_ is recorded from Zante, Ionian Islands, by P. Hesse.

Algeria—The _H. moesta v. minor_ is recorded by Bourguignat from Oued Kebir, near Blidah, and from Bône, Dellys, Oran, etc.

The sub var. _lenta-minor_ is recorded from Bône.

The sub-var. _viniabilis-minor_ from Oran.
Var. nigrescens Grateloup.

_Helix variabilis_ var. nigrescens Grateloup, Moll. Landes, 1829.

_SHELL_ with the whole surface suffused with purple-brown.

[The var. _nigrescens_ of Westerlund is not this variety, but a fasciate form with very dark zonation].

This form is usually more or less segregated, but is also of more or less sporadic distribution. At Yarmouth, Isle of Wight, this variety is chiefly concentrated within the space of a few square yards of sea cliff, where the prevalent plant is _Cardium tenuifolius_, on whose stems and leaves it is found associated with the typical form.

**BRITISH DISTRIBUTION.**

Devon S.—Beer Head, Nov. 1903 ! F. J. Partridge.


_Dorset_—Quarry, Portland, Sept. 1889 ! N. M. Richardson. Poole, C. E. Wright.


_Kent W._—Brookland, Aug. 1896, Lionel E. Adams.


_Yorks._ S.E.—Plentiful near the sea, Hornsea, July 1880, J. Darker Butterell.

_Klings Warren_, Spurn, T. Petrich.


_Pembroke_—Giltar, St. Catherine's Rock, Jubilee gardens, Ritec gardens.

_Manoirbie_, and occasionally on the Burrows at Tenby, A. G. Stubbs.


_Cork_—Youghal, Aug. 1862 ! P. H. Grierson.

_Kerry S._—Veunting, Dingle, K. Welch and A. W. Stelfox.

**FOREIGN DISTRIBUTION.**

_France_—Environ of Paris (Pascal) ; Dax and Le Puay-du-Hour, Landes (Grateloup), Nimes, Gard (M. Clement).

_Spain_—Plentiful but small, Algeciras, Andalusia (K. H. Jones).

Var. rufula Moquin-Tandon.

_Helix variabilis_ var. rufula Moquin, Hist. Moll., 1853, p. 263.

_SHELL_ nearly uniformly dark rufons.

This variety is probably rare, as there are comparatively few undoubted records.

**BRITISH DISTRIBUTION.**

_Channel Isles_—Alderney (Tomlin and Marquand, Journ. of Conch., x, p. 389).

_Somerset N._—Near Burnham (Norman, Somerset list, 1861).

_Dorset_—Wyke-Regis, near Weymouth, August 1886, J. R. le B. Tomlin.

_Lancashire S._—Southport, 1915 ! W. J. Farrei.

_Glamorgan_—Limestone cliffs near Cardiff, April 1907 ! H. R. Wakefield.

_Pembroke_—South Cliff, Tenby, Oct. 1895 ! A. G. Stubbs.

_WALES._


_IRLAND._

_France_—Recorded for the environs of Paris by M. Pascal ; from Durfort, near Sorèze, Tarn, by Moquin-Tandon ; and from Nimes, Gard, by M. Clement.

_Algeria_—Recorded from Oran by M. Bourguignat.

Var. lutescens Moquin-Tandon.


_Helix lineata_ var. lutescens Moq., op. cit., p. 265.


_SHELL_ uniformly yellowish.

This form, though sometimes associated with other varieties or with the typical form, more usually lives in more or less segregated communities.

Its distribution is practically coincident with that of the typical form, but precise and definite records are very scanty.
XEROPHILA VIRGATA.

**BRITISH DISTRIBUTION.**

The var. lucescens extends over a considerable number of comital divisions in the British Isles.

**FOREIGN DISTRIBUTION.**

**France**—It is recorded by M. Pascal from the environs of Paris, and by Dr. Scharff from Bordeaux, Gironde. It has also been found by Dr. W. E. Clarke at Perpignan, Pyrénées Orientales; by Mr. Hugh Watson at Cap Breton in the Landes, and Grasse in the Alpes Maritimes; by Moquin-Tandon from Port Vendres, Alpes Maritimes; and by Mr. F. H. Sikes at Bayeux in Calvados, and Estretat in Seine Inférieure.

**Italy**—Dr. Arturo Iscel has recorded its presence at Perniglia, etc., in Umbria, as well as from the Island of Malta.

**Spain**—It is recorded by Bohill from Barcelona in Catalonia.

**Asia Minor**—It is recorded by Prof. von Martens from Troas (the ancient Troy), in the province of Bronsa, on the authority of Dr. Virchow.

**Algeria**—M. Bourgnignat records it from Oran, Mostaghemen, and other places.

**Var. hyalozena** Moquin-Tandon.


The var. *hyalozena* Moq. is described as yellowish with transparent bands.

The sub-var. *hyalozena* Westerlund is yellowish [or matt-white] with transparent bands, and only in part placed here.

Neither Moquin-Tandon or Westerlund give any precise references to its range.

**France**—The var. *hyalozena* Moq. is enumerated for the Pas-de-Calais as var. 6 by M. Bonelard-Chantereaux, and recorded for Nimes, Gard, by M. Clement.

**Var. albicans** Grateloup.

*Helix variabilis* var. *5 Draparnaud, Tabl. Moll.*, 1804, p. 73.


**Shell** almost uniformly whitish, frequently tinged with rufous at the aperture.

This variety is said to be often smaller than the fasciate form found with it, and its characters are probably a result of living under exposed and arid conditions. It has been noted by Rev. E. A. Woodruffe-Beacock and Mr. Hawkins as especially frequenting and feeding upon the black knapweed (*Centaurea nigra*) in Lincolnshire, and at Castle Howard, Yorkshire.

The var. *albicans* Grateloup s.s. is described by Moquin-Tandon as entirely whitish or white.

The var. *albinos* Bourgnignat is described as entirely whitish.

The var. *istiensis* Ziegler, described by Menke as "unicolor albida," and the *H. caruensis* Muhl. from Zara, Dalmatia, are both probably referable to the var. *albicans* of the present species.

The var. *albida* Westerlund is unicolorous whitish, spire slightly elevated.

The var. *albescens* Benoit is smaller, uniformly whitish, sometimes fasciate, spire somewhat raised, and apertural rib of a rosé red.

The var. *bordighalenisa* Reinhardt is described as small, entirely white, and unbanded, but this is not the *Helix bordighalenisa* of Grateloup, which is a banded form and belongs the fasciate group.

The var. *grisea* Bouchard-Chantereaux is described by Moquin-Tandon as entirely grey, and I inclined to regard it as merely an extreme and subordinate form of the var. *albicans*. 
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