

THE
CONCHOLOGIST:

A Journal of Malacology.

EDITED BY

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VOL. II.

1893:

MASON COLLEGE, BIRMINGHAM.

PRINTED BY M^cCONQUAER & CO. LIMITED, LEEDS.

PREFACE.

WITH this number the second volume of "The Conchologist" is concluded, and with it the paper as a general journal of the Mollusca will cease to exist. The reasons for such a step are already known to many. The paper was started with the object of improving the study of the Mollusca in this country, and in looking back upon the short space of three years we feel much has been achieved. Our effort has culminated in the foundation of a Malacological Society—now an active and vigorous body. The need of an independent paper has, therefore, in a large measure ceased to exist, and the Proceedings of the Society will only be weakened by the continued existence of this paper, so we readily retire from the field wishing the Society a long and prosperous career, and inviting subscribers to "The Conchologist" to lend their support to such an effort.

Although as "The Conchologist" the paper will no longer exist, yet as "The Journal of Malacology" it will be continued, confining its attention solely to the slugs, and slug-like genera.

I am pleased to know that I continue to enjoy the friendship of most of my contributors and supporters, and trust that such relations may always continue. To all who have in any way furthered the interests of the paper I tender my sincere thanks.

In conclusion, I desire to acknowledge my great indebtedness to my colleagues Messrs. A. H. Cocke, Walter Garstang, Charles Hedley, R. F. Scharff, E. R. Sykes, and B. B. Woodward, for their constant assistance and support. My best thanks are also due to Mr. Edgar A. Smith, of the British Museum, for very many kindnesses.

W. E. C.

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Birmingham. 1893.

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LONDON SWAN SONNENSCHN & CO.

BERLIN R. FRIEDLÄNDER & SOHN.

PRICE ONE SHILLING.

THE CONCHOLOGIST.

VOLUME II.

SOME REMARKS ON THE DISTRIBUTION OF BRITISH LAND AND FRESHWATER MOLLUSCA.

By R. F. SCHARFF, Ph.D., B.Sc., M.R.I.A.,

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ONE of the most important objects to be gained in collecting British Land and Freshwater Mollusca is to supply data to enable us to draw conclusions as to their origin. If we can discover approximately the period at which some of them migrated to England from the Continent, we shall have solved an extremely interesting zoological problem.

But these results are not to be attained by collecting information only of the range of Mollusca now living in the British Isles; we must also study their distribution in past times, extending our researches to Continental Europe as well. It is evident that during these investigations, in order to be able to draw any satisfactory conclusions, we must, as far as possible, keep step with Continental authorities. British Conchologists, as a rule, are apt to be too conservative in nomenclature, as Mr. E. A. Smith* has justly remarked in his recent address to the Conchological Society.

In more recent geological times (as Mr. Quilter† has already pointed out in the 1st vol. of "The Conchologist") the glacial period no doubt played a very important part in the distribution of British Non-Marine Mollusca. Many geologists hold that almost the whole of the British Islands were covered thousands of feet deep

* On the nomenclature of certain Genera of British L. & F. Shells. *Journal of Conch.*, vol. vi., 1891.

† The glacial period and British Non-Marine Mollusca. *Conchologist*, ser. 10, 1891.

by ice during that period, but Mr. Quilter—following Mr. Wallace—inclines to the belief that the British Molluscan fauna was destroyed by the subsequent submergence rather than by the ice action.

The evidence of an enormous submergence of the British Islands, after the height of the glacial period, seems to rest chiefly on the occurrence of a bed of marine shells on Moel Tryfaen in Wales, and one on the Three Rock Mountain near Dublin. As has been shown, however, by Mr. Bell,* the occurrence of these shells at a height of over 1,000 feet above sea-level does not necessarily prove such a great submergence, and the utter absence in other parts of the British Islands of recent marine deposits at such heights should, at any rate, make us careful in accepting this theory.

It is enough for our purpose to note that there exists a certain amount of doubt as to whether the British Non-Marine Mollusca were exterminated or not during Pleistocene times, and this fact must encourage us in searching for a satisfactory explanation of their present distribution, and especially for the presence of so many southern species of shells in these islands.

The important contributions of Mr. B. B. Woodward† show that most of the existing Land and Freshwater Mollusca which now inhabit the south-eastern portion of England lived in the same district before the glacial epoch also. If we look through the list of land shells which have been found in the more recent deposits of the south-east of England, we find there are no signs of the typical southern European forms, such as *Helix pisana*, *revelata* and *acuta*, *Testacella maugei*, *Pupa anglica*, and *Geomalacus maculosus* ever having been there, although I believe it has been generally assumed that migration after the Glacial period from the Continent to Great Britain took place by a land connection somewhere in the neighbourhood of Dover. On the other hand, almost all these forms occur in the more westerly parts of the British Isles—most of them being found in Ireland—which, according to geologists, was only for a very short time, if at all, connected with England in post-glacial times.

The late Prof. E. Forbes‡ maintained that the two great primary causes influencing the distribution of pulmoniferous mollusca, were climate and soil. He believed that individuals multiplied to a much greater extent on calcareous and sandy soils, than on slate, clay, or granite, but that the influence even of limestone could be completely

* Pleistocene of the glacial epoch. Trans. Geol. Soc. Glasgow, vol. ix., 1867.

† On the Pleistocene (Non-Marine) Mollusca of the London District. Proceed. Geol. Assoc., vol. xi.

‡ Report on the Distribution of Pulmoniferous Mollusca in the British Isles. British Association Report, Birmingham, 1870.

neutralized by climate. As an example, he adduced the Shetland Isles, where we have limestone, but nevertheless a great paucity of species and individuals owing to the unfavourable climate. On the other hand, he explained the presence of vast numbers of specimens of *Helix variabilis* (= *virgata*) and other species in Guernsey, where the surface is composed of granite and quartz, by the overpowering influence of climate over soil. The manner in which a particular soil favours not only the distribution of the species, but also its multiplication, has, I think, never been satisfactorily explained. To demonstrate this action of the soil, a series of experiments would have to be made by keeping a number of specimens (say, on a pure quartz soil and on pure limestone) and allow them to breed under similar conditions, recording the result from year to year. No doubt we read a great deal in conchological works about certain "limestone species," that is to say, species supposed to be confined to limestone soil; but I fail to see that there is any real foundation for this belief. Some species, indeed, seem to increase at an enormous rate on limestone, whilst only very few specimens can be found on a slate or granite rock; but it seems very probable that any mollusc can thrive perfectly on the merest traces of lime, which it may find in any kind of soil.

It seems to me that the climate and soil in almost every part of the British Islands is eminently suited for the development of molluscan life, and the extreme poverty of our fauna must be explained by other reasons than those put forward by Prof. Forbes. At the time when he published his account of the pulmoniferous mollusca, 101 species of non-marine mollusca were known to inhabit the British Isles. Nearly forty more have been added since, and many more may yet be discovered in some of the less known regions.

Prof. Forbes divided the British Isles into ten districts, according to the distribution of their mollusca fauna, as follows:—I., the Channel Isles; II., South-east of England (inclusive of Cambridge-shire); III., South-west of England; IV., North-east of England; V., North-west of England (inclusive of Isle of Man); VI., North of Ireland; VII., South of Ireland; VIII., South of Scotland; IX., North of Scotland; X., Shetland Isles.

The first district is founded on the occurrence of *Helix naticoides* (= *H. aperta*) and *Helix rostrata*, but as the first of these has never been found since, and may, according to Mr. Jeffreys' suggestion, have been only the var. *tenuis* of *H. aspersa*, and as the second occurs in the south-west of England also, the distinct nature of the district cannot be maintained.

The second district is characterized by the presence of a number of Germanic forms, such as *Helix obvoluta*, *H. carthusianella*, (= *H. carthusiana*), *Clausilia ventricosa* (= *Cl. biplicata*), *Cl. Rolphi* and *Bulimus montanus* (= *Bullininus montanus*). Here we have, no doubt, a well-marked province.

Prof. Forbes' third district includes the south-west of England, with such characteristic forms as *Helix pisana* and *Bulimus acutus* (= *H. acuta*). The former has since been found in south Wales, and the latter occurs also in the Channel Isles, the Isle of Man, Cheshire, and some of the islands on the west coast of Scotland. Its claim to form a separate province therefore falls to the ground, but it might be conveniently united with the Channel Isles and south Wales, with which it has the following in common, which are absent from the second district, viz., *Testacella maugei*, *Helix pisana*, and *H. acuta*.

The fourth district, viz., the north-east of England, has not any peculiar species, but, according to Prof. Forbes, it contains such forms as *Helix scarburgensis* (= *H. lamellata*), *Helix excavata* (= *Hyalinia excavata*), and *Pupa anglica*, unknown in the south. However, as we now know, *H. lamellata* occurs also in Ireland and Scotland, *Hyalinia excavata* in the south-west of England, in the west of Ireland, and on the island of Arran in Scotland; while *Pupa anglica* appears in the Channel Isles, Herefordshire, in most parts of Ireland, and in the extreme north of Scotland. In fact, this is a province which, I think, might be more correctly united with the second, with which it has many forms in common.

The North-west of England, with the Isle of Man, forms the fifth district, but it does not contain any peculiar forms either, and should be included in the preceding.

The sixth and seventh districts are the North and South of Ireland. The former has no peculiar species, and only three—as far as I am aware, viz., *Helix pisana*, *H. arbustorum*, and *Clausilia laminata*—which are not also found in the South. The South, on the other hand, has five species which have not hitherto been discovered in the North, viz., *Testacella maugei*, *Geomalacus maculosus*, *Succinea oblonga*, *Planorbis corneus* and *Limnæa involuta*. Not a single one of the peculiar Germanic forms referred to in the second district penetrate into Ireland.

The districts VIII., IX., and X. include the South and North of Scotland and the Shetland Isles respectively. The South of Scotland, according to Prof. Forbes, is distinguished from district IX., the North of Scotland, by the absence of *Pupa cylindrica* (= *umbili-*

cata) and *Succinea oblonga*, from the latter. It is true that *S. oblonga* has hitherto only occurred in the South of Scotland, but as the other species, *P. umbilicata*, has now been discovered abundantly in the extreme North of Scotland, I think it is hardly justifiable to retain the separate districts. There is apparently not a single distinct species in the Shetland Isles, and their rank as a separate province rests chiefly on the extreme paucity of their fauna.

Thus we see that most of Prof. Forbes' districts have not any very prominent features, in fact, it is not at all easy to draw up a table of well-marked provinces, readily distinguishable from one another by their molluscan fauna.

However, if we look over the list of British non-marine mollusca, we find that the following species are all absent from the extreme South-west corners of England and Wales, and the whole of Ireland and Scotland:—*Helix cantiana*, *H. carthusiana*, *H. lapicida*, *H. obvoluta*, *H. pomatia*, *Buliminus montanus*, *Pupa secale*, *Clausilia Rolphii*, *Cl. biplicata*, *Cochlicopa tridens*, *Sphærium ovale*, *S. rivicola*, *Unio tumidus*, *U. pictorum*, *Paludina vivipara*, *P. contecta*, *Planorbis lineatus*. These are chiefly Central European species, and we may, therefore, look upon England and Wales, with the exception of their extreme South-west corners, as constituting a province.

The South-west of England and Wales, with the whole of Ireland and Scotland, may be regarded as another province. They do not together contain many species absent from the rest of the British Isles, but in each of them is found one or more mostly typical Southern forms unknown in Central Europe. Thus we have *Geomalacus maculosus*, a Portuguese slug living in the South-west of Ireland; *Testacella maugei* in the Channel Isles, the South-west of England and Wales, and Waterford, in Ireland; *Helix pisana* in the Channel Islands, the South-west of England and Wales, and the North-east of Ireland; *Helix revclata* in the Channel Islands and South-west of England; and *Helix acuta* in the Channel Islands, South-west of England, some of the islands on the West coast of Scotland, and all Ireland (this species touches slightly on the first province in Anglesea and Cheshire); *Pupa ringens* occurs in the Channel Islands, Ireland, and the North of Scotland, and is another typical Southern form, but it ranges into the North of England also to some extent.

This attempt at classifying the British non-marine mollusca into two groups, according to their distribution, deals really only with a very small section, but I am endeavouring to incorporate the remainder of the British molluscan fauna in a larger memoir on Geographical Distribution. Some more critical examination still

remains to be done in the genera *Hyalinia* and *Vertigo* to enable us to make the records of distribution more valuable.

Under the auspices of the Conchological Society, following the suggestion of Mr. Roebuck (*Journ. of Conch.*, vol. 3, 1880-82, p. 138), what the promoters call a "census" has been started. It is an imitation of the system which has been carried out in so admirable a manner by the late Mr. Watson in recording botanical localities. As far as the census has been published, it forms a valuable store of information for the purpose of studying the distribution of British non-marine Mollusca, but I venture to think that in some cases more care is needed in order to insure really authentic information.

NOTE ON A VARIETY AND THE EPIDERMIS OF CYCLOPHORUS ZEBRINUS OF BENSON.

By EDGAR A. SMITH, F.Z.S.,

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A SPECIMEN of a *Cyclophorus*, clothed with a very beautiful hairy epidermis, has been recently presented to the British Museum by Mr. Hugh Fulton, who was under the impression that it belonged to a new species. Indeed this is not surprising, for, as far as I can ascertain, a pilose *periostracum* has not been noticed in any other species belonging to this group of Indian *Cyclophori*, and, moreover, in the diagnoses given by Pfeiffer and Reeve, no reference whatever is made to it, as doubtless in the specimens before them it had become worn off. Benson's* description, copied by Sowerby†, runs thus:—"Epidermis crassa, fusca, pilicis longitudinalibus, his setis fortibus munitis, instructa."

In the present variety it is thinnish and deciduous, of an olive-brown colour, and furnished with very numerous hairs or bristles. These are arranged in regular spiral series upon the liræ (or ridges) which encircle the whorls, and are also disposed in oblique rows in the direction of the lines of growth, which are about a millimetre apart. The individual bristles are very sharply pointed, but not of uniform size, the longest (about a sixteenth of an inch in length) occurring upon the most prominent of the spiral liræ.

* *Journ. Asiatic Soc. Bengal*, 1836, vol. v, p. 355.

† *Thesaurus Conch. Cyclostoma* Suppl., p. 157.

The typical form of this species is prettily ornamented with brown zigzag lines and blotches of the same colour. On the contrary, the variety in question is uniformly dirty whitish beneath the epidermis, and entirely devoid of markings. The few specimens I have examined are evidently rather young shells, as they are comparatively thin, and hence it is that they have retained the epidermis, which in more adult thickened shells appears invariably to wear off to a great extent.

ON THE CLASSIFICATION OF VARIETIES.

By REV. WILLIAM L. W. EYRE.

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IN a late number of "The British Naturalist," Mr. Gain informs his readers that he is at present breeding *Helix nemoralis* and *H. hortensis*, and, so far as his experiments have gone, the parents invariably produce young of the same colour, but of a slighter shade, and of a similar banding. If such facts can be established upon a sufficiently wide basis, it will be of considerable interest, and remarkable indeed, if, as Mr. Gain is disposed to think, that the progeny appear to come as true as the different breeds of domestic poultry. From anatomical differences conchologists have now agreed to separate *H. nemoralis* and *hortensis* into two species, each having many varieties and sub-varieties; but if we are to learn anything of the more permanent forms of each locality, it will be necessary to have clear ideas on the subject of classification. When the Conchological Society's new list is issued, we shall, perhaps, be better able to ascertain, and, therefore, arrange better in our cabinets the many differing forms so often met with in every county. Our ordinary text-books seem to ignore the subject as beneath notice. Having recently asked Mr. Ashford, of Christchurch, to name varieties of *hortensis* and *nemoralis*, he has most kindly drawn out schedules of those submitted to him, and it is certainly the easiest to comprehend of any plan that I have yet seen, the basis being ground colour, then lip colour, followed by band formula. We thus get sufficient for our purpose without too much Continental *minutie*, yet exactness of definition where it seems desirable. Such a schedule, drawn up for the two species, extending over the usual varieties, would be helpful, at least to beginners; and the more experienced would see their way clearer amid the perplexing intermediates that so often occur in every neighbourhood.

HELIX HORTENSIS.

Ground Colour.	Colour of Lip.	Banding.
Type—Yellow.	White.	12345.
var. <i>albina</i> , Moq. white.	typ.	00000
" " "	"	12345, &c.*
" " "	"	<i>arenicola</i>
v. <i>castanea</i> (chestnut).	typ.	hands colourless.
" "	"	00000
" "	v. <i>roscolabiata</i> .	00300, &c.
" "	v. <i>bimarginata</i> .	00000
v. <i>lutea</i> , Moq. yellow...	typ.	00000
" "	"	02345, &c.
" "	v. <i>roscolabiata</i> .	00000
" "	"	12345
" "	v. <i>fuscolabiata</i> .	00000
" "	"	12345
" "	typ.	v. <i>arenicola</i> .
v. <i>incarnata</i> , Moq. red or rosy red. }	"	00000
" "	"	12345, &c.
" "	v. <i>luteolabiata</i> .	00000
" "	"	12345
" "	v. <i>roscolabiata</i> .	00000
" "	"	12345
" "	v. <i>fuscolabiata</i> .	00000
" "	"	12345
v. <i>baudonia</i> , Moq. light brown or fawn. }	typ.	00000
" "	"	12345
" "	v. <i>roscolabiata</i> .	00000
" "	"	12345
" "	v. <i>fuscolabiata</i> .	00000
" "	"	12345
v. <i>olivacea</i> , Taylor, olive brown or liver coloured. }	typ.	00000
" "	"	12345
" "	v. <i>roscolabiata</i> .	00000
" "	"	12345
" "	v. <i>fuscolabiata</i> .	00000
" "	"	12345
v. <i>lilacina</i> , Taylor, bluish violet.	typ.	00000
" "	v. <i>roscolabiata</i> .	00000
" "	v. <i>fuscolabiata</i> .	00000

Other primary varieties may be known. The referees of the Conchological Society recognise, I think, a v. *carnea*, but the

* The "&c." in Schedule means one or more of the varieties arising from confluent or broken bands, as (10)245, (10)345, (10)445, and the like; or partial absence of bands, as 00345, or resolution of bands into spots, as 00245, 00045; or reduction of bands to fine lines, as 10245, 10445.

present paper may serve to draw attention to the necessity of a good classification, and serve as a basis upon which to proceed. It does not seem desirable to extend the table so as to embrace *Colour of Band*, as *roseozonata*, *luteozonata*, or other forms of colouring. Further, it is possible for any one of the variations above-mentioned to depart from the *type* in size or shape. The shell may be overgrown, stunted, depressed, conical, scalariform, or sinistral. Two or three such deviations have already been recorded in this country.

HELIX NEMORALIS.

Ground Colour.	Lip.		Bandings.
	Typ.—Yellow.	Black	
var. <i>libellata</i> , Risso. yellow.	typ. ... ..	...	00000
" "	" ... ..	...	00300
" "	"	(123) (45) and many others.	
" "	v. <i>albolabiata</i> , von Mart.	...	00000
" "	" transparent, v. <i>hyalozonata</i> , Taylor.	...	
" ?	"	citron, v. <i>citrozonata</i> .	
" ?	"	pink, v. <i>roseozonata</i> , Ckll.	
" "	"	various bands.	
" "	v. <i>luteolabiata</i> ...	transparent, v. <i>hyalozonata</i> .	
" "	v. <i>hybrida</i> , Porret =	}	
" "	v. <i>roseolabiata</i> , Taylor.)		" "
" "	" ... ..	...	00000
" "	"	various bands,	
" "	v. <i>bimarginata</i> , Picard.	...	00000
" "	" ... ..	...	00305 and others.
var. <i>albescens</i> , Moq. whitish.	v. <i>bimarginata</i> . ?	}	transparent bands,
" "	"		v. <i>hyalozonata</i> .
" "	" ... ..	...	00000 ?
" "	v. <i>hybrida</i>.	...	various bands.
" "	" ... ..	...	00000 ?
var. <i>rubella</i> , Moq. red or yellowish red.)	typ. ... ..	...	00000
" "	" ... ..	...	00300 and many others
" "	" ... ..	...	(<i>undulata</i> , Gent. (::::))
" "	v. <i>hybrida</i>.	...	transverse markings,
" "	" ... ..	...	00000
" "	" ... ..	...	00300
" "	"	typ. and many others.	
" "	v. <i>bimarginata</i>.	...	00000
" "	" ... ..	...	00300 and others.
var. <i>carnea</i> , R. & T. flesh coloured.)	typ. ... ..	...	12345 and others.
var. <i>castanea</i> , Moq. chestnut.	typ. ... ..	...	00000
" "	" ... ..	...	broken bands and others.
var. <i>olivacea</i> , Gassies, olive.	typ. ... ..	...	00000
" "	" ... ..	...	a few banded.
var. <i>petiveria</i> , Moq. light brown or fawn.)	typ. ... ..	...	a few banded forms.
var. <i>studeria</i> , Moq. deep lilac.	typ. ? ... ..	...	00000

The shells of some one or more of the above may be abnormal in shape or size, *major* (dia. 25, alt. 19 m.m.), *minor* ("remarkably diminutive"), *compressa* (dia. 22.5, alt. 15 m.m.), *conica* (dia. 21.5, alt. 19 m.m.), *tenuis*, *sinistrorsa*, *scalariformis*, each more or less characteristic, have been recorded.

The band formula (::::) *undulata*, must be interpreted to imply that all the bands are broken into patches, and at the same time confluent, so as to result in distinct transverse coloured streaks.

It is not thought desirable to extend the table beyond its present limits, which is based on recent records, and compiled from such sources as were at hand; neither does it profess to be complete, but to embrace the great majority of forms prevailing in this country.

The ? inserted is an indication of insufficient evidence.

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BY WALTER D. CRICK,

Northampton.

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NOTE ON THE AFFINITIES OF THE GENERA LIMAX, ARION, AND HELIX.

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HITHERTO it has been the practice among most conchologists to place far too much reliance upon the nature of the lingual ribbon in separating not only families and genera from one another, but also species. The genus *Arion* has, for instance, been kept persistently joined with *Helix* because their lingual ribbons exhibit some resemblance to one another, whilst *Limax* has been put into a distinct family for the opposite reason. And although the fallacy of this view has been conclusively proved by Dr. Simroth almost seven years ago, many conchologists are quite unaware of this fact, and still look upon the radula as the most suitable and reliable portion of the molluscan anatomy for the purposes of classification. The radula has certainly no claim to be looked upon as constituting *the anatomy* of a mollusc, as some would have us believe. If we examine *Arion*, *Helix*, and *Limax* anatomically, we find that the two latter have a hard calcareous shell, whilst *Arion* has none. *Arion*, on the other hand, has a caudal gland, but *Helix* and *Limax* have no trace of such a structure. There is one columellar muscle in *Helix* and *Limax*, whilst in *Arion*, instead of it, there are three, viz., two widely-separated tentacular and one pharynx retractor muscle. Two nerves run along the back to the tail in *Arion*, whilst *Helix* and *Limax* agree in having only one. At last, and this is the most important difference, in both *Helix* and *Limax* the male portions of the reproductive organs are everted during copulation, whilst in *Arion* the female portions fulfil that function.

CURRENT LITERATURE.

Catalogue et Distribution Géographique des Mollusques Terrestres, Fluviales et Marins d'une partie de l'Indo-Chine (Siam, Laos, Cambodge, Cochinchine, Annam, Tonkin), par le DR. FISCHER. (Extract from Vol. IV. of the Bull. Soc. Hist. Nat., Autun. iv., 1891, 194 pp. 8vo).

This is an extremely interesting and valuable catalogue of the mollusca of a district, the conchological literature of which is too scattered to be within the reach of many. During the last decade, the labours of L. Moilet, von Möllendorff, Heude, Gredler, Crosse, and Fischer have immensely increased our knowledge of the mollusca of China and Indo-China, as may be gathered from the following list given by Dr. Fischer:

	GENERA.	SPECIES.
Terrestrial mollusca	35	309
Fluviatile „	28	318
Brackish-water „	7	25
Marine „	133	477

As far as the marine species are concerned, the district cannot be said to possess any interest of its own, since it is only a part of the great region which extends from E. Africa and the Red Sea to the Sandwich Islands and tropical Australia, and includes all the countries washed by the Indian and W. Pacific Oceans.

The Land Mollusca of this great district (which practically includes the whole of Indo-China minus Burmah and the Malay Peninsula) consists of :

Inoperculates	18 genera	=	206 species.
Operculates	17 „	=	103 „

the proportion of operculates being very high, as much as one-third of all the land mollusca.

The inoperculates consist of *Streptaxis* (18 sp.), *Ennea* (1), *Helicarion* (7), *Ariophanta* including *Microcystis*, *Macrochlamys*, *Kaliella*, *Hemiplecta*, *Ryssota* (44), *Prochomorpha* (6), *Geotrochus* (2), [query whether *Geotrochus* proper extends so far west], *Helix* (50), the principal groups being *Plectopylis*, *Plectotropis*, *Trachea*, *Fruticicola*, *Acusta*, *Chloritis* (?), *Camaena* and *Hadra*; *Amphidromus* (34), *Bocourtia* [a genus of doubtful value, established by Rochebrune for a group of *Bulinus* in shape resembling *Limnea palustris*] (2), *Hypselostoma* (2) [this remarkable genus has lately been detected by von Möllendorff on Cebu, one of the Philippine group], *Tonkinia* [one of Mabille's genera of doubtful value] (1), *Clausilia* (14), *Opeas* (7), *Spiraxis* (2), *Subulina* (1), *Succinea* (4) [a remarkably small number for so well-watered a region], *Vaginula* (7).

The operculates consist of *Assiminea* (7), *Procyclus* [= *Cyclotus* Pfr. et auct.] (6), *Dasytherium* [a formidable name, suggestive of some shaggy-haired quadruped of pre-historic times rather than a gentle *Cyclotus* with a prickly epidermis], (2), *Opisthoporus* (5), *Rhiostoma* (6), *Myxostoma* (1), *Pterocyclus* (7), *Cyclophorus* (28), *Leptopoma* (10), *Lagochilus* (6), *Pupina* (7), *Hybocystis* (3), *Alycaeus* (6), *Catulus* (1) [the presence of this genus is remarkable, if authenticated, since it is hitherto known only from Ceylon, part of S. India, and the Nicobars], *Diplommatina* (2), *Helicina* (4), *Georissa* (2).

The Fluviatile Mollusca consist of 28 genera and 318 species, and fall under the following headings. GASTEROPODA: 17 genera and 168 species, prominent among which are *Melania* (39), *Paludina* (38, a very large proportion), *Canidia* (13, a genus which finds its metropolis in Indo-China), and the peculiar genera *Wattebledia*, *Pachydrobia*, *Jullienia* and *Lacunopsis*. PELECYPODA: 11 genera and 150 species, among the more noticeable of which are *Unio* (63), *Corbicula* (35), *Mycetopus*, hitherto only known from S. America (1), *Dipsas* and *Arconia* (peculiar to E. Asia).

In all probability further investigation will at once add to and diminish the molluscan riches of this country, by the discovery of new forms, and also by the gradual weeding out of species which have been hastily described on insufficient evidence. Dr. Fischer has not been able to discuss this latter question, for many of the so-called species of the later French school (to which he is strenuously, and in our opinion, most justly opposed), have never been figured.—A. I. C.

Manual of Conchology by George W. Tryon, Jr. and H. A. Pilsbry, 1st Ser. Vol. 13, pt. 3, and 2nd Ser. pls. 25—27. Philadelphia: Academy of Natural Sciences.

The parts to hand of this well-known manual, maintain the high standard and excellence of their predecessors. Part 3 of Series 1, deals with the genera *Nacella* and *Helcioniscus*, the former being divided into *Nacella* and *Patinella*, while the latter is dealt with geographically and divided into six groups, viz. Chilean, Polynesian and East Indian, Japanese and Chinese, New Zealand and Australian, East African, from the Red Sea to the Cape, and those of unknown locality. The synopsis given on p. 79 of this volume, is varied on the ground that *Nacella*, *Patinella*, and *Helcion* have been discovered to possess two lateral teeth on each side, while *Patella*, *Helcion*, *Patina*, &c., have three. The plates—both anatomical and conchological—are a great advance upon some of those in the earlier volumes.

The parts so far issued of Volume VII. continue the *Helicida*. The genus *Helix* is concluded in part 26, and a commencement made with the genus *Cochlostyla*, Pfr. The execution of the fifteen plates with each part is admirable. In reply to a communication addressed to the Academy, we are informed that but few complete copies of Series 2 remain, a fact to be noted.—W. E. C.

CLASSIFICATION AND NOMENCLATURE.

The Genera *Hadra* and *Camæna* (Nachr. Deutsch. Malak. Gesell., Nov. and Dec. 1891).

Von Mollendorff writes on "*Hadra* and *Camæna*," criticising the sub-divisions given in Pilsbry's continuation of Tryon's Manual, and proposing the following grouping:

Gen. *Hadra* (Albers)

Sect. 1.	<i>Eutadra</i> (Pilsbry),	type	<i>H. peliampala</i> , Pfr.
" 2.	<i>Thevrites</i> (Pfr.),	"	<i>H. richmondiana</i> , Pfr.
" 3.	<i>Hadra</i> , s. str.	"	<i>H. bipartita</i> , Fér.
" 4.	<i>Sphaerospira</i> , Mörch.	"	<i>H. Fresseri</i> , Gray.
" 5.	<i>Xanthomelon</i> , v. Mart.	"	<i>H. pomum</i> , Pfr.

Gen. *Camæna* (Albers)

Sect. 1.	<i>Camæna</i> , s. str.	type	<i>H. cicatricosa</i> , Müll.
" 2.	<i>Phœnicobius</i> , Mörch	"	<i>H. arata</i> , Sowb.
" 3.	<i>Psuedella</i> , Müll.	"	<i>H. mamilla</i> , Fér.
" 4.	<i>Stylodonta</i> , Cr. and Jan.	"	<i>H. unidentata</i> , Chem.

[This separation of *Phœnicobius* from *Cochlostyla*, where it has so long been placed, and its recognition as a true *Helix*, appears perfectly justified. The section which contains these very remarkable shells is peculiar to the islands of Mindoro, Luban, Busuanga, and probably Calamian. It forms a culmination of the remarkable Celebesian forms *mamilla* and *papilla*, a link between which and *Phœnicobius* is furnished by Hidalgo's *H. bintuanensis* and probably by *H. Ceres*, Pfr. The placing of *Stylodonta* (a group peculiar to the Seychelles) in such close connection with *Camæna*, seems very questionable].

New Chinese and Japanese Land Mollusca. (Nachr. Deutsch. Malak. Gesell., Nov.—Dec., 1891).

Schmacher and Boettger continue their "New Materials for the characterisation and geographical distribution of Chinese and Japanese Land Mollusca." The following are new: *Claustilia* (*Hemiphaedusa*) *uraniscopeyx*, *Tornatellina* *hanningi*, *Helicina* *badia*, *Cyclophorus* *moellendorffi*.

Three new *Helices* from New Guinea. (Nachr. Deutsch. Malak. Gesell., Nov.—Dec., 1891).

Kobelt describes three new *Helices* from New Guinea, *H.* (*Sphaerospira*) *Rohdei*, Dohrn. ms., *H.* (*Sphaerosp.*) *lepidophora*, Dohrn. ms., *H.* (*Chloritis*) *delphax*, Dohrn. ms.—all from Astrolabe Bay.—A. H. C.

HABITS AND HABITAT.

The Habitat of *Montacuta ferruginosa* (Jour. Conch., Vol. VI. No. 12, 1891.)

Mr. J. T. Marshall has been investigating the habits and habitat of this mollusc. Previously it has been considered a rare form, owing to its true habitat being unknown. In 1870 Mr. Marshall collected at Guernsey *M. substriata* from off the spines of *Spatangus purpureus*, and then observed specimens of *M. ferruginosa* in a similar position. In 1888 he again found both species on the same species of echinoderm. The *M. ferruginosa* were invariably on the spines around the oral aperture, while the *M. substriata* were at the anal region. *Spatangus purpureus* does not seem to occur on the South Devon coast, but

E. cordatum, Penn., a form having much shorter and closer set spines than the former, and of somewhat different habits, takes its place. In close proximity to this latter echinus *M. ferruginosa* was again found. At least 100 *E. cordatum* were dug up, and quite 60 per cent. revealed *M. ferruginosa* in close attendance. These *Montacutæ* are not parasitic, but dwell on or near the echinoderms so as to partake of the food brought by currents to the *Spatangus*.

M. ferruginosa is an active mollusc, and possesses a large and muscular foot which, when travelling, it fully extends; having previously opened its valves and then partially closed them, the animal draws itself along swaying from side to side in a somewhat awkward manner.

NEW SPECIES.

Description of 11 New Species belonging to the genera Columbarium, Pisania, Minolia, Liotia, and Solarium (Journ. Conch., Vol. VI., No. 12, 1891).

Mr. Melvill figures and describes 11 new species comprised in the above genera. The drawings lack finish.

New South African Helicidæ (Ann. & Mag. Nat. Hist., p. 84, 1892).

Messrs. Melvill and Ponsonby describe and figure 24 new species of South African Land Molluscs.

New West Indian Helix (Pro. Acad. Nat. Sci., p. 456, 1891).

Mr. H. A. Pilsbry describes *Helix maynardi* from the Bahamas, a form lying between *Plagioptycha* and *Hemitrochus*. It resembles *H. brownii*, Pils., in the surface-sculpture, which, like *H. albersi*, is decidedly coarse.

SHELL.

Double-mouthed Shells (Sci. Goss., Dec., 1891).

Mr. Charles Ashford describes the various records, from Moquin-Tandon's work, of double-mouthed *Clausilia*, &c. He thinks the cause is that the *clausium* becomes fixed by foreign bodies, and hence the animal must, by means of the jaw, break through the shell or perish. Judging by the absence of records, he is of opinion that shells with large and simple mouths, are not liable to such an accident.

Shells with Double Mouths (Sci. Goss., Jan., 1892). W. E. Collinge.

On the Growth of the Shell in *H. aspersa* (Ann. and Mag. N. H., p. 49, 1892). A very useful and interesting abstract of a recent paper by M. Moynier de Villepoix.

VARIATION.

Helix lapicida* v. *sub-angulata, Pascal, (Journ. Conch., Vol. VI., No. 12, 1891).

Mr. C. T. Musson has found this variety in Dovedale, which is here recorded by Mr. J. W. Taylor. It is similar to the type in colour, but differs from it in having the last whorl rounded and not carinated. In general contour and size it bears a close resemblance to *H. cornua*, and is synonymous with the var. *grossulariæ* Voith.

Notes on Varieties (Brit. Nat., Feb., p. 35, 1892).

Mr. W. A. Gain is of opinion that among the varieties of *Helices*, banding and colour are probably the more permanent characteristics. *H. nemoralis* and *H. hortensis* he finds invariably produce young of the same colour and banding as themselves, with slight variations in shade; coming as true as the different breeds of domestic poultry. Interesting notes are also given on varieties of *Pupa dolium*, *H. hispida*, *Bul. decollatus*, *Paludina*, *Limnaea*, &c.

Varieties of *Unio Tumidus* (Nat., p. 86, 1891).

Mr. George Roberts records that a var. *bicolor*, Wilcock, has been verified by M. Bourquignat and named *U. wilcocki*. The description is as follows: Shell medium size, smooth, marked with alternate longitudinal brown and green bars. As almost any variety ranks as a species among the "Bourquignat school" the varietal name will be retained. A var. *constricta* is described as follows: Shell darkly coloured; slightly incrassate; both valves constricted. There is nothing of particular interest about either of the forms.

DISTRIBUTION.

Contribution towards a List of Irish Mollusca (Journ. Conch., Vol. VI., No. 12, 1891).

Mr. J. G. Milne describes the L. and F. Mollusca of Achill Island, enumerating 8 freshwater species, 7 slugs, and 27 land species.

Land and F. W. Moll. of Suffolk (Suff. Inst. Arch. and N. H., Vol. VII., p. 3, 1891).

The Rev. Carleton Greene's compilation enumerates 95 species (37 freshwater and 58 land forms, including 9 slugs). A bibliography of the county would have added to the usefulness of the list.

Testacella Scutulium in Yorkshire (Nat., Jan., p. 12, 1892).

It has been a matter of doubt for some time as to whether this slug occurred in Yorkshire. Mr. Edgar R. Waite collected specimens near Leeds in 1886, and again in 1891, which have been identified, and are now placed on record.

Mollusca of the Thames Estuary (Essex Nat., Vol. V., p. 220).

Mr. Jenkins discusses *Hydrobia jenkinsi*, and compares it with its nearest allies amongst the New Zealand species. A list of the land mollusca and those found in fresh and brackish water is appended, together with bibliographic references on the subject.

Remarks on Australian Slugs (Ann. and Mag. N. H., p. 169, 1892).

Mr. C. Hedley takes exception to Mr. Cockerell's classification of Australian Slugs (P.Z.S., p. 214, 1891). He considers *Limax megalodontes*, Q. & G. a true *Limax*, and therefore should not be included under *Aneitea*, Gray. After examining several hundreds of *A. græffei*, Humbert, he is of opinion that *A. kreffti* and *schusteri* are mere synonyms. Mr. Cockerell assigns 18 species of *Helicarion* to Australia, whereas Mr. Hedley says Australian naturalists are unacquainted with even eight.

MISCELLANEOUS.

The Chromatophores of Cephalopods (Ann. and Mag. N. H., p. 182, 1892).
M. Raphael Blanchard.

On the Nature of the Movement of the Chromatophores of Cephalopods (Ann. and Mag. N. H., p. 183, 1892).—M. C. Phisalix.

Conchology in Winter (Brit. Nat., Mch., p. 45, 1892).—W. A. Gain.

Notes on Mollusca—Genus *Odostomia*, Decoliate Shells, &c. (Brit. Nat., p. 46, 1892).—B. Tomlin.

On the Variation in the Banding of *Helix* (Brit. Nat., p. 47, 1892).—Walter E. Collinge.

The New Britain Currency or Shell-money (Pro. Roy. Soc. Vict., Vol. III., p. 46, N. S.).—R. H. Rickard.

Land Shells of Dorset (Pro. Dorset N. H. and A. F. Club, p. 99, 1891).—C. O. P. Cambridge.

- Development of *Pal. vivipara*** (Journ. Marine Bio. Ass., p. 139, 1821).—
Dr. Erlanger.
- Mollusca of Carcassone** (Feu. Jeun. Nat., Jan., 1892).
- N. H. Rambles on the S.E. Coast of England** (Sci. Goss., Mch., p. 54, 1891).—A. H. Shepherd.

EMBRYOLOGY AND DEVELOPMENT.

The Viviparous Nature of *Balea* (Journ. Conch., Vol. VI., No. 12, 1891).

In describing the life-history of a mollusc, recent authors have been content to simply repeat the accounts of their predecessors. Happily things are changing. Some years ago it was pointed out in that admirable little work of Rimmer's* that Mr. Rich had stated that *B. perversa*, L. was viviparous, and not ovoviparous as stated by Bouchard-Chautereaux.† Mr. A. E. Craven has found a number of specimens among the ruins of Vianden Castle, in the Grand Duchy of Luxemburg, containing two or three young specimens possessing about three whorls. We may now hope to see Bouchard-Chautereaux's observations on this species omitted in future accounts.

Development of *Dreissena polymorpha* (Ann. & Mag. Nat. Hist., February, pp. 157-169, 1891).

Dr. Korschelt has been studying the hitherto unknown reproduction and development of this mollusc, with the immediate view of determining the presence or absence of free-roving larvæ, and to facilitate a later investigation of the minutæ of the development.

Ova were first deposited about the middle of May, but soon perished, possibly owing to the cold spring of 1891. In the middle of June ova were again deposited. The method of oviposition is interesting. The valves of the shell are slightly opened and quickly closed again; each time this takes place a whitish-mucous-like ball of ova is extruded. The ova contain but little yolk, and are enclosed in a very delicate envelope. Segmentation is unequal, and agrees generally with that of other mussels. After the widening of the primitive segmentation cavity the embryo is of a roundish-oval form. The rudiment of the intestine now arises from an invagination of the ectoderm, ultimately uniting with the endoderm; previous to this however, the rudiment of the shell gland has been formed by an ectodermal invagination. The animal now assumes a pear-shaped form, the anterior end broadens, and the cilia, present at an earlier period, become more closely arranged here, forming a ciliated ring. We have now a free-swimming *Trochophora*. After a description of the development of the velum, which is bilobed and of a considerable size, Dr. Korschelt mentions that in the short time he was able to devote to the younger larval stages, he did not succeed in finding the primitive kidney, but its presence would appear to be almost certain since Ziegler found it in *Cyclas*. The later stages of development are generally referred to.

ANATOMY.

Reproductive Organs of *Aplysia* (Atti. R. Acad. Sci., Napoli, Vol. IV., p. 1-50).

Sig. G. F. Mazzarelli gives an account of the reproductive organs of *Aplysia*, which he considers to be in a primitive condition, and is of opinion that the genus is morphologically allied to the Cephalopoda.

* Rimmers' Land and Freshwater Shells of the British Isles. Bogue, 1880.

† Cat. Moll. Ter. et Fluv. d. l. Dépt. du Pas-de-Calais, p. 62, 1838.

NOTES.

Marine Shells of North Wales.—Correction.—I have to thank Mr. T. D. A. Cockerell for pointing out, in "The British Naturalist," pt. 5, 1891, an error in my "Marine Shells of North Wales."* *Donax trunculus* should be read *Donax vittatus* and the preceding record erased. The error had been detected, and I take this opportunity of acknowledging it.—Rev. CARLETON GREENE, M.A.

Additions to the Hampshire and Isle of Wight Mollusca.—The following species are not enumerated in the Conchological Societies' Census List for county number 12 (North Hants). All were found by my friend Mr. J. R. Longhurst at Overton, whilst staying there last spring, and verified by Mr. J. W. Williams.—*Succinea elegans*, common; *H. virgata*, very common, with the vars. *subdeleta* and *albicans*; *H. rotundata* and *pulchella*, *Physa hypnorum* and *fontinalis*, *Planorbis complanatus*, *vortex* and *contortus*, *Valvata cristata*, *Anodonta cygnea*, *Limnaea auricularia* and *stagnalis*.

Mr. Longhurst informs me that he found *H. rotundata* in a water tank, submerged several inches below the surface. Does the mollusc sometimes take to the water in the same way as *H. hispida*? I am not aware of any previous observations on the subject.

B. obscurus, *Cl. rugosa*, *Cyclos. elegans*, *H. hispida*, and *pulchella*, are all common in the Isle of Wight (county number 10). Mr. Longhurst showed me specimens he had taken in the immediate neighbourhood of Ventnor. These are also additions to the list.—E. W. SWANTON, Dodington.

Helix fruticum.—May I point out an unfortunate misprint in the frontispiece of the "Young Collector's Manual of Land and Freshwater Shells." *Helix fruticum* should be read *Helix fruticum*. This error has caused trouble to some of our friends whose Latinity or knowledge of the literature of the subject is not extensive. It is difficult to see why this species is figured there, as it is only British in a fossil state according to Jeffreys, and in the body of the work there is no mention of exotics.—Rev. CARLETON GREENE, M.A.

EDITOR'S NOTES.

THE reception given to the syllabus of Volume II. at once indicates that "The Conchologist" meets a recognised want, and the increased support assures us that its continuance and further enlargement are certain.

The Conchological Section in our esteemed contemporary "The British Naturalist" is now being continued under the joint editorship of Messrs. W. A. Gain (L. and F. W.) and Brockton Tomlin (Marine), who have our best wishes.

We are pleased to learn that Mr. E. Ruthven Sykes, B.A., is devoting his attention to the mollusca of the Channel Isles, and will be glad to see specimens therefrom.

Amongst the names of those gentlemen upon whom the University of Edinburgh intends conferring the honorary degree of Doctor of Laws (J.L.D.) we notice that of the Rev. Robert Boog Watson, B.A., F.R.S.E., F.L.S.

Conchologists will be pleased to hear that Dr. Hidalgo is publishing, under the auspices of the Academy of Science of Madrid, a collection of his published and unpublished works. The parts at present published deal with, and form material towards a fauna of the Philippines, and also of Spain, Portugal, and the Balearic Isles. Those who are best capable of judging of such a work speak very highly of it.

* Conch., Vol. I., pt. 7, 1891.

THE
CONCHOLOGIST

A Quarterly Journal of Malacology.

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LONDON

SWAN SONNENSCHNEIN & CO.

BERLIN

R. FRIEDLÄNDER & SOHN.

PRICE ONE SHILLING.

THE CONCHOLOGIST:

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Vol. II.

JUNE 24th, 1892.

No. 2.

NOTE ON THE OCCURRENCE OF PLEUROPHYLLIDIA LOVENI IN BRITAIN.

By W. C. MINTOSH, M.D., LL.D., F.R.S., F.R.S.E.,

Professor of Natural History in the University of St. Andrews.

WHEN my late friend Dr. Gwyn Jeffreys published the fifth volume of his "British Conchology" in 1869, *Pleurophyllidia loveni*, Bergh, was considered an extremely rare British Mollusk, only two specimens, indeed, having been procured, viz., one by Mr. Barlee in Shetland in 1849, and a second by the Rev. R. C. Abbes from the fishing boats at Whitburn in Durham, as stated in the Appendix to Forbes and Hanley's British Mollusca.† Nothing appears to have been heard of it till the Trawling Expeditions of 1884, when a specimen was procured E. by S. of Girdleness, Aberdeen. Since that period Mr. Holt obtained two fine specimens from the fishermen's lines at St. Andrews,** and Mr. Cunningham mentions‡ that Mr. Garstang recognised it last summer amongst material obtained from a shrimp-trawl near Plymouth.

In Scotland it is an inhabitant of the deeper offshore waters, and ranges to the south-western coasts of Norway and Sweden.

† Vol. IV., p. 200, and Vol. I., plate KKK., figs. 105. The species is the *Diphyllidia turata*, Olin, of these authors.

** Ann. and Mag. N.H., August (1891)

‡ Journ. Mar. Biol. Assoc. (1891)

DESCRIPTION OF A NEW SPECIES OF ACROPTYCHIA.

By EDGAR A. SMITH, F.Z.S.,

Zoological Department, British Museum.

ONLY two species of this genus have as yet been described, both from Madagascar, and the species under consideration was also obtained at the same island. *A. metableta** of Crosse and Fischer, the type of the genus, is one of the most remarkable operculated land-shells on account of the lamellæ (former peristomes) which ornament the last half of the body-whorl. The second species, *A. æquivoca*, Pfeiffer† (syn. *A. manicata*, Crosse and Fischer‡) has quite the form of the type, but only a single lamella just behind the aperture. Considering the similarity in shape, sculpture, epidermis, operculum, and colour, it should perhaps be regarded as a variety rather than as a distinct species. On the contrary, M. Mabille†† appears to have discovered sufficient difference to separate it not only specifically, but even generically! But this may have arisen from the possible fact that he either did not know *Acroptychia*, or it did not occur to him to compare his so-called new genus *Anceyiella* with it. At all events, he does not mention either of the species described by Crosse and Fischer, and evidently was not aware that *A. æquivoca*, the type of his genus *Anceyiella*, was identical with *Acroptychia manicata*.

On the other hand, if M. Mabille knew the genus *Acroptychia* at the time, it shows what very feeble characters are estimated of generic importance by a certain class of conchologists. If the presence of one lamella, instead of several, is sufficient to distinguish a species generically, why not separate a *Mitra* with three folds on the columella from those with four or more, a *Triton* with several varices from another with few, a *Scalaria* with distant varices from those in which they are very numerous and close-set? To form genera on such very slight differences in sculpture is simply

* Journ. de Conch. (1874), 76 pl., pl. 1, f. 5-5b, also in Grandidier's Hist. Phys. Nat. et pol. de Madagascar. Vol. xxx., Mellinques, p. 241, f. 1-4a.

† Reeve's Con. Icon Cyclotoma, fig. 40.

‡ Journ. de Conch. (1882), p. 325; Grandidier's Madagascar, pl. 243, f. 5-5c.

†† Bull. Soc. Philomat. (1885), Vol. ix., p. 728.

ridiculous, and tends merely to confusion and to bring the science into contempt.

The species I am about to describe is very much smaller than *A. metableta*, but of a similar conical form, exhibits traces of a deciduous epidermis, but has only a simple broadly expanded peristome. Unfortunately, the operculum is wanting in the two specimens examined, and therefore it is not quite certain that it should be regarded as belonging to *Acroptychia*. If it possessed a sutural tube it would be an *Alycæus*, for it has the constriction of the body-whorl so characteristic of that genus.

ACROPTYCHIA NOTABILIS.

Testa turbinata, conica, umbilicata, saturate fusca, ad peripheriam palliãa; anfractus 6, convexi, sutura subprofunda discreti, lineis incrementi perobliquis flexuosis et striis spiralibus microscopicis indistinctis ornati, ultimus in medio rotunde angulatus, haud ascendens vel descendens, paulo pone aperturam leviter constrictus, prope labrum tenue album et valde expansum quadri-indentatus; apertura subcircularis, fusca, zone pallida dimidiata, pustulis quatuor intus instructa; perist. tenue, vix continuum, marginibus callo tenui junctis, columellari ad umbilicum sinuato, infra sinum dilatato. Diam. mag. 10 millim., min. $7\frac{1}{2}$, alt. 9. Apertura intus $3\frac{1}{2}$ longa et lata.

Hab. Madagascar, probably from the neighbourhood of Tamatave.

The constriction of the body-whorl and the four indentations between it and the expanded peristome, which have the appearance of blisters within the aperture, readily distinguish this interesting little species. The outlines of the spire are a little concave, and the apex is large and obtuse. The epidermis in both *A. metableta* and *A. æquivoca* is more or less diaphanous, and the remains of a similar periostracum is also traceable in the present species. The lamellæ in both the above-named forms are very sharp, flat, and at right angles to the surface of the body-whorl, and the peristome in this species is almost precisely of the same character, and differs only in being more interrupted near the umbilicus. Another feature which induces me to place this shell in *Acroptychia* is the presence of very fine spiral sculpture, which also occurs in the two larger forms. As a guide to the form of *A. notabilis*, reference may be made to the figure of *Alycæus galbanus*, Godwin-Austen.*

* Proc. Zool. Soc. (1869), pt. xxxvii, f. 1-12. This gives a fair idea of the general form, but of course has differences of detail.

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BY E. RUTHVEN SYKES, B.A.,

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DESCRIPTIONS OF A NEW VARIETY OF ARION HORTENSIS, FÉR., AND A. CIRCUMSCRIPTUS, JOHNST.

By WALTER E. COLLINGS,

Assistant Demonstrator in Zoology, St. Andrews' University.

DR. SCHARFF has very kindly sent me a number of Irish *Arioninae*, amongst which are numerous examples of the blue form of *Arion hortensis*,* and which I am now describing as a variety of this species. Possibly further investigations may prove its anatomical characteristics to be more permanent than we at present suppose.

Arion hortensis, Fér.

var. nov. *caeruleus*.

Body, blue or greyish-blue, with dark blue lateral bands, and pale yellow between these and the foot fringe; *mantle*, dark bluish central patch, with darker bands at each side; *head* and *tentacles*, bluish-grey; *sole*, variable, white or very light yellow, generally covered with a red or yellowish slime; *foot-fringe*, white, without lineoles; *rugæ*, flat, large, and elongate; *sulci*, dark.

Length in spirit, 27 mm.; alive, 43 mm.

Hab.—Co. Dublin, Ireland, and Berkshire and Oxford, England.

* I hope to deal with the variations, &c., of this species in more detail in a forthcoming
“Review of British *Arionidae*.”

ANATOMY.—The reproductive organs are generally larger than in the type. The most constant features are the shortness of the receptacular duct, the enlarged lower vestibule, and the globose form of the lowest portion of the sperm duct. In some—five specimens—the oviduct was very characteristic, showing a well marked difference in size between the upper and lower portions; in others, however, it varied greatly.

Arion circumscriptus, Johnst.

var. nov. *flavescens*.

Body, light brownish-yellow, dark lateral bands, with light brown or dark yellow stripe below, faint blue stripe above foot-fringe, from head to mucous gland; *head* and *tentacles*, dark blue; *sole*, white or bluish-white; *foot-fringe*, white, no lineoles; *rugæ*, large and prominent; *sulci*, dark.

Length alive, 49 mm.

Hab.—St. Andrews, N.B.

Found in company with the smaller brown form (var. *neustriacus*, Mabile. ?).

ON THE CLASSIFICATION OF VARIETIES.

By ROBERT MACDONALD, M.A., B.Sc.,

Madras College, St. Andrews.

A SPECIALIST is almost certain to discover amongst members of a species differences so persistent that he is compelled to recognise them as marks of permanent varieties; but it seems to me that a variety of a species should be constituted only under compulsion (as it were), since the multiplication of varieties is a loss to simplification. Now the schedule of classification of varieties of *Helix hortensis*, Müll., and *H. nemoralis*, L., proposed by the Rev. W. L. W. Eyre, in last quarter's "Conchologist," is a distinct invitation to form as many varieties as possible—the more numerous they are, the more in accordance with the schedule will the collection be.

Mr. Eyre gives seven varieties of *H. hortensis*, based on ground colour alone (of course, seven does not exhaust the number of ground hues, but suppose for argument's sake it does). The lip may vary in colour according to the schedule in five different ways. On these two features alone—ground colour and lip colour—35 varieties could be made.

If the shells be classified according to number of bands only, i.e., according to the presence or absence of one or more of bands 12345, then 32 varieties could be distinguished; if attention were paid also to confluence of bands, 95 varieties; if to resolution into spots as well, 276 varieties.

If the distinction into varieties proceed upon the variations in either ground colour, lip colour, or number, confluence and spotting of bands, then altogether there could be distinguished 35 times 276, or 9,660 varieties of *H. hortensis*. The same reasoning applies to the possible number of varieties of *H. nemoralis*. To distinguish further varieties by the reduction of the bands to fine lines or transparencies, &c., would increase the number by several thousands.

Whether bandings in *H. hortensis* and *H. nemoralis* are permanent features or not, is a very pertinent enquiry; but while there is evidence to show that they are fluctuating, to constitute varieties on their differences, is like distinguishing "men" by the colour of their hair, or the freckles of their face. Men may be so distinguished indeed, but is the distinction of scientific value?

As a scheme of arrangement of shells in a cabinet, the schedule will suit admirably; but as yet it is too early to introduce it into our text books as a scientific classification of varieties. That the system of naming is not a satisfactory one, is evidenced by the fact that a very similar proposal made by Mr. T. D. A. Cockerell,* in 1885, was never generally adopted. The awkwardness of the names of the several forms is forbidding, e.g., *H. nemoralis*, var. *libellula*, var. *albolabiata*, var. *hyalonzonata*.

Might I point out, that for identification, *H. hortensis*, var. *roseolabiata*, should be made = var. *hybrida*, Jeff., by law of priority.

THE GENERA LIMAX, ARION, AND HELIX.

By T. D. A. COCKERELL, F.Z.S., F.E.S.,

Institute of Jamaica.

THE facts mentioned by Dr. Scharff in his interesting and timely note (Conch., p. 14, 1892) are undoubtedly of importance, but the conclusion, as expressed in his work on the Slugs of Ireland (p. 513), that *Limax* and its allies must be united with *Helix* in one family seems to me unjustifiable, and I do not think any systematic

* Naturalist's World, vol. ii. p. 143 (1885).

conchologist will be found to adopt such an arrangement. The true result, following the researches of Simroth and others, is that the *Arionidae* constitute a distinct family; but the validity of the *Limacidae* as a family group still remains, and it still remains true, as I believe, that the *Arionidae* are more related to the *Helicidae* than to the *Limacidae*. Thus the arrangement given by me in P.Z.S., 1891, p. 216, based largely on characters of the jaw and lingual ribbon, is in no wise affected.

In classifying slugs it is very difficult at times to find good characters to distinguish groups, and probably the jaws and lingual ribbon are, on the whole, as useful as any others, if used with caution. Dr. Scharff relies in part upon the shell and caudal gland; but it must be remembered that some *Arionidae* have a calcareous shell, while the caudal gland, although present in *Arion*, is wanting in *Anadenus* and other genera belonging to the same sub-family, and is present in various tropical genera of *Limacidae*. How far the other characters hold good, we are not yet altogether in a position to judge, and further researches into the anatomy of the several genera, such as those Dr. Simroth has so ably conducted, are much to be desired.

Kingstown, Jamaica,
May 1, 1892.

SOME FURTHER REMARKS ON THE BURROWING HABITS OF CERTAIN LAND MOLLUSCS.

BY WALTER E. COLLINGS,

Assistant Demonstrator in Zoology, St. Andrews' University.

My observations "On the Burrowing Habits of Certain Land and Freshwater Molluscs" * seems to have awakened some little interest in the subject, and has induced me to give further and closer attention to a matter of such importance.

In speaking of *Geomalacus maculosus*, Allm., I quoted the well-known observations of Allman and Jeffreys on this species, but purposely refrained from commenting upon the same until they were verified by some other observer, as I doubted both statements. Dr. Scharff, who has not only paid careful attention to this species in captivity, but also in its natural habitat, writes me: "I quite

* "Naturalist," p. 75 (1891).

disbelieve in their supposed power of elongating themselves so as to assume the appearance of a worm. They flatten themselves out very much, and are thus enabled to creep into very narrow fissures in rocks, but they will not escape through a perfectly round hole in a tin box, even if it should be almost a quarter of an inch wide." Speaking of *Amalia sowerbyi*, Fér., Dr. Scharff says he has "frequently found it buried several inches beneath the surface, destroying bulbs and living on vegetable matter—in fact, it is a most typical burrowing slug in this country" (Ireland).

Last autumn I found numerous cases where fairly large specimens of *H. aspersa*, Müll., had burrowed to depths of from five to six inches. Mr. George Paul, F.R.M.S., informed me some little time ago that he frequently found *Agr. agrestis*, L., at depths varying from six to eight inches. *H. rufescens*, Penn., and *H. hispida*, L., are very plentiful on the summit of the cliffs along the East Sands near to St. Andrew's. The latter species is the more abundant, and I am inclined to think that what I previously thought were the burrows of earthworms are burrows excavated by the mollusc itself. It is very difficult to say whether or not they have been first formed by earthworms. In one case I dug out three specimens—two immature, the other adult—in a distinct burrow which seemed to terminate at a depth of about seven inches. *Clausilia rugosa*, Drap., a species I have not yet met with at any depth, except under stones, has been found in Yorkshire by a friend of mine, in damp earth at a depth of five inches. Mr. J. W. Taylor records (Journ. Conch., p. 299, 1888) the finding of *Bulimus montanus*, Drap., at a depth of two feet in Somersetshire. I hope next winter to continue these observations, and I trust others interested in the subject will do the same. The oft occurring question, What becomes of the slugs and snails in winter? has not yet been satisfactorily answered, but I think that careful and continued observation will prove that a very large proportion, if not all, burrow, and in some cases, to considerable depths.

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- 1891.—T. D. A. C[OCKERELL].—Bandless *H. nemoralis* from Lewes. Brit. Nat., p. 65. Describes 5 forms sent by Mr. C. H. Morris.

SOCIETIES' PROCEEDINGS.

ZOOLOGICAL SOCIETY, LONDON.

April 5.—W. T. Blandford, F.R.S., in the chair.

An account of the Land-Shells of St. Helena, by Mr. Edgar A. Smith, was read. Mr. R. J. L. Guppy exhibited specimens of *Bulinus oblongus*. Descriptions of 7 new species of Land-Shells from the U.S. of Columbia were read by Mr. G. B. Sowerby.

May 17.—Prof. W. H. Flower, C.B., LL.D., F.R.S., in the chair.

The Rev. A. H. Cooke, M.A., F.L.S., F.Z.S., read a paper “On the Geographical Distribution of the Land Mollusca of the Philippine Islands,” which showed that the distribution of the different subgenera of *Cochlostyla* affords an interesting clue to the early relations of the various islands of the Philippine group. Regarded from this point of view, the central islands, Samar, Leyti, Bohol, Negros, and Panay with Luzon, were closely related, while Mindoro and Mindanao were remarkably isolated even from their nearest neighbours. An examination of the intervening seas accounted for these phenomena, the depths between the central islands being inconsiderable, while Mindoro and Mindanao are surrounded by very deep water. The Mollusca of the two ridges between the Philippines and Borneo, formed by Busuanga, Palawan, and Bulaboc, and by the Sulu Archipelago, were partly Philippine, partly Indo-Malay. Two remarkable groups of *Helix*, peculiar to Mindoro, Busuanga, and Palawan, showed relations with Celebes, and possibly with New Guinea. The Mollusca of the Batan, Tular, and Talantse Isles were also discussed. Regarded as a whole, the Land Mollusca of the Philippines were stated to contain:—

1. Indo-Malay. 2. Polynesian. 3. Indegenous elements, the first decidedly predominating.

LINNEAN SOCIETY.

April 7.—Prof. Stewart in the chair.

Specimens of *Testacella maugei*, Fér., from Devonshire, were exhibited by Mr. W. S. D'Urban.

CURRENT LITERATURE.

REVIEWS.

Manual of Conchology by George W. Tryon, Jr. Continuation by H. A. Pilsbry, 1st Ser. vol. xiii, pt. 52, 2nd Ser. vol. vii, pt. 28. Philadelphia: Academy of Natural Sciences.

Part 52 of Series I, completes volume xiii, and concludes the *Patellida*. A revised classification of this family is put forward, which agrees generally with that of Dr. Thiele in his "*Das Gebiss der Schnecken*." It is as follows:—

Subfamily *Patellina*. Lateral teeth three on each side, two of them anterior.

1. Genus *Patella*. Branchial cordon complete; apex near centre.
2. Genus *Helcion*. Branchial cordon interrupted; apex anterior.

Subfamily *Nacollina*. Lateral teeth two on each side; one of them anterior.

1. Genus *Nacella*. Epipodial ridge on sides of foot; branchial cordon complete.
2. Genus *Helcioniscus*. Sides of foot smooth; branchial cordon interrupted in front.

In Series II, pt. 28 completes volume vii, and continues the Genus *Cochlostyla*, treating of the following sections, *Ptychostylus*, *Helicobulimus*, and *Orthostylus*. There is an index to the sub-genera and sections contained in vol. vii., and an explanation of the plates. An index to the species of *Helix* is promised in the next volume, which subscribers will welcome.—E.R.S.

List of British Land and Freshwater Mollusca. Leeds: The Conchological Society, 1892.

Some 18 months ago the Conchological Society of Leeds decided to issue a new list of the British Land and Freshwater Mollusca, and the same now lies before us. We pointed out at the time that a strong committee of well-known and competent conchologists would alone ensure an authoritative list; the Society, however, thought otherwise, and the undertaking was entrusted to three well-known collectors, whose incompetency for such a task is at once evident in the errors of classification. Possibly shell collectors think lightly of such matters, so we pass on to the question of nomenclature. An insufficient acquaintance with anything beyond books and shells is at once evident, while the question of priority is treated in a most mischievous and childish manner.

We will content ourselves with here pointing out a few of the more flagrant errors and inaccuracies amongst the Slugs on p. 3. *A. empiricornis*, Fér., is styled *A. ater*, L., *A. intermedius*, Normand, as *A. minimus*, Simroth, *Limax variegatus*, Drap., as *L. flavus*, L. In the nine pages of notes we are informed that the Society "are convinced that the more distinct and striking forms of every species should be definitely distinguished, we cannot assent to the publication of distinct names for the slighter modifications." With this we agree, but the list is an absolute denial of any such treatment. The most casual reader will be at once struck by the undue prominence that has been given to the minor varieties of Messrs. Taylor and Roebuck, while many well marked varieties of particular authors are most carefully excluded.

The most important omissions in the Slugs are *A. ambiguus*, Poll., and *A. collicus*, Poll. *L. cinereo-niger*, Wolf, is retained as a species. Surely the authors cannot have seen Simroth's observations on the anatomy, who has proved it to be but a var. of *L. maximus*! Under *A. ater* the var. *brunnea* is still retained, which is of course, nothing more than a form of *v. rufa*, L., the var. *plumbea* is a minor form of *v. nigrescens*, Moq., which latter is omitted to make room for this less important one! The three most important vars. of *A. subfuscus* are also omitted, together with a number of those of *A. hortensis* and *A. circumscriptus*. We do not wish to deal harshly with Mr. Roebuck's varieties, but after the above clause *re* minor varieties, we really fail to see how or why *v. lilacina* of *L. maximus* has been included.

We will not tire the reader with pointing out further errors or inaccuracies. The Society's previous list of 1883 is now regarded as a curiosity, and there is every reason to believe that this, their latest development, will find a secure slumbering place with its embryonic brother of 1883, until "the Society" next attempts to deal with the nomenclature and classification of so small a section of the Mollusca as our British Land and Freshwater forms.

W.E.C.

ANATOMY.

Testacellæ. (Journ. Conch., p. 423, 1891.)

Dr. Simroth has been further investigating the *Testacellæ*, and finds that since the publication of the works of Lacaze-Duthiers and Dr. Plate, his treatise published in 1891—but written in 1887—requires some slight corrections.

T. dubia from Caveretto, nr. Turin, and *T. barcinonensis* from Barcelona, are perhaps only varieties of *T. haliotidea*. The *T. haliotidea* from Trieste, should be ranged under the *T. cotatonica*, Poll. and *T. pecchiolii*, Bgt., from Settignano, nr. Florence.

Referring to the origin of the retractor muscles of the pharynx and tentacles, Dr. Simroth thinks that it is evident that the innervation—as pointed out by Dr. Plate—of these two muscles, cannot be held as an argument that they never were united with the pharynx retractor. Possibly they may have had relations, as in *Dandebardie*.

On the Genital organs of *Helix*. (Arch. für. Naturgesch., pp. 1-65, 1892.)

Dr. Schubert gives a number of anatomical diagnoses, and upon structural grounds confirms the distinctness of the generality of the species catalogued by Kobelt.

On the Anatomy of some Tasmanian L. Shells. (Pro. Linn. Soc. N.S.W., vol. vi., pt. 1, 1891.) C. Hedley.

Anatomy and Physiology of *Pholade dactyle*. (Ann. de l'Univ. d. Lyon, T. II. 1892.) R. Dubois.

On the Colouration of the Tegument in the Cephalopods. (Arch. Zool. Exp., vol. x., p. 277.) Dr. L. Joubin.

On the Radula of *Paludestrina jenkinsi*, &c. (Ann. & Mag. N.H., p. 376, 1892.) B. B. Woodward.

EMBRYOLOGY AND DEVELOPMENT.

The Development of *Bythina tentaculata*. (Ann. and Mag. N.H., p. 411, 1892.)

All students interested in the embryology of Gastropods are acquainted with Dr. R. Erlanger's works upon the same. The above paper is especially important, for Dr. Erlanger has, "in almost all important points . . . arrived at precisely opposite views to Sarasin," who has previously written at some length upon this species.*

The process of segmentation, the development of the blastopore and various organs are minutely described. In opposition to Sarasin, Dr. Erlanger enforces the following points—

"There is in *Bythina* a separate mesoderm, which arises from the endoderm, and the development of which from the two primitive cells is traceable step by step. The archenteron proceeds from an invagination of the endoderm. The

* P. Sarasin, "Entwicklung. d. *By. tentaculata*." Inaugural-Dissertation, Wiesbaden, 1882.

whole mid-gut, *i.e.*, stomach and liver, as well as end-gut (if we can use the term at all as applied to molluscs), arises from the archenteron, which always exhibits a distinct lumen. The mouth proceeds directly from the blastopore, accompanied by an invagination of the ectoderm, which forms the œsophagus; consequently a complete closure of the blastopore does not take place. The anal opening corresponds to a small pit at the hinder end of the blastoporal groove. Primitive kidney and kidney, apart from their ectodermic excretory ducts, are of mesodermic origin; the same is true for the heart and pericardium. The ganglia arise completely separate from one another, and do not come into connection until afterward.⁵

The Cleavage of the Ovum in *Crepidula fornicata*. (Zool. Anz., p. 185, 1892.)—E. G. Conklin.

HABITS AND HABITAT.

The Genus *Rissoa*. (Brit. Nat., p. 72, 1892.)

Mr. Breckton Tomlin gives a very interesting account of this genus, giving details as to nomenclature, variation, &c., which will prove of service to beginners.

The Limpet's Adhesive Power. (Nat. Sci., p. 319, 1892.)

Mr. J. Lawrence-Hamilton, after experiment, finds nothing to suggest any sucker-like action, and concludes that the major part of the adhesive power is due to a secretion of the animal. [In this he agrees with Reaumer, Johnston, and Jeffreys.]

Observations on two rare British Nudibranchs. (Ann. and Mag. N. II., p. 378, 1892.)

Mr. F. W. Gamble figures and describes *Lomanotus genei*, Verany, and *Hancockia endactylota*, Gosse, both of which have lately occurred at Plymouth. Interesting observations are given relative to the papillæ, and a useful table comparing the different specimens of *Hancockia* and *Govia*.

The Genus *Cristaria*. (Nachr. Deutsch. Malak. Gesell., Jan. and Feb., 1892.)

Von Ihering writes on this genus, at present only known from E. Asia, and its relations to the other groups of *Unionide*.

***Rissoa parva*, DaC., v. *nigra*, Norman.** (Brit. Nat., p. 127, 1892.)—B. Tomlin.

NEW SPECIES.

Mollusca of Galapagos Islands. (Journ. de Conch., Oct., 1891.)

Dr. Dall mentions the discovery of some interesting molluscan novelties in the Galapagos Is. These are a species of *Helicina* (*nesiotica*, Dall), of *Lepinaria* (*chathamensis*, Dall) and a small ? *Zonites* (*baueri*, Dall). All three genera are new to the group.

New Shells from the Palearctic Region. (Verband. d. Zool. Bot. Gesell. in Wien, B. xlii., p. 25.)

This is practically a reprint of a paper published by Dr. Westerlund in the *Versammlung* last winter. Many new species and varieties are described: principally *Helices* of the section *Xerophila*. The one of most interest to British conchologists is *H. lampra* from Aran, Co. Galway [This is very near if not identical with *H. ericetorum*]. Dr. Westerlund also suggests a classification of *Sticliaria*—a sub-genus of *Clavosilia*—in which he groups together *Cl. crassicostata*, *Cl. leucophryne*, *Cl. nobilis*; then *Cl. confinata*; also *Cl. tiberi*, and *Cl. calcaris*; and finally *Cl. grahamiana*, and *Cl. septuplicata*. [This latter species is hardly satisfactory, its lamellæ and general facies would incline one rather to place it with *Cl. confinata*.]

Helix vendryesi and Veronicella jamaicensis. (Journ. Inst. Jamaica, p. 55, 1892.)

Mr. T. D. A. Cockerell describes the above two species, the former from Montego Bay (W.I.), and the latter from Kingstown. This slug has already been figured and described by Semper, and referred as doubtful to *V. kyaussis*, Fér. [We much regret to find Mr. Cockerell has here departed from a rule he has hitherto laid down and adhered to very stringently, viz., that of naming species &c., after individuals and places.]

New Australian Mollusca. (Trans. Roy. Soc. S. Aust., vol. xiv, p. 257 and 265.)

Prof. Tate gives a second supplement to the list of Lamellibranch and Palliobranch Mollusca of S. Australia. The new recent species belong to the genera *Siphonalia*, *Latirofusus*, *Diala*, *Leioptyrga*, *Semele*, *Tellina*, *Lucinopsis*, *Crassatella*, *Pectunculus* and *Leda*.

Some New Land Shells. (Brit. Nat., p. 125, 1892.)

Mr. C. F. Ancey describes the following new species:—*Ennea consobrina*, from Cape Colony; *Helix melvilliana*, from Ovampoland; *Nenia orbigny* (allied to *Cl. crossii*, Hidalgo), from Bolivia; and *Cyclostoma burtoni* (allied to *C. anceps*, Von Marten), found in the vicinity of L. Tanganyika.

[Presuming that these shells were made and occupied by some animal, a reference to the same would have been useful. In the absence of any description of the points of difference in the anatomy, we fear the latter two can hardly rank as species until further and more completely described.]

Pecten crouchi and Mitra fultoni. (Ann. and Mag. of N. H., pp. 255-6, 1892.)

Mr. Edgar A. Smith describes and figures the above forms, the former from the Mauritius and the latter from Lower California.

Unio oscari. (Nautilus, p. 124, 1892.)

Mr. B. H. Wright here describes a form allied to *U. athenus*, Lea, from which it differs, however, in having a much smoother epidermis, a deeper shell cavity, and shorter and wider lateral teeth. Habitat: a creek from L. Osceola, Florida.

New Unio (U. corbeti) from Ceylon. (Bull. Soc. Zool. France, T. xvii., p. 68.)—Emile Deschamps.

VARIATION.

Notes on Varieties. (Brit. Nat., pp. 70, 74, 105, and 127, 1892.)

Messrs. W. A. Gain and T. D. A. Cockerell contribute further notes and observations upon this subject, which are interesting and full of suggestive points, worthy of further attention.

Variation of the Genus Arion. (Ann. and Mag. N.H., p. 307, 1892.)

Mr. W. E. Collinge, who is at present devoting some attention to the *Arionida*, here records some interesting forms of *A. empiricorum*, grouped as sub-varieties of var. *bocagei*, Simroth. Speaking of the red forms of this species, Mr. Collinge is of opinion that *v. brunneum*, Roebuck, would be better grouped as a sub-var. of *v. rufus*, L. The *v. subreticulatus*, Ckll., he also suggests might be similarly grouped under *v. reticulatus*, Roebuck. The *v. fallax*, Ckll., of *A. hortensis*, Fér., he views as a form of *v. subfusca*, C. Pfr., and questions the validity of *v. albespes*, Ckll.

DISTRIBUTION.

Mollusca of Lord Howe's Island. (Journ. de Conchl., Oct. 1891.)

Dr. P. Fischer has an interesting article on the mollusca of Lord Howe's Island (between New South Wales and New Zealand), compiled from the publications of Etheridge and Redley. The Land Mollusca are 21 (possibly 24)

in number, all peculiar, and consist of *Nanina* (3 sp.), *Charoia* (3, possibly 6, 3 more being, probably wrongly, attributed to the island by Pfeiffer), *Diplommatina* (4), *Bithynella* (2), *Parmella*, *Microcystis*, *Patula*, *Placostylus*, *Simpulopsis* [a most unlikely identification], *Tornatellina*, *Omphalotropis*, *Realia*, and *Onchidium* (1 each). Thus the fauna is markedly Polynesian. The occurrence of a *Placostylus* is exceedingly interesting, and places the island in connection with N. Caledonia and N. Zealand rather than with E. Australia, although three times as near Australia as it is to either N. Caledonia or N. Zealand. [An examination of a chart, however, will show that Lord Howe's Island lies nearly on the west extremity of a long ridge of comparatively shallow water, under 1,000 feet, which stretches in a north-westerly direction from N. Zealand towards the E. coast of Australia, but abruptly terminates in about long. 158° E.]. The marine mollusca are of the Indo-Pacific type. This fact is remarkable, since on the E. Australian coast the mollusca of this type are generally regarded as not penetrating further south than Cape Sandy, which is 6 degrees further north than Lord Howe's Island.

Heude's "Notes on the Terrestrial Mollusca of the Blue River." (Nachr. Deutsch. Malak. Gesell., Jan. and Feb., 1892.)

Von Möllendorff has some highly polemical criticisms on the last instalment of Heude's "Notes on the Terrestrial Mollusca of the Blue River" (Yang-tse-Kiang). He falls specially foul of Heude's treatment of the genera *Myxostoma*, *Rhyssoloma*, and the land operculates in general. The new Heudean genera *Fargesia* and *Hemibia* have already been characterised (*Pseudopomatias* and *Prosothenia*), *Mesostoma* and *Frisularia* are, respectively, a typical *Pupina* and a group of *Paludina*.

Mollusca of the Madeiran Isles. (Journ. Conch., p. 1, 1892.)

The Rev. R. Ecog Watson discusses the relation of the L. and F. Mollusca of the Madeiran Isles to those known elsewhere. The distribution of the Mollusca is one to which serious attention is now being given, and Dr. Watson's paper bristles with queries on some very perplexing points.

Marine Mollusca of North Wales. (Journ. Conch., p. 25, 1892.)

Mr. Tomlin contributes some interesting additions to the Molluscan fauna of the coast of North Wales, including the Nudibranchs and Cephalopods.

Remarks on Australian Slugs. (Ann. and Mag. N. II., p. 370, 1892.)

Mr. Cockerell replies to Mr. Hedley's criticism, showing "that on every single point mentioned, Mr. Hedley's criticism is without sufficient reason."

The Mollusca of the Red Sea. (Ann. Sci. Nat., vol. xii., pp. 343-363.)

Dr. Jousseume adds a large number—some 200—of species to the known fauna, amongst them a brachiopod, a new species, and the first found in this locality. Mr. Edgar A. Smith's views upon the Red Sea fauna are confirmed, viz., that it is practically that of the Indian Ocean, and has no relations with that of the Mediterranean. He discusses the variation of the Mollusca, and strongly believes in the reality of "species," considering that each varies within certain definite limits, and that one species is always distinguishable from another.

Mollusca of Southport and District. (Southport Soc. Nat. Sci., pp. 32-38, 1892.)

Dr. Chaster's list enumerates 175 forms, including L. F. & M., and is an evidence of careful work. The system of classification adopted detracts somewhat from the value of the list.

Land and Freshwater Shells peculiar to the British Isles. (Nature, p. 76, May, 1892.)

The unsatisfactory state of our knowledge of the inland Mollusca of the British Isles is, in the opinion of Mr. T. D. A. Cockerell, due to two causes, "firstly, that so many conchologists consider varieties, and especially slight varieties, to be of little or no importance; secondly, because those who study our native shells,

are, as a rule, but ill-acquainted with foreign species and varieties." Mr. Cockerell proceeds to review Dr. Wallace's list of peculiar forms (*Island Life*, new ed.), and gives notes upon a number of interesting varieties. [We fear it would be unwise to lay any great stress upon the importance of slight varieties. While thoroughly endorsing Mr. Cockerell's remarks as an acquaintance with foreign species and varieties, and a more scientific treatment of the external morphology of the Mollusca—shell and animal—we fear the root of the evil lies in conchologists being mere shell collectors and entirely ignoring the presence of a mollusc in their dilettante studies of the shell].

Irish L. and F. Mollusca. (*Irish Nat.*, p. 45, 1892.)

Dr. Scharff commences what promises to be a very interesting account of the Mollusca of Ireland.

Odostomia albella, Loven, in Ireland. (*Irish Nat.*, p. 61, 1892.)

Mr. R. Lloyd Praeger records a single example of this species from Groomsport, Co. Down. Other species are also mentioned.

T. haliotidea at Shipley. (*Nat.*, p. 154, 1892.) E. Self.

T. scutulum at Horbury, Yorks. (*Nat.*, p. 145, 1892.) W. Rushworth.

The L. Moll. Fauna of British New Guinea. (*Proc. Linn. Soc. N.S.W.*, 1891.) C. Hedley.

Vertigo pusilla in Lancashire. (*Jy. Conch.*, p. 7, 1892.) R. Standen.

Vertigo pusilla in Lancashire. (*Sci. Goss.*, p. 143, 1892.) F. C. Long.

Pl. albus, m. scalariforme at Peniston. (*Jy. Conch.*, p. 7, 1892.) L. E. Adams.

H. aspersa, m. sinistrorsum, in the I. of Man. (*Jy. Conch.*, p. 24, 1892.) R. Standen.

Notes on Marine Moll. collected on the coasts of Donegal, &c. (*Zool.*, pp. 51, 105, 139, 181; 1892.) H. C. Hart.

On Mediterranean Conchology. (*Il. Nat. Siciliana*, p. 50, 1892.) M. se. De Gregario.

Y.N.U. at Horton-in-Ribblesdale. (*Nat.*, p. 180, 1892.) W. D. Roebuck.

PALÆONTOLOGY.

Tertiary Moll. of Florida. (*Trans. Wagner Inst.*, 1892).—W. H. Dale.

" " (*Naut.*, p. 128, 1892).—Review.

Monog. of the British Jurassic Gasterop., pt. I., No. 8, **Gasterop. of the Inferior Oolite.** (*Palæontog. Soc.*, Vol. xlv., pp. 225-272, 1892).—W. H. Huddleston.

MISCELLANEOUS.

The Pearl Molluscs of the Persian Gulf. (*Pro. Roy. Phys. Soc.*, p. 30, 1891).—A. Galletly.

Mollusca of Meiringen, Switz. (*Journ. Conch.*, p. 32, 1892).—Rev. J. W. Horsley.

In Memoriam—Dr. Wesley Newcomb. (*Naut.*, p. 121, 1892).—R. E. C. S.

- On the Species of Donax of Eastern North America.** (Naut., p. 125, 1892.)—W. H. Dale.
- Mollusks as Cat-fish Food.** (Naut., p. 127, 1892.)—C. C. Adams.
- The Argonaut of the Mediterranean.** (Le Naturaliste, p. 114, 1892.)
- On the Schematism of Shells in the Mollusca.** (Sci. Goss., p. 127, 1892.)
E. W. W. Bowell.
- On the Genus Pectunculus.** (Il Nat. Siciliana, p. 89, 1892.)—M. de Gregorio.
- On the Mending of the Shell in *H. aspersa*.** (Bull. Soc. Zool. France, T. xvii., p. 30, 1892.)—Moynier de Villepoix.
- Arion minimus* = *intermedius*.** (Jy. Conch., p. 31, 1892.)—T. D. A. Cockerell.

NOTE.

Additions to the Mollusca of South Wilts.

The following are not recorded in the Census of the Conchological Society for South Wilts, and were collected near Salisbury by my friend, Mr. J. R. Longhurst:—*Succinea elegans*, *L. palustris*, *P. vortex*, *P. contortus*, *Valvata piscinalis*, *Bythinia tentaculata*, *Physa fontinalis*, *Anodonta anatina*, and *Sph. cornutum*. It is very probable that Mr. Longhurst will find many other species, as, excepting the above additions, only five species are enumerated.—E. W. Swanton, Doddington.

EDITOR'S NOTES.

We are pleased to hear of a proposal to form a Conchological Society in Somerset, which we trust will be successful. Conchologists interested in the same are requested to communicate with Mr. E. W. Swanton, Doddington, Sittingbourne, Kent.

Owing to various causes—one being Dr. Scharff's absence from home—a number of papers are unavoidably compelled to stand over until the September issue. That, and all future numbers will, where necessary, be illustrated.

During the past quarter various suggestions have been received regarding the Bibliography (Current Literature). While every effort is made to make this department as complete as possible, articles in Scientific and Local Natural History Societies' proceedings often escape our notice from the inaccessible nature of many of these publications. For such we must rely upon the kindness of our readers or the generosity of the respective Societies.

A number of authors have very kindly promised to forward copies of their reprints, and a reference to short articles, notes, &c., every quarter, which will greatly facilitate matters.

We have pleasure in notifying that Mr. Walter Garstang, M.A., Berkeley Fellow of Owens College, Manchester (Victoria University), and one of the Naturalists of the Marine Biological Association of the United Kingdom, has very kindly agreed to render assistance (editorially, &c.) in connection with the Nudibrachs and the anatomy of Marine Molluscs.

THE
CONCHOLOGIST

A Quarterly Journal of Malacology.

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LONDON

SWAN SONNENSCHN & CO.

BERLIN

R. FRIEDLÄNDER & SOHN.

PRICE ONE SHILLING.

THE CONCHOLOGIST:

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Vol. II.

SEPTEMBER 29th, 1892.

No. 3.

ON THE ORIGIN OF THE GENERA OF LAND AND FRESHWATER MOLLUSCA.

BY THE REV. A. H. COOKE, M.A., F.Z.S.,

Fellow and Tutor of King's College, Cambridge.

THE ultimate derivation of the whole of the land and freshwater molluscan fauna must, in common with that of all other forms of life, be looked for in the sea. All the great families of mollusca can be referred, with more or less distinctness, to a marine origin, and all are the modified descendants of an ancestry originally marine. In certain cases the process of conversion, if it may be so termed, from a marine to a non-marine genus, is still in progress, and can be definitely observed; in others the conversion is complete, but the modification of form has been so slight, or the date of its occurrence so recent, that the connection is unmistakable, or at least highly probable; in others again, the modification has been so great, or the date of its occurrence so remote, that the actual line of derivation is obscured or at best only conjectural.

This passage from a marine to a non-marine life—in other words, this direct derivation of non-marine from marine genera—is illustrated by the faunal phenomena of an inland freshwater sea like the Caspian, which is known to have been originally in connection with the Mediterranean, and therefore originally supported a marine fauna. The mollusca of the Caspian, although without exception freshwater species, are in their general facies distinctly marine. Of the 26 univalve species which inhabit it* 19 belong to 4 peculiar genera

* Dylowski, *Mal. Włta, N.F.*, x, 17.

(*Micromelania*, *Caspia*, *Clessinia*, *Nematurella*), all of which are modified forms of *Rissoidea*. The characteristic bivalves belong to the genera *Adacna*, *Didacna*, and *Monodacna*, all of which can be shown to be derived from the common *Cardium edule*. We have here a case where complete isolation from the sea, combined no doubt with a gradual freshening of the water, has resulted in the development of a number of new genera. The singularly marine facies of several of the freshwater genera now inhabiting Lake Tanganyika, has given rise to the belief, among some authorities,* that that lake was at one time an inlet of the Indian Ocean. In the upper waters of the Baltic, marine and freshwater mollusca flourish side by side. So complete is the intermixture that an observer who had lived on no other shores would probably be unable to separate the one set of species from the other. Thus between Dragö and Papenwick† *Mytilus edulis*, *Cardium edule*, *Tellina balthica*, *Mya arenaria*, *Littorina rudis*, and *Hydrobia balthica* are the only true marine species; with these live *Unio*, *Cyclas*, *Neritina*, *Limnaea*, and *Bithynia*. The marine species and *Neritina* live up to 15-20 fath., the rest only up to 3 fath. Under stones close to the shore of the Skärgård at Stockholm‡ are found young *Cardium* and *Tellina*, and at 3 to 6 fath. *Limnaea peregra*, and *Physa fontinalis*. Near Gothland *Limnaea* is found in the open sea at 8-12 fath., and with it occur *Cardium* and *Tellina*. At the Frischen Haff|| *Mya arenaria* is the only marine species, and lives in company with 6 sp. *Limnaea*, 1 *Physa*, 9 *Planorbis*, 1 *Ancylus*, 4 *Valvata*, 2 *Spharium*. Were the Sound to become closed, and the waters of the Baltic perfectly fresh, it would be inevitable that *Mya arenaria*, and such other marine species as continued to live under their changed conditions, should in course of time submit to modifications similar in kind to those experienced by the quondam marine species of the Caspian.

It seems probable, however, that the origin, at least in a great part, of the land and freshwater mollusca need not be accounted for by such involuntary changes of environment as the enclosure of arms of the sea, or the possible drying up of inland lakes. These cases may be taken as illustrations of the much more gradual processes of nature by which the land and freshwater fauna must have been developed. The ancestry of that fauna must be looked for, as far as the Gasteropoda are concerned, in the littoral and estuarine species, for the Pelecypoda, in the estuarine alone. The effect of the recess of the

* See Pelsoneer, Bull. Mus. Belg. iv., 1886.

† Braun, Arch. f. Naturk. Lit. (5) x. p. 305 f.

‡ Linnéström, Of. K. Vol. Akad. Berh. Stockh. 1855, p. 46.

§ Menéndez, Schv. Ges. Königsb. xxx, p. 97.

tide, in the one case, and the effect of the reduced percentage of salt, in the other, has tended to produce a gradual adaptation to new surroundings, an adaptation which becomes more and more perfect. It may be safely asserted that no marine species could pass into a land or freshwater species except after a period, more or less prolonged, of littoral or estuarine existence. Thus we find no land or freshwater species exhibiting relationships with such deep-sea genera as the *Volutidæ*, *Cancellariidæ*, *Terebridæ*, or even with genera trenching on the lowest part of the littoral zone, such as the *Haliotidæ*, *Conidæ*, *Olividæ*, *Capulidæ*. The signs of connection are rather with the *Neritidæ*, *Cerithiidæ*, and above all the *Littorinidæ*, which are accustomed to live for hours, and in the case of *Littorina* for days or even weeks, without being moistened by the tide. Similarly the freshwater Pelecypoda exhibit relationships, not with genera exclusively marine, but with genera known to inhabit estuaries, such as the *Mytilidæ*, *Corbulidæ*, *Cardiidæ*.

It would be natural to expect that we should find this process of conversion still going on, and that we should be able to detect particular species or groups of species in process of emigration from sea to land, or from sea to fresh water. Such species will be intermediate between a marine, and a land, or freshwater species, and difficult to classify distinctly as one or the other. Cases of mollusca occupying this intermediate position occur all over the world. They inhabit brackish swamps, damp places at high-water mark, and rocks only at intervals visited by the tide. Such are *Potamides*, *Assiminea*, *Siphonaria*, *Melampus*, *Hydrobia*, *Truncatella*, among the univalves and many species of *Cyrena* and *Arca* among the bivalves.

ORIGIN OF THE FRESHWATER FAUNA.

(A) PELECYPODA.

Estuarine species, which have become accustomed to a certain admixture of fresh water, have gradually ascended the streams or been cut off from the sea, and at last have become habituated to water which is perfectly fresh.

Thus *Dreissena* (rivers and canals throughout N. Europe and N. America) and *Mytilopsis* (rivers of America) are scarcely modified *Mytili*; *Scaphula* is a modified *Arca*, and lives in the Ganges, the Jumna, and the Terasserim at a distance of 1,600 miles from the sea. *Pholas rivicola* is found imbedded in floating wood on the R. Pantai many miles from its mouth. *Cyrena*, *Corbicula*, and probably *Sphacrium* and *Pisidium* are derived, in different degrees of removal, from the *Veneridæ*; *Potamomya* (rivers of S. America), and *Limella* (R. Amazon) are forms of *Corbula*. The Caspian genera, derived

from *Cardium* (*Adacna*, *Didacna*, *Monodacna*), have already been referred to. *Nausitora* is a form of *Teredo*, which lives in fresh water in Bengal. *Rangia*, *Fischeria*, and *Galatea* probably share the derivation of the *Cyrenida*, while in *Iphigenia* we have one of the *Donacidae* which has not yet mounted rivers, but is confined to a strictly estuarine life. The familiar *Scrobicularia piperata* of our own estuaries is a *Tellina*, which lives by preference in brackish water.

The great family of the *Unionida* is regarded by Neumayr* as derived from *Trigonia*, the points of similarity being the development of a nacreous shell, the presence of a strong epidermis, and the arrangement of the muscular scars. It is remarkable, too, that on many *Uniones* of Pliocene times there is found shell ornamentation of such a type as occurs only on *Trigonia* among the Pelecypoda.

The earliest types of freshwater Pelecypoda occur in the cretaceous (*Unio*, *Cyrena*).

The genera of freshwater Pelecypoda are comparatively few in number, and their origin is far more clearly discernible than that of any other group. This is perhaps due to the fact that the essential changes of structure required to convert a marine into a freshwater bivalve are but slight. Both animals "breathe water," and both obtain their nutriment from matter contained in water. Similar remarks apply to freshwater operculate Gasteropoda. But the passage from a marine to an aerial life involves much profounder changes of environment, which have to be met by correspondingly important changes in the organism. This may be in part the reason why the ancestry of all Pulmonata, whether land or freshwater, is so difficult to trace.

(b) GASTEROPODA. (1) Operculate.

Canidia, *Clea*, and perhaps *Nassodonta* are forms closely allied, with but little modification, to the marine *Cominella*.† They occur (in fresh water) in the rivers of India, Indo-China, Java, and Borneo, associated with essentially freshwater species. *Potamidus* with its various subgenera (*Telescopium*, *Pyrazus*, *Pinenella*, *Cerithidea*, &c.), all of which inhabit swamps and mudflats just above high-water mark in all warm countries, are derived from *Cerithium*; *Assimineia*, *Hydrobia*, and perhaps *Truncatella*, from *Rissoa*. It is a remarkable fact that in *Geomelania* (with its sub-genera *Chittya* and *Blandiella*) we have a form of *Truncatella* which has entirely deserted the neighbourhood of the sea, and lives in woody mountainous localities in certain of the West Indies. *Cremnocochus*, a remark-

* Anz. K. Akad. Wiss. Wien, 1889, p. 4.

† Not to *Nassa*, as has been generally held. The shape of the operculum, and particularly the teeth of the radula, show a much closer connection with *Cominella*.

able shell occurring only on wet cliffs in the ghâts of South India, is a modified *Littorina*. *Neritina* and *Nerita* form a very interesting case in illustration of the whole process. *Nerita* is a purely marine genus, occurring on rocks in the littoral zone, one species however (*lineata*, Chem.) ascends rivers as far as 25 miles from their mouth, and others haunt marshes of brackish water.* *Neritina* is the freshwater form, some species of which are found in brackish swamps or even creeping on wet mud between tide marks, while the great majority are fluviatile, one group (*Neritodryas*) actually occurring in the Philippines on trees of some height, at a distance of a quarter of a mile from any water. *Navicella* is a still further modified form of *Neritina*, occurring only on wet rocks, branches, &c., in non-tidal streams.

The great family of the *Melaniidæ*, which occurs in the rivers of warm countries all over the world, and that of the *Pleuroceridæ*, which is confined to North America, are, in all probability, derived from some form or forms of *Cerithium*. The origin of the *Paludinidæ*, *Valvatidæ*, and *Ampullariidæ* is more doubtful. Their migration from the sea was probably of an early date, since the first traces of all three appear in the lower Cretaceous,† while *Melaniidæ* are not known until tertiary times. *Ampullaria*, however, shows distinct signs of relationship to *Natica*, while the affinities of *Paludina* and *Valvata* cannot as yet be approximately affirmed.

(2) *Inoperculate.*

Intermediate between the essentially freshwater and the essentially marine species come the group known as *Gehydrophila*, consisting of the two great divisions *Auriculidæ* and *Otinidæ*. These may be regarded as mollusca which, though definitely removed from all marine species by the development of a true lung in place of a gill, have yet never become, in respect of habitat, genuine freshwater species. Like *Potamides*, they haunt salt marshes, mangrove swamps, and the region about high-water mark. In some cases (*Otina*, *Melampus*, *Pedipes*), they live on rocks which are moistened, or even bathed by the spray, in others (*Cassidula*, *Auricula*), they are immersed in some depth of brackish water at high tide, in others again (*Scarabus*), they are more definitely terrestrial, and live under dead leaves in woods at some little distance from water. Indeed one genus of diminutive size (*Carychium*) has completely abandoned the neighbourhood of the sea, and inhabits swampy ground almost all over the world.

* e.g. Huetter (Ben. Senckenb. Gesell., 1891), classifies several as brackish water species.

† It is curious, however, that while *Ampullaria* has developed a lung, it at the same time breathes water through the gill. See, in particular, Fischer and Houvier, *Comptes-Rendus* cas. p. 500, for a full description of the process.

To this same section *Gekydrophila* (though separated off by some authors as *Thalassophila*) may be assigned two remarkable forms of air-breathing "limpet," *Siphonaria* and *Gadinia*, and the aberrant *Amphibola*, a unique instance of a true operculated pulmonate. *Siphonaria* possesses both a lung and a gill, while *Gadinia* and *Amphibola* are exclusively air-breathing. *Siphonaria* lives on rocks at or above high-water mark, *Gadinia* between tide marks, *Amphibola* in brackish water at the estuaries of rivers, half buried in the sand. There can be little doubt that all these are marine forms which are gradually becoming accustomed to a terrestrial existence. In *Gadinia* and *Amphibola* the process is so far complete that they have exchanged gills for lungs, while in *Siphonaria* we have an intermediate stage in which both gill and lung exist together. A curious parallel to this is found in the case of *Ampullaria*, which is furnished with two gills and a pulmonary chamber, and breathes indifferently air and water. It is a little remarkable that *Siphonaria*, which lives at a higher tide level than *Gadinia*, should retain the gill, while *Gadinia* has lost it.

The ultimate affinities of the essentially freshwater groups, *Limnaea*, *Physa*, *Chilina*, cannot be precisely affirmed. The form of shell in *Latia*, *Gundlachia*, and perhaps *Ancylus*, may suggest to some a connection with the *Otinidae*, and in *Chilina*, a similar connection with the *Auriculidae*. But, in a question of derivation, similarities of shell alone are of little value. It is not a little remarkable, for instance, that we should find a simple patelliform shell in genera so completely distinct from one another in all anatomical essentials as *Ancylus*, *Patella*, *Siphonaria*, *Propitidium*, *Hipponyx*, *Cocculina*, and *Umbrella*.

Bouvier, on grounds of general organisation, regards* the *Hygrophila* in general as *Opisthobranchs* adapted to an aerial life. He considers that the *Nudibranchiate Opisthobranchs* have given birth to the *Pulmonata stylommatophora*, and the *Tectibranchiate Opisthobranchs* to the *Pulmonata basommatophora*. Such a view is much more easily stated than definitely disproved, but it seems open to serious objection from other views than those which deal simply with anatomy. The *Opisthobranchiata* are not, to any marked extent, littoral genera, nor do they specially haunt the mouths of rivers. On the contrary, they inhabit, as a rule, only the very lowest part of the littoral zone, and are seldom found except where the water is purely salt. In other cases, when the derivation of land or freshwater genera is fairly well established, intermediate forms persist, which indicate, with more or less clearness, the lines along which

* *L. Naturaliste*, 1880, p. 242 f.

modification has proceeded. No such undoubted links can be shown to exist, or to have existed, in the present case, between the *Tectibranchiate Opisthobranchs* and the *Limnaeidae*. Bouvier indeed finds this link in the *Siphonariidae* and *Amphibolidae*, but the connection is of the slightest. It might be held, with equal, or more, probability, that the *Hygrophila* are in reality derived from the land *Pulmonata*, a section of which may be supposed to have betaken themselves to an aquatic life. Or we may hold, with Pelseneer, that the reverse process has taken place, and that the *Basommatophora* are the direct ancestors of the *Scylommatophora*. In this case, *Succinea* would be an intermediate link, with a curious parallel in *Onchidium*, a pulmonate which has retrogressed* to a semi-marine habit of life.

ORIGIN OF THE LAND FAUNA.

GASTEROPODA. (1) Operculate.

On *a priori* grounds, one might predict a double origin for land operculates. Marine species might be imagined to accustom themselves to a terrestrial existence, after a period, more or less prolonged, of littoral probation. Or again, freshwater species, themselves ultimately derived from the sea, might submit to a similar transformation, after a preliminary or intermediate stage of life on mudbanks, wet swamps, branches overhanging the water, &c. Two great families in this group, and two only, seem to have undergone these transformations, the *Littorinidae* and the *Neritidae*. The derivation of all existing land operculates may be referred to one or other of these groups.

The power of the *Littorinidae* to live for days or even weeks without being moistened by the sea may be verified by the most casual observer. In the tropics this power seems even greater than on our own shores. I have seen, in various parts of Jamaica, *Littorina muricata* living at the top of low cliffs among grass and herbage. At Panama I have taken three large species of *Littorina* (*varia*, *fasciata*, *pulchra*) on trees at and above high water-mark. Cases have been recorded, in which a number of *L. muricata*, collected and put aside, have lived for three months, and *L. irrorata*, for four months.† These facts are significant, when we know that the land operculates almost certainly originated in a tropical climate.

The *Cyclophoridae*, *Cyclostomatidae*, and *Aciculidae*, which, as contrasted with the other land operculates, form one group, have very close relations, particularly in the length and formation of the radula, with the *Littorinidae*.

* Bergii, Morphol. Jahrb. x, 179 G.

† Collins, Amer. Nat. xi, p. 682.

On the other hand, the *Helicinidæ*, *Hydrocenidæ*, and *Proserpinidæ* are equally closely related to *Neritina*. The *Proserpinidæ* (restricted to the Greater Antilles, Central America and Venezuela) may perhaps be regarded as the ultimate term of the series. They have lost the characteristic operculum, which in their case is replaced by a number of folds or lamellæ in the interior of the shell. It has already been noticed how one group of *Neritina* (*Neritodryas*) occurs normally out of the water. This group furnishes a link between the freshwater and land forms. It is interesting to notice that here we have the most perfect sequence of derivatives; *Nerita* in the main a purely marine form, with certain species occurring also in brackish water; *Neritina* in the main freshwater, but some species occurring on the muddy shore, others on dry land; *Helicina* the developed land form, and finally *Proserpina*, an aberrant derivative which has lost the operculum.*

GASTEROPODA. (2) *Inoperculate*.

The origin of these, the bulk of the land fauna, must at present be regarded as an unsolved problem. Bouvier, as we have seen, regards them as derived from the *Nudibranchiate Opisthobranchs*, the evidence in support of such a view being purely anatomical. No argument can be drawn in this case from the radula, which is very variable in form throughout the *Opisthobranchiata*, both the great sections of which order include genera possessing radulæ of a quasi-Helicid type, with a formula $\infty 1 \infty$.

The first known members of the land *Pulmonata* (*Pupa*?, *Hyalinia*) are from the Carboniferous of North America. Similar but new forms appear in the Cretaceous, from which time to the present we have an unbroken series. The characteristically modern forms, according to Simroth,† are *Helices* with thick shells. According to the same author, *Vitrina* and *Hyalinia* are ancestral types, which give origin not only to many modern genera with shells, but to many shell-less genera also, e.g., *Testacella* is derived through *Daudebardia* from *Hyalinia*, while from *Vitrina* came *Limax* and *Analia*. A consideration of the radulæ of the genera concerned certainly tends in favour of these views.

Godwin-Austen, speaking generally, considers‡ genera of land *Pulmonata* with strongly developed mantle-lobes and rudimentary shell as more advanced in development than genera in which the shell is large and covers all or nearly all the animal.

* One step even further (or perhaps it should be termed a branch derivative) is seen in the genus *Smaragdin*, which is probably a *Neritina* which has resumed a purely marine habit of life.

† *Sil. Naturf. Gesell. Leipzig*, 1886-7, pp. 40-48.

‡ *J. L. and R. W. Moll. of India*, vol. 167.

NOTES ON THE STRUCTURE AND HABITS OF JORUNNA JOHNSTONI.

By WALTER GARSTANG, M.A.,

Naturalist on the Staff of the Marine Biological Association.

THE nudibranch *Jorunna Johnstoni*, or *Doris Johnstoni*, as it was called before the old genus *Doris* was subdivided, received a careful description at the hands of Alder and Hancock in their well-known monograph, and characteristic figures of the species are given in the same place. Another figure may be found in Prof. McIntosh's "Marine Invertebrates and Fishes of St. Andrews," Plate II, fig. 16. The species has a fairly general distribution around our coasts, and may be readily identified from Alder and Hancock's excellent description. In the present communication several points in its external form and habits that merit attention will be described.

At Plymouth, *Jorunna Johnstoni* can be generally obtained at low water from the large loose stones which lie on the northern side of the great breakwater, and also from the Renny Rocks; but although a constant inhabitant at these places, it is never found in large numbers. Unlike *Doris tuberculata* and other allied species, it is not gregarious; and it also appears to be of stationary habit and averse to migration.

Its form is, in general, depressed, and its contour extremely variable. When in motion it usually assumes a narrow and elongated form, the posterior end of the foot projecting slightly from beneath the dorsal fold; but when at rest, the body usually broadens out until the outline is decidedly ovate, sometimes even circular, the foot being entirely concealed. The colour of *J. Johnstoni* is well described by Alder and Hancock as "generally yellowish white or pale cream-coloured, occasionally of a buffish orange or lemon yellow." It is not uniform, however. The rhinophores and anal tube are more or less deeply tinged with brown; and the back presents a mottled appearance, owing to numbers of darker spots which are scattered all over it. These spots are mostly of a pale brown or fawn-colour, and are small in size, but in addition there are always present a few rather larger spots which are conspicuous from their dark chocolate-brown or blackish colour and from their more or less regular arrangement. They are five or six in number, and are situated at various points upon three imaginary longitudinal lines,

one of which runs down the middle of the back, while the other two run backwards on either side from the rhinophores to the region of the branchiæ. Differentiations of the dorsal integument along these three lines occur also in several allied genera, e.g. *Goniodoris*, *Idalia*. It is the general arrangement of the dark spots in these three lines which is constant; the actual position assumed by them upon the lines is subject to extensive variation in different individuals. The most symmetrical condition that I have met with is one in which there are two spots in each longitudinal row, the anterior spot in each lateral row being midway between the rhinophore and the posterior spot. Under this arrangement the brown-pigmented rhinophores seem to be the anterior members of the lateral rows of spots and easily escape recognition. Often there are no spots in the middle line at all (see McIntosh's figure); more rarely there are more spots in the middle line than in either of the lateral lines (see Alder and Hancock's fig. 2). Lastly, an asymmetrical arrangement of the spots in the lateral lines is very frequent: there may, for instance, be only one spot on one side, while there are two, or even three, on the other.

Another feature which is highly characteristic of this species is met with in the disposition of the branchial plumes. These vary slightly in number, from 12 to 16 in all; and when expanded, as is almost always the case, they form a complete circle, enclosing the anus, and assuming the shape of a conical, tubular or cup-shaped prominence, according as the number of plumes present is smaller or greater.

Alder and Hancock have described the back as being "closely covered with very minute, equal, linear, and spiculose tubercles, scarcely visible to the naked eye, and giving the cloak a granular appearance," and one of their figures (figure 4) illustrates this statement. This account is correct and distinctive so far as it goes, but it is inadequate in regard to the structure of the individual tubercles, and the figure can only have been drawn from a specimen in very poor condition. In a fresh and healthy individual the tubercles are seen to have the shape of slender inverted cones, armed around their sides with 5 or 6 stout spicules, which project freely beyond the upper margins of the cones. Each tubercle, moreover, terminates in a slender tentacular process which possesses powers of slow contraction and extension. When contracted, the tentacular process is quite concealed within the crown of spicules; but when fully extended it protrudes for a considerable distance beyond them. Its surface is covered with cilia, and these appear to be stiffer and less vibratile at the apex than on the general surface. Near the tip of each tentacular

process is a small group of opaque white bodies which appear to be gland-cells.

I am inclined to believe that these curiously-formed tubercles discharge both a defensive [spicules] and a tactile [tentacular processes] function. So many fishes and invertebrates search for their prey by the sense of touch that it is a distinct advantage to a sedentary gastropod to have special tactile organs by which it may be warned when to adhere more firmly to its place of attachment. Every one knows how firmly a limpet clings to a rock after being touched or slightly disturbed.

The tubercles are uniformly distributed all over the back of the nudibranch, except on the dark-brown patches, where they are more scanty.

For several years I have paid attention to the habits of *Jorunna Johnstoni*, both in its native haunts and in aquaria, in order to see whether the peculiarities of the species are in any sense adaptive. I believe that a decidedly affirmative answer can now be given to the question. *Jorunna Johnstoni* is a very convincing instance of protective mimicry among marine animals—as complete in its own way as the best of cases in the insect world.

In a paper* published three years ago, I drew attention to the remarkably sponge-like appearance of an individual of this species, the conical tube of branchial plumes simulating the protruding osculum of a small *Halichondria*. So many additional details in this resemblance have since been forced upon me that I can no longer doubt the reality of the mimicry; and in this fact the key is found to almost every peculiarity of form, marking, and habit which distinguishes the species from its allies.

The nudibranch lives on the same stones as the small *Halichondria* (provided with only one or two oscula), which it so closely resembles, and the sponges are far more plentiful than the nudibranch.

The irregularly ovate contour of *Jorunna Johnstoni*, when at rest, approximates closely to the form of the sponge. The osculum of the latter is strikingly mimicked by the tube of branchial plumes.

The general colour of the two forms is the same, and the slight variations in tint exhibited by the nudibranch are also found in the sponge. The pale brownish spots on the back of *Jorunna Johnstoni* are seen again in the sponge, where they seem to indicate the positions of the inhalent pores or ostia.

The yielding, velvety, but spiculose surface of the sponge is similarly found in the nudibranch, whose back is completely covered

* Journ. Mar. Biol. Ass. (N.S.), 1, 1909, pp. 174 and 179. See also same journal, 1900, p. 447.

with minute spiculose papillæ, the structure of which has been described above.

The only external structures in the nudibranch which are altogether unrepresented in the sponge are the two dorsal tentacles or rhinophores; and these might conceivably nullify the effect of all the resemblances which have here been shown to exist. This obstacle, however, has been overcome in a way that points most decisively to the operation of natural selection. The presence of conspicuous spots on the back of the nudibranch, coloured darkly like the rhinophores, and arranged so that the rhinophores are included in the same series, effectually deceives the eye, and conceals the existence of projecting rhinophores from any but the closest scrutiny. The generally asymmetrical position of the dark spots, and the irregularity of their size and tint, also conspire to prevent the formation of any suspicion.

In conclusion, it should be stated that the advantage to the species of so close a mimicry of sponges must be considerable, since it has already been shown by me ("Nature," 1890, p. 418) that sponges are highly distasteful to predatory fishes, and are shunned by them under natural as well as artificial conditions.

AN ADDITIONAL OCCURRENCE OF PLEUROPHYLLIDIA LOVENI IN BRITAIN.

BY W. A. HERDMAN, D.Sc., F.R.S., F.R.S.E.,

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IN Professor M'Intosh's interesting "Note on the occurrence of *Pleurophyllidia loveni* in Britain," in the "Conchologist" for June, p. 21, one record seems to have escaped notice. It is stated in the Note that since the specimens mentioned in "Forbes and Hanley's British Mollusca," nothing appears to have been heard of the species "till the Trawling Expedition of 1884." But during that interval a specimen was taken by the late Professor F. M. Ballour, off Dunbar, in mud, from a depth of thirty fathoms, as is recorded in Leslie and Herdman's "Invertebrate Fauna of the Firth of Forth," published in 1881.

ON THE PERIOSTRACUM OF HELIX ARBUSTORUM, Müll.

By G. SHERRIFF TYE,

Birmingham.

ON cleaning the shells of this species preparatory to putting them in my cabinet. I had often noticed that on the ultimate whorl for the space covering the last period of growth and completion of the shell, there appeared a dark fuscous covering which was readily removed by a little vigorous rubbing with a damp cloth, leaving the shell cleaner looking, and with its periostracum apparently undisturbed.

Last year I collected this species in plenty at Buxton and Castleton, in Derbyshire, where it occurs generally distributed about the district with various varieties, *flavescens* being fairly abundant. My attention was thus more particularly called to the peculiarity spoken of above. Careful examination revealed the fact that the periostracum is double. This doubling starts from the commencement of a period of growth—where it is scarcely perceptible—and goes on gradually increasing in strength until the finish of that growth, being most easily seen in the last, or finishing part.

The outer periostracum of early life is probably rubbed off by the creature's movements among damp vegetation, as it is not so firmly fixed to the inner—or true—periostracum below it, as that is to the shell. In patriarchal individuals it is not of such extent as in the more recently finished shells, although I have never seen a shell whereon it did not show plainly round and about the lip.

I have forwarded to Mr. W. E. Collinge five numbered shells in illustration of my remarks, the first four being from Buxton.

No. 1. The outer layer of periostracum is removed in a band (going towards the mouth) to a line terminating below the peripheral band. The inner periostracum is removed (exposing the shell) in a line above the band, thus showing the two periostracal layers.

No. 2 has the outer covering only, removed in a curve terminating at the mouth above the band, but not below it.

No. 3 (var. *flavescens*) is treated in a similar manner to No. 1, and shows the three bands, shell white, lower periostracum lemon, upper ochre.

No. 4 shows the three bands as above, but running from the base of the penultimate whorl towards the umbilicus (*i.e.*, reverse way to the others), the lip dark with its double covering, next ochre lower covering, then shell.

No. 5 is var. *flavescens* just as it occurs in nature. When the two layers of periostracum are present the shell is a dark ochreous colour, when only one, it is a pale lemon, a small spot of the inner coating is removed, showing the white shell. Five of these shells were taken at Lassington, in Worcestershire; they are very pale. One in my possession has the outer periostracum intact, and gently graduated from the end of the second growth to the finish—a perfect example of a beautiful shell—showing the double periostracum as clearly as it can be seen, and the change of tint due to it.

If the last (completing) growth of a shell be dissolved in dilute hydrochloric acid, the periostracum—which is not acted upon by the acid—will plainly show the double layer, under the microscope.

I do not know whether this peculiarity may be found in other species, I have examined many from various parts of the world but failed to find it. As *H. arbustorum* has been considered the representative in Europe of a type having its home in California I turned specially to the species from that part of the earth, but failed to find any indication of a double periostracum, although it is readily seen on every form of *H. arbustorum*—from every country or locality—which has come under my notice.

While speaking of this species may I ask if there is a true *albino* variety? The var. *flavescens* is milk-white when denuded of its periostracum—analogue to *H. aspersa* var. *exalbida*. I have never seen a shell of *H. arbustorum* which by any stretch of the imagination could be called white with the periostracum on, though I note Moquin-Tandon gives a var. *albina*.

In Science Gossip for August, Mr. Wigglesworth reports taking pink coloured shells of this species—In June last I found pink shells, which I kept on account of their colour, at the Wren's Nest, Staffordshire. The Molluscs were feeding on Coltsfoot (*Tussilago farfara*, L.). Has the plant any influence in giving this colour to the shells? It is known to entomologists that if the caterpillar of the common Tiger Moth (*Arctia caia*) is fed upon Coltsfoot, it gives rise in the perfect insect to varietal shades of colour in yellow, brown, or black.

SOME REMARKS ON THE COLOUR CHANGES IN ARION INTERMEDIUS, Normand.

By W. A. GAIN,

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It appears to me that we shall be obliged to greatly reduce the number of varieties generally accorded to our British Slugs, for many of the forms usually considered distinct are merely stages in the growth of a variety or species; probably to write a full history of any species it will be found requisite, not only to describe a number of varieties, but under each variety to group the forms through which it successively passes. *Arion empiricorum*, Fér., as is well known, darkens with age, in many cases passing through stages of colouring quite distinct from that which it finally assumes. Of this slug I hope to say more at a future time, as I have a number at present under observation, and am taking notes of the colour changes.

In *A. intermedius* the general change of colour appears to be from dark to light. I have known this slug in its young state either as dark green or yellow. On April 9th, 1892, I obtained a number of the green-coloured variety, and the following notes record the various changes:—

On May 24th they had "slightly grown; greenish-yellow in colour, with more or less distinct slaty lines."

June 5th.—"Larger, and have lost the green colour, now yellow, more or less bright, with well-developed lines, one specimen with a dusky line down the centre of the back."

June 17th.—"All four living, three full-grown. All very pale yellow, almost white, uniform except sole and slime gland, which are rather deeper. No lines on the sides of the body or around the mantle."

June 29th.—"One appeared above the soil after watering,"—they frequently penetrate into loose soil—"light yellow and handless." After a second watering another specimen came to the surface, "light yellow, almost straw-colour, with a very light touch of grey on the centre and edge of the mantle, slime gland rather darker yellow, almost unicolour."

July 8th.—"Retired below the surface."

July.—"Very pale yellow, almost white, colour nearly uniform, except slime gland and sole, which are rather deeper, no lines on the sides of body or around the mantle."

July 15th.—“Have now probably assumed their final colour; mantle, dull greyish-orange; back grey; light greyish-yellow at the sides; caudal region and gland yellower.”

On returning from a journey I notice on August 12th a cluster of about a dozen eggs, strongly cemented together into an irregular mass. They are globular, pearly white, and barely 2 mm. in diameter. The slugs are now of a more uniform yellow or orange-yellow, than when last described.

From the above extracts from my note-book, it will be seen that these slugs at different ages might have been described as distinct varieties. I hope next year to observe the changes which take place in those individuals which commence life with a yellow habit.

A REVIEW OF THE ARIONIDÆ OF THE BRITISH ISLES.

BY WALTER E. COLLINGE,

Assistant Demonstrator in Zoology, St. Andrew's University.

IN attempting to review a family of Slugs such as the *Arionidæ*, I am only too conscious of how difficult a task I have undertaken and of the ability and able memoirs of my predecessors, and yet I venture to think that—imperfect as these pages must necessarily be—the same will be of use and assistance to those who have not had the facilities and advantages which I have been so generously favoured with.

Through the kindness of many conchologists I have had unlimited supplies of material to work upon, and I take this opportunity of thanking the many willing helpers who have so generously assisted me, and to whom more special mention is made hereafter. My thanks are specially due to the following gentlemen:—Dr. R. F. Scharff, B.Sc., Keeper of the Natural History Museum, Dublin, who has not only supplied me with specimens of all the Irish *Arionidæ*, but throughout the preparation of these pages has offered every assistance, and has most generously read over my MS. before going to press; to Prof. W. C. M'Intosh, M.D., LL.D., F.R.S., who, during the latter part of July and the beginning of August, allowed me to continue my researches, &c., at the St. Andrews' Marine Zoological Laboratory; to Mr. T. D. A. Cockerell, F.Z.S., F.E.S., Curator of the Museum of the Institute of Jamaica, Kingston, who has rendered most generous assistance and made many valuable suggestions, as the following pages witness; to Mr. E. W. Swanton,

Sittingbourne, Kent, who has devoted much time and care on my behalf to the *Arions* of the S. and S.W. of England, forwarding continual supplies; to Dr. Heinrich Simroth I am also much indebted for very kindly examining doubtful or perplexing forms, &c.; and to Signor Carlo Pollonera, of the Museum of Zoology and Comparative Anatomy of the Royal University of Turin, for examples of Italian and French *Arions*, &c.

INTRODUCTORY.

The *Arionidæ* are a family of slugs distributed throughout the E. and W. Hemispheres, the different sub-families, genera and species of which have engaged the attention of anatomists, malacologists, and collectors of almost every school. Prominent among such we find the names of Férussac, Blainville, Nunneley, Platner, Jourdain, Garnault, Simroth, Pollonera, Lessona, Binney, Heynemann, Mörch, J. G. Cooper, Godwin-Austen and others.

The known genera may be conveniently grouped under four sub-families, viz. :—

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| 1. <i>Philomycinae</i> . | 3. <i>Rinneyinae</i> . |
| 2. <i>Arioninae</i> . | 4. <i>Oopeltinae</i> . |

Until more systematic and minute anatomical investigations have been made upon a many of the genera of these sub-families, but little can be said respecting their affinities. The second family having come more directly under my own observations, as embracing all our British forms, is the one whose anatomy I am more particularly acquainted with. I agree with Scharff (36) who has very conclusively shown that there is no ground whatever for including the genera *Arion* and *Geomalacus* under the *Helicidæ*: Cockerell (5) considers the *Arionidæ* more closely related to the *Helicidæ* than to the *Limacidæ*. While these last two families have many points in common, I know of no observations that have demonstrated any marked relation in either of them to the *Arionidæ*.

As previously stated, the *Arionidæ* at present known to the British Isles, are all members of the sub-family *Arioninae*, and may be grouped in two genera, viz., *Arion*, Fér., and *Geomalacus*, Allman. Both of these genera are characterised by the presence of a mucous gland at the caudal extremity of the body. While such a feature, at present, is characteristic of both of these genera, it cannot be said to be so of the sub-family, for in the genus *Anadenus*, Heyne, it is absent. Seeing that it is also present in certain *Limacidæ*, it cannot be looked upon other than a minor generic distinction. Mr. Cockerell (4), whose classification I give below, recognises seven true and two doubtful genera, viz. :

Sub-family ARIONINÆ.

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| 1. <i>Arion</i> , Fér. 1819. | 6. <i>Prophysaon</i> , Bld. & Binn. 1873. |
| 2. <i>Ariunculus</i> , Lessona. 1881. | 7. <i>Anadenulus</i> , Ckil. 1890. |
| 3. <i>Geomalacus</i> , Allman., 1846. | *8. <i>Hesperarion</i> , Simroth. 1892. |
| <i>Letourneuxia</i> , Bgt. 1866. | |
| 4. <i>Anadenus</i> , Heyne. 1863. | [9. <i>Tetraspis</i> , Hagenm. 1885]. |
| 5. <i>Ariolimax</i> , Mörch. 1860. | [10. <i>Aspidoporus</i> , Fitz. 1833]. |

Genus *Arion*, Férussac, 1819.

Body nearly cylindrical, elongated, strongly wrinkled; mantle shagreened or granulate; tentacles separated at their base; respiratory orifice in front of middle of right edge of mantle; genital orifice below and close to respiratory orifice; keel absent, a slight indication of one in young forms; mucous gland at posterior extremity of body, triangular, base of angle directed towards the head; shell consists of loose calcareous granules in some species, in others, however, they assume a more compact form. Subject to great variation.

This genus was created by Férussac in 1819. It is confined to the European region, with the exception of those introduced by human agency into North America, New Zealand, St. Helena, &c. There are nine species known to the British Isles.†

Moquin-Tandon has divided the genus into two sub-genera: *Lochea* and *Prolepis*. In the former the shell is represented by a series of unequal, isolated, calcareous granulations, and in the latter by an aggregation of separate calcareous particles. Simroth (39) divides the genus into *Monatriidæ* and *Diatriidæ*, according to the number of vestibules. Pollonera (31) classes the various species, &c., under four groups as follows:—

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| 1. The <i>A. empiricorum</i> group. | 3. The <i>A. hortensis</i> group. |
| 2. The <i>A. subfuscus</i> group. | 4. The <i>A. bourguignati</i> group. |

The anatomy has been carefully described by Nunneley (28), and still later by Simroth (39), and that of various species by Lawson (22a) and Pollonera (29, 30, and 31). I shall, therefore, point out only the principal characters. There are four convolutions of the intestine, thus being easily distinguished from *Limax*, which has six. There are two tentacular muscles, which arise independently, and supply the upper and lower tentacles—from the latter a small labial branch is given off. The pharynx retractor muscle arises beneath the mantle on the left side of the body wall; it divides into

* Created since Mr. Cokerell's paper was written.

† I am ranking all the forms mentioned here as species, as I have previously done in my "Catalogue of British Slugs." It is quite possible, however, that some may ultimately be shown to be but sub-species.

two branches, which pass to each side of the bucal cavity. There is no retractor muscle to the lower portion of the vas deferens. Strong retractor muscles, however, are attached to the receptaculum seminis and the oviduct. The most prominent and distinguishing feature in the nervous system is the two large dorsal nerves. There is no penis or muciparous glands, and the spermduct never has a flagellum attached. During copulation the female portion of the reproductive organs are everted.

Arion empiricorum, Fér., 1819.

= *A. ater*, Brit. Auctt.

BODY convex above, contracted and rounded in front, pointed behind; varies greatly in colour, being various shades of black, brown, red, and yellow; tentacles strongly granulated, considerably enlarged at their bulbs; sole variable; foot-fringe variable; rugæ large, keeled, and elongated; shell absent, mass of small calcareous granules.

That the large black slug occurring in the British Isles is the *A. empiricorum*, Fér., there can be but little doubt. Pollonera, the principal authority on the *Arionidæ*, considers it specifically distinct from *A. ater*, L. Young specimens are often mistaken for *A. subfuscus* and *A. lusitanicus*. Scharff (35) has pointed out that if adult specimens be tapped on the head, they invariably draw themselves together and arch the body, and if again tapped, the specimen assumes a peculiar swaying movement from side to side. I have also noticed this arched position in *A. lusitanicus*, *A. circumscriptus*, and *A. intermedius*.

ANATOMY.*—There are two vestibules, an upper and a lower one, into the lower portion of the former the receptaculum seminis and sperm duct (= Patronstrecke of Slinroth) open, the free oviduct opens into the upper portion of this vestibule. The vas deferens is long, but shows no distinct marking between the upper and lower portions, viz. the vas deferens and sperm duct. The retractor muscles are attached to the upper portion of the oviduct, and also to the duct of the receptaculum. The hermaphrodite gland is of a purple brown colour, but subject to much variation; the duct is convoluted and comparatively long. Scharff (35, p. 539) mentions a variety in which the retractor muscles are attached much lower down the oviduct. This is, I think, likely to be *A. lusitanicus*, as I have found this to be the case in what specimens I have examined of that species.

REPRODUCTION.—The eggs are deposited from June to August, and average from 40 to 50 in number. Young specimens show

* Dr. Scharff has so recently described and figured the reproductive organs of most of the forms here mentioned, that I have only given the principal points.

prominent lateral bands and stripes, continued around the mantle. Gain (17) records that young light-coloured varieties have darker stripes at the sides and round the mantle, similar to those of *A. subfuscus*. When about half-grown the difference in colour becomes less prominent, owing to the rest of the body becoming darker. Simroth (39) looks upon the banding as an ancestral character ("Stambinde"). I know of no species of *Arion* in which the bands are absent in the young form. Scharff (35, p. 515) distinguishes between bands and stripes, "the former dark, the other light in colour." I think it is preferable to retain the term band for the largest and most prominent line—generally the upper one—and the term stripe for the finer lines nearer the foot-fringe.

VARIATION.—It is quite out of the question to here make any attempt to review the whole of the minor varieties. A plan I have previously adopted (10) has been here adhered to, viz., that of grouping the less important under the well-marked and characteristic variations.

- A—*fasciatus*, Ckll. Possibly this form will have to be re-named, as Schbert has described a v. *fasciatus* of *A. rufus* (probably it is synonymous).
- B—*clineolatus*, Ckll. Mr. Cockerell thinks this is the var. 4, of Leach, from Cornwall. (See Synops. Moll. Gt. B., p. 67).
- C—*swammerdamii*, Kal., = *marginatus*, Moq. An interesting form. The foot-fringe varies from yellow to an orange-red.
- D—*razoumousskii*, Kal. Such forms as *nigrescens*, Moq., *cinerescens*, Ckll., and *plumbeus*, Roebuck, are synonymous.
- E—*albus*, Fér. Varies from white to cream colour.
- F—*ruber*, Moq.-Tand. All the red and brown forms that I have examined—and I must have seen some hundreds—should, I think, be referred to this variety. The following may, therefore, be looked upon as synonymous.
v. *draparnaudii*, Kal. = *draparnaudii*, Moq., v. *lamarkii* and *johnstonii*, Kal., v. *brunneus*, Roebuck.
- G—*hibernus*, Mab. = *violescens*, Cllge., M.S. Not an uncommon form in this country.
- H—*bicolor*, Moq. This handsome variety has been figured lately by Scharff (35). I have noticed very little variation in the specimens I have examined.
- I—*pallescens*, Moq. Such forms as *brunneopallescens*, *luteopallescens*, and *fuscolutescens* are minor forms of this variety. The latter name has been previously used for a similar variety by Pavia, but Mr. Cockerell informs me that the term was merely descriptive and not intended as a name, hence he re-described

it, but at the best it is only a minor form of *pallescens*, and in classing it as such, I am glad to know that Mr. Cockerell agrees with me.

j—*albolateralis*, Roebuck. This interesting variety has been found to be much commoner than was originally supposed.

k—*bocagei*, Simroth. Mr. Cockerell first drew my attention to this variety. Although the identical form figured by Simroth (41) has not yet been found in this country, forms very closely allied have occurred which, at Mr. Cockerell's suggestion, I have grouped under this variety (10).

VARIATIONS OF THE FOOT-FRIDGE, &c.

The colour of the foot, foot-fringe, and lineoles is subject to great variation. The following table will illustrate some I have met with:—

Colour of Foot-fringe	Colour of Lineoles.	Colour of Body, &c.	Remarks
1. Grey.	Absent.	Pale blackish.	= <i>v. griseomarginatus</i> , D. & M.
2. "	Black.	Black, with slaty-grey sides.	= <i>v. aldrondis</i> , Kal. (= <i>niger</i> , D. & M.) <i>v. griseomarginatus</i> , D. & M., probably identical with this. (T. D. A. C.)*
3. Yellow.	Grey or black.	Typ.	= <i>v. marginellus</i> , Schrank.
4. "	Black.	Black, with slaty-grey sides.	= <i>v. marginatus</i> , Moq. (T. D. A. C.).
5. Brick-red.	Chocolate or brown.	Brick-red.	Probably the salmon-red colored form mentioned by Scharff (35, p. 541) = <i>v. ruber</i> .
6. Orange-red.	Brown.	Brown.	
7. Light-brown.	Black.	Black, with slaty-grey sides.	Near <i>v. cinerescens</i> , Ckll. and <i>v. marginellus</i> , Sch. (T. D. A. C.).
8. Chocolate.	Absent.	Chocolate.	
9. Black.	"	Black, sole also almost black.	Near <i>v. hiemalis</i> , Malb. (T. D. A. C.).
10. White.	Generally absent, grey or yellow when present.	White or cream-coloured.	= <i>v. albus</i> , Fér.
11. Greyish-violet.	Absent.	Violet.	= <i>v. alerina</i> , D. & M.
12. Light-steel-blue.	Deep black, very narrow.	Typ.	
13. " "	Deep black, very narrow.	Black, with slaty-grey sides.	

Where the initials T. D. A. C. occur, the description has been submitted to Mr. Cockerell upon whom I have made the preceding remarks.

Arion lusitanicus, Mabille.= *A. rufus*, Morelet, Descr. d. Moll. Port., 1845.

It may be questioned by some whether this form is distinct enough to rank as a species. As yet, I have only seen very few specimens, but both Simroth (41) and Pollonera (30) recognise its specific rank. Both of these authors have figured it and its various colour variations. Pollonera's figures represent such forms as I have seen (30, pl. ix., figs. 1—4), a number of Simroth's figures represent young examples.

Arion subfuscus, Drap., 1801.

Bony yellowish or greyish-yellow; mantle generally covered with a reddish-yellow mucous; head and tentacles greyish: sole white, yellowish or grey; foot-fringe white or light-yellow; lineoles grey; rugæ short and flat; sulci blue; slime colourless.

For a long time this species was looked upon in this country as a form of *A. hortensis* or the young of *A. empiricorum*. Cockerell (3) was the first to separate it from these and rightly class it under this species. The *A. flavus* of Müller, is thought by Scharff to have been an immature form of this species. Like *A. empiricorum* this species has the foot-fringe transversely striated, and a dark head and tentacles. The back and mantle are usually so largely covered by a thick orange-red mucous, that the actual colour is at first doubtful. This mucous secreted by the mucous glands of the integument and mantle, must not be confounded with the slime, which is colourless.

ANATOMY.—The lower vestibule is proportionately much larger than that of *A. empiricorum*, the upper one being absent. The retractor muscle has its attachment to the oviduct, far removed from the vestibule. The oviduct and prostate are comparatively short. The vas deferens is long and tapering. Generally the receptacular duct exhibits a slight dilatation previous to entering the lower vestibule, differing in this point from the two preceding species. The form of the reproductive organs in any but adult specimens, is very difficult to diagnose. The absence of an upper vestibule and the] form of the oviduct, are perhaps the two most characteristic features. Mr. E. W. Swanton recently sent me some *Arions* from Southampton, which I thought resembled *A. cottianus*, Poll.; dissection, however, did not support such a view. Simroth, who has seen a dissection, writes me, saying, "I think it is a very developed *A. subfuscus*, richly folded in the distal copulatory portion of the oviduct." There were three specimens all alike and quite unlike anything I have seen before in this species.

REPRODUCTION.—The eggs which are deposited from June to October average from 20 to 30 in number. They are transparent

and of an ovoid form, varying greatly in size. The largest I have seen were $3\frac{1}{2} \times 2\frac{1}{2}$ mm.; Scharff gives their size as $3 \times 2\frac{1}{2}$ mm., and of some deposited in captivity $2\frac{1}{2} \times 2$ mm.

VARIATION.—The three principal varieties of this slug are a red, a grey, and a yellow form.

A—Var. nov. *lateritius*. Whole of body a deep brick-red, *not due to the mucous*; handless; foot-fringe light-grey; lineoles light-brown or chocolate.

This is not unlike in colour the *A. rufus* Cont. Auctt., viz., a pure brick-red. The colour rapidly fades in alcohol. I am indebted to Mr. A. W. Borthwick for examples of this variety, obtained at Mount Melville, N.B., where he informs me it is fairly common. Being a distinct and well-marked variety, I am grouping the minor red forms under this name. Some little time ago I sent Mr. Cockerell descriptions of a number of the more important variations that had come under my notice. For the ordinary red form I proposed the name *rufescens*, but Mr. Cockerell points out a fact I had overlooked, viz., that Locard named a variety *rufescens*, but did not, he thinks, describe it. He also mentions another form, viz., v. *vormanni*, Locns., which is a deep orange-red, varying, however, to yellow. The *rufo-fuscus*, Drap., is another minor red form.

B—Var. nov. *griseus*. Grey, with light sides, handless. The var. *krynickii*, Kal., is a form of this variety. Mr. Cockerell sends me the following description:—"Described as a species—is yellowish-grey above, whitish below, with the banding becoming obsolete." Locard has named a var. *cinereus*, but I think the same has not been described, in which case it would also fall under this variety, and v. *cinereo-fuscus*, Drap.

C—Var. *succineus*, Bouill. = v. *flavescens*, Clge. MS. This is figured by Scharff (35, pl. lvi., fig. 18).

D—Var. *aurantiacus*. Probably very closely allied to the preceding variety.

Arion intermedius, Normand., 1852.

Limax intermedius, Norm., Descr. six Limaces nouv. 1852.

Arion flavus, Moq.-Tand., Moll. terr. et fluv. de France. 1855.

„ *hortensis*, Jeffreys, Brit. Conch. 1862.

Geomalacus intermedius, Mabille, Rev. Zool., p. 57. 1867.

„ *bourguignati*, Mabille, Rev. Zool., p. 58. 1867.

„ *hiemalis*, Drouet, Moll. Côte-d'Or., p. 27. 1867.

„ ——— Baudon, Limac. du Dépt. de l'Oise, pl. ii, fig. 2-4, 1871.

„ *mabilli*, Baudon, Limac. du Dépt. de l'Oise, p. ii, pl. i, fig. 8-12, 1871.

Arion mabilianus, Baudon, Trois. catal. Moll. Oise, p. 8, 1884. (Not *A. mabilianus*, Bgt., 1866).

„ *flavus*, Clessin, Dent. Excurs. p. 116, f. 55, 1884.

„ *minimus*, Simroth, Zeit. f. wiss. Zool., p. 2891, 1885.

Body white, light-yellow or grey; head and tentacles dark grey; lateral bands faint or absent, diffuse on mantle; rugæ have minute conical spikes; foot, white, appears yellow, due to slime.

This, the smallest of our *Arions*, was first identified as a British slug by Dr. Scharff (34) in 1890. Like *A. empiricorum* it assumes the peculiar arched position when at rest. Although priority rests with Normand, as far as the actual name is concerned, Simroth (39) was the first to re-establish its claim to rank as a species, on anatomical grounds, in 1885.*

Mabille (23), Drouet (15), and Baudon (2), have all classed this species as a *Geomalacus*, chiefly from the fact that the calcareous granules are sometimes found congregated together, and thus forming an irregular shell.

The rugæ are very peculiar in this slug, the apex of each forms a minute knob-like projection or spike. In most of the specimens I have examined, the lateral bands have been absent; they are never very prominent however, and always diffuse.

ANATOMY.—The vestibule is large. Like *A. subfuscus*, it has the oviduct and prostate short. The free portion of the oviduct is short and shows no bend, as in some species. There is but little difference in the upper and lower portions of the vas deferens. The receptaculum seminis is generally of an oval form, being of greater width than length.

REPRODUCTION.—I have not been fortunate enough to breed this form as yet, but my friend Dr. Scharff (35, p. 550), who has been more successful, describes the eggs, &c., as follows:—"The clusters of eggs which I observed very frequently in August and September never exceeded twenty. The eggs are remarkably large for the size of the slug, being 2 mm. long by 1½ mm. broad. The young ones of 8 mm. in length, which I bred in captivity, were of a light-grey, owing to the intestine being visible through the semi-transparent walls of the body. The head was of a delicate grey, and no bands were visible on the body or mantle. Still younger ones, of 3 mm. long, were of a very light red, with violet tentacles, and had emerged from the egg three weeks after their deposition."

* It is very questionable whether descriptions of new species omitting an account of the anatomy can be termed adequate, and malacologists are rightly inclining to confine themselves to descriptions, or descriptions of shells apart from the animal.

VARIATION.—Mr. W. A. Gain very kindly sent me the following descriptions. None of the variations seem to be important enough to name (excepting, perhaps, No. 1), and are probably due in a large measure to the slime and food.

Form 1 (var. nov. *plumbeus*, Clge.). Body very dark grey; mantle and tail only slightly tinged with orange; sole very slightly coloured, pale cream with darker central portion. Habitat, Newark. Dr. Scharff records this variety from Lough Caragh, in Kerry, and from Connemara, West Ireland.

Form 2. Body pale grey, almost white, faintly tinged with yellow; mantle pale yellow lines, extremely faint; sole as type.

Form 3. A green form from Ossington. Were young specimens which lost this peculiar green tinge as they grew older.

Form 4. Very pale yellow, almost white, colour nearly uniform, excepting mucous gland and the sole, which are rather deeper in colour. No lines on the sides or around the mantle.

Arion hortensis, Fér., 1819.

Body dark grey, light brown or blue; lateral bands generally much darker than the ground colour, continued to front of mantle; head and tentacles dark greyish-blue; sole red or yellowish, sometimes white; foot-fringe variable; rugæ oblong, closely set, coarse. Slight indications of a keel in young specimens. Shell calcareous granules cemented together in a somewhat oval mass.

This is, perhaps, the most perplexing of any of our British *Arions*, assuming almost every colour variation conceivable. Pollonera has made a number of species out of the various forms.

ANATOMY.—Both upper and lower vestibules are present, the latter being the larger. The oviduct is long, and larger in the lower portion. The large retractor muscle supplies both receptaculum seminis and oviduct. There is seldom any marked difference between the upper and lower portion of the vas deferens. Scharff gives a very typical drawing of the reproductive organs of this species (pl. lvii, fig. 34). A figure of Pollonera's (30 pl. ix., fig. 22) is, I fancy, a variation.

REPRODUCTION.—The eggs are deposited from June to October, and are generally in clusters varying from 30 to 40. They are perfectly round and have a diameter of 2 mm.

VARIATION.—Numerous species and varieties have been made from immature examples of this species. *A. hortensis* differs very markedly when young from the adult form, so much so that great care should be exercised before assigning to this or that species.

A careful examination should be made of the living animal, and also of the anatomy. The following synopsis will illustrate the more important anatomical differences:—

	<i>A. hortensis.</i>	<i>A. bourguignati.</i>
Vestibule	Two.	One.
Oviduct	Long.	Short.
Vas deferens	Short.	Long.
Sperm-duct (= Patron.) ...	Swollen.	Not swollen.
Receptaculum seminis ...	Globular.	Long and pointed.

A—*cæruleus*, Cllg. (11). Probably a distinct species.

B—*rufescens*, Moq. A well marked form with prominent lateral bands, which are usually black.

C—*niger*, Moq. The var. *limbata*, Moq. (animal black or blackish, foot-fringe orange or pale yellow) is probably a form of *niger*. There are numerous intermediate forms, showing the gradual loss of the bands.

D—*griseus*, Moq. This form can always be distinguished from any of those classed under E, by the absence of lateral bands or lines.

E—*fasciatus*, Moq. It is difficult to separate this variety from v. *leucophæa*, Moq., and v. *pyrenaica*, Moq.

F—*subfusca*, C Pfr. The var. *fallax*, Ckll., is probably a minor form of this variety.

The var. *albipes*, Ckll., is, I think, only an immature example of the type. The lateral bands and lines vary greatly in this species.

[To be continued.]

CURRENT LITERATURE.

REVIEW.

Marine Shells of South Africa, by G. B. Sowerby, F.L.S., F.Z.S., London: Sowerby. (Pp. 89, pl. i-v.)

"The purpose of the present work," says the author, "is to give in a small compass a list, as complete as possible, of all the known Marine Shells of South Africa, with references to figures in well-known works, descriptions of new species, and figures not only of these, but some that have been described from time to time by other authors without figures." How far Mr. Sowerby has succeeded in his purpose is at once evident, no less than 740 species being enumerated, of which 323 are said to be confined to South Africa.

The work forms a valuable addition to Krauss' well-known catalogue, and will, we feel sure, be welcomed by all interested in the Mollusca as a useful piece of work well done. It is well printed, nicely got up, and carefully illustrated by five plates.—H.

ANATOMY.

On the Innervation of the Cerata of some Nudibranchiata. (Quart. Jour. Micros. Sci., xxxiii. pp. 541-558, pl. 32-34, 1892.)

There has been considerable controversy of late in regard to the nature of the so-called epipodial processes of the Rhipidoglossa. Lacaze-Duthiers and others of his school have denied their right to be regarded as pedal structures, and have regarded them as pallial outgrowths, innervated from the pleural ganglia. Pelseuer has disproved this statement, however, and has shown conclusively that the processes in question are supplied by epipodial nerves, which arise from the pedal ganglia.

It is still a moot point whether the dorso-lateral ridges and processes of Opisthobranchiate Mollusca are homologous with the epipodia of the Rhipidoglossa, or whether they are not rather to be regarded as structures *sui generis* (the "pleuropodia" of Garstang). In the present paper, Prof. Herdman and Mr. J. A. Clubb have endeavoured to solve this problem by investigating the nerve-supply to the processes (cerata) in several different types of Nudibranchiata. They arrive at negative results upon the main point, owing to the remarkably different modes in which the innervation is effected in different sections of the group; and they conclude that the nerve-supply cannot be taken in this case as a sure indication of homology. The following are the modes of innervation established.

In *Polycera* and *Ancula* (Holohepatica) the nerve-supply is entirely derived from the pleural ganglia, except that in *Polycera* there is a small accessory nerve on the left side which springs from the pedal ganglion, according to Alder and Hancock. In *Hermua* (Ascoglossa) the innervation is also entirely from the pleural ganglia. In *Dendronotus* (Cladohepatica) the cerata are innervated on each side by two nerves, one of which is entirely pleural in nature, while the other contains a pedal element (cf. the similar pleuro-pedal cervical plexus described by Pelseuer in gymnosomatous Pteropods and *Aplysia*). In *Tergipes* (Cladohepatica) the innervation is entirely from the pedal ganglia; as it is also in *Facelina* (Cladohepatica), except for the existence of a small accessory pleural nerve on the left side, which supplies only the most anterior clump of cerata.

The authors regard the innervation from the pedal ganglia only (*Tergipes*) as the most primitive condition, and suggest that this arrangement has been secondarily supplemented (*Facelina*, *Dendronotus*) or entirely replaced (*Hermua*, *Ancula*, *Polycera*) by innervation from the pleural ganglia.

On the Eyes of the Mollusca. (Arch. de Biologie. T. xii., pp. 57-150, pls. iii-v.)

M. Victor Willems' memoir is most interesting. The terrestrial Pulmonata guide themselves principally by their sensation of touch. The distinct form of objects can only be distinguished at a distance of from 1 to 2 mm., while a confused image is obtained at a distance of a centimetre. All the Pulmonate Gastropods, both those which can and those which cannot see, have dermatopic perceptions. They cannot perceive ultra-violet rays, but all are sensible of different degrees of light, while a rapid change produces a greater sensation of fear in freshwater than in terrestrial forms. *Cyclostoma* sees better than any of the marine Prosobranchiata, and is therefore regarded as being near to the terrestrial Pulmonata.

On the Nervous System of Heteropods. (Comptes Rend., cxiv., p. 775, 1892.)

M. P. Pelseuer gives an account of his studies on the nervous system of a number of Heteropoda. The pleural and cerebral ganglia are fused and the visceral commissure crossed. He is of opinion that generally the nervous system agrees with those streptonatural Gastropods, which are most closely allied to the Heteropoda. The Heteropoda are modified Prosobranchs, the external modifications being largely due to their pelagic life.

On the Reproduction of the Dart. (Jy. Conch., p. 33, 1892.)

Mr. R. Standen during an attempt to breed from a sinistral specimen of *H. aspersa*, has made some interesting notes on the reproduction of the Dart, which fully confirm the observations of Peréz, Collinge, and others, that this organ is re-formed in from five to seven days.

- On the Development of Chiton.** (John Hopkins Univ. Circ., xi., pp. 79-80.)
M. M. Metcalf.
- Morphology of the Prosobranchiata.** (Morph. Jahrb., B. 18, p. 451.)
B. Haller.
- The Genital Organs of Helix.** (Zeit. f. wiss. Zool., B. liv., pp. 386-423.)
H. v. Ihering.
- On the Paired Nephridia of Prosobranchs, &c.** (Q. J. M. S., vol. 33,
pp. 587-623.) R. v. Erlanger.
- Morphology of Lamellibranchiata.** (J. Hopkins' Univ. Circ., xi., p. 80.)
I. H. Kellogg.

EMBRYOLOGY AND DEVELOPMENT.

- On the Viviparous Nature of Balea.** (Jy. Conch., 1892.) Thomas Rogers.

HABITS AND HABITAT.

- Some Observations on a Living Argonaut.** (Arch. Zool. Expér. et Gén.,
v. x., p. 57.)
Prof. H. de Lacaze-Duthiers has recently made some very interesting observations on a living Mediterranean Argonaut, the results of which tend to show that previous accounts were very largely imaginative. When brought to the laboratory the animal dropped its shell, but on both being placed in the aquarium it soon reinstated itself again, and continued to float at the surface until it died.
- The Genus Rissoa.** (Brit. Nat., p. 155, 1892.) B. Tomlin.

CLASSIFICATION AND NOMENCLATURE.

- The Genera Hadra and Camæna.** (Nachr. Deutsch. Malak. Gesell., pp.
69-73, 1892.)
Mr. H. A. Pilsbry acknowledges and replies to Dr. von Möllendorff's criticism (Nachr. (1891), p. 195) on his arrangement of the genera *Hadra* and *Camæna* in the "Manual of Conchology."
- On the Atlanta-like Larval Mollusc.** (Ann. and Mag. N. H., p. 107, 1892.)
Prof. W. C. McIntosh.

NEW GENERA AND SPECIES.

(See also under "Special Fauna," etc.)

- Veronicella virgata.** (Journ. Inst. Jamaica, p. 96, 1892.)
Mr. T. D. A. Cockerell describes this species, which anatomically somewhat resembles *v. floridana*. The species is referred by Dr. Simroth to his group "Acrocaulic." Mr. Cockerell also mentions a species of *Agriolimax*—probably *Agri. levis*—which is of interest, as the genus does not appear to have been hitherto recorded from the West Indies.
- The Shells of the Victoria Nyanza.** (Ann. & Mag. N.H., p. 121, 1892.)
Mr. Edgar A. Smith has an interesting article on the shells of the Victoria Nyanza or Lake Oukôrôwê. The first shells recorded from this lake were five species by Dr. H. Dohrn in 1864 (P.Z.S., 1864), but as there is considerable doubt as to whether these really were from the Lake, Mr. Smith excludes them

until their occurrence is further established. In 1879 Dr. E. von Martens mentions nine species from the S.W. shores. In 1883 M. Bourguignat, unaware of these two preceding papers, recorded ten species as the first recorded from the Lake. In 1885 he described three more, and again in 1887 he described two others, enumerating the thirteen previously known. Mr. Smith now adds the following — *Viviparus victorie*, *V. jucundus*, and *V. repoides* (spec. nov.), *Alutela rufus*, Lam., and *Limosina parasitica* (Parreys), and gives a complete list of all the known shells, viz., twenty eight.

The fauna of this great lake appears to be Nilotic, and does not possess a specialized fauna like the L. Tanganyika. Twelve of the known species have been recorded from the Nile, and of the remaining sixteen species allied forms are known from other lakes and rivers of Central Africa.

Additions to the Marine Mollusca of St. Helena. (Ann. and Mag. N. H., p. 129, 1892.)

This paper includes records of (1) Additional Indigenous species; (2) Species found on a Floating Tangle; and (3) Marine species found inland. In section 1 Mr. Edgar A. Smith describes and figures the following new species — *Jeffreysia atlantica*, *Tellinmya producta*, and *T. similina*. [This latter form is probably only a variety of *T. bidentata*, Montagu. The grounds upon which it rests as a species are certainly insufficient.] The occurrence of *Montacuta ferruginosa* (Montagu) from so southern a locality is of interest. A fact worthy of note is recorded in section 3, viz., that of a large number of small shells at an elevation of 700 ft. Mr. R. B. Newton has suggested that wind was the probable agent in transferring them there, which seems very likely.

Agariste n. gen. (Journ. de Conch., pp. 78-81, 1892.)

The Marquis de Monterosato proposes a new genus (*Agariste*) for the fossil species *Emarginula compressa* of Contraine. The characteristics are: Shell very much compressed, apex capuliform, sculpture and base arched; otherwise as *Emarginula*.

New Indo-China Species. (Journ. de Conch., pp. 82-86, 1892.)

M. L. Morlet describes ten new species of Land and Freshwater Mollusca from Indo-China, viz.: *Stroptaxis dugasti*, *Plectroypis hyperteleia*, *Phania* [??] *dugasti*, *Clausilia massiei*, *Incunopsis dugasti*, *Chlorostrova massiei*, *Paludina biosensis*, *Spiraculum massiei*, *Dreissensia massiei*, *Unio dugasti*. The descriptions are fairly full, but none of the species are figured.

New Species of Unio. (Journ. de Conch., pp. 86-84, 1892.)

M. H. Drouet thinks it worth while to describe (of course without figures) ten new species of *Unionida*, from various localities.

New Species from Bolivia. (Le Nat., p. 178, 1892.)

Mr. C. F. Ancey describes the following species from Bolivia: *Cyane orbignyi*, *Nenia orbignyi* (allied to *N. crossei*), *Odentostomus temoini*.

Notes on the Genus Xerophila. (Boll. Mus. Zool. Torino, No. 128, 1892.)

Signor Carlo Falloner's review of this group of the Mollusca is one of more than usual interest. The genus is divided into five groups, viz. (1) *X. subprofuga* (*X. mentila*, *ivatica*, *trinetma*, and *balteata*, n. sp.); (2) *X. warnieriana* (*X. warnierella* and *clivus* n. sp.); (3) *X. lallentantiana* (*X. parca* n. sp.); (4) *X. neglecta* (*X. stossiciana*, *trinacrina*, *nerusia*, *mendica*, *janalis*, *senensis*, and *pistoriana* n. sp.); the fifth group consists of a number of new species and varieties, but the validity of some of the former is questionable.

New Land Shells from U.S. of Colombia. (Proc. Zool. Soc., p. 296-9, 1892.)

Mr. G. B. Sowerby figures and describes the following species: — *Bulimus guentheri*, *Bulimus kappeli*, *B. da-costa*, *B. glandiniiformis*, *Hyalinia gomezi* (probably belongs to the *Proserpinidae*), *Clausilia magistra* and *Cyclenus filicostatus*.

VARIATION.

Shell-bearing Mollusca of Michigan. (Naut. p. 31-35, 1892.)

Mr. Bryant Walker has an interesting article on the *Linnæids* of Michigan, illustrated with eight figures.

New Varieties of American Mollusca. (Jy. Conch., 1892.) T. D. A. Cockerell.

New Variety of *H. arbustorum*. (Sci. Goss., p. 187, 1892.) R. Wigglesworth.

Notes on Varieties. (Brit. Nat., p. 153, 1892.) W. A. Gain.

SPECIAL FAUNA AND DISTRIBUTION.

Anodonta and *Glabaris*. (Zool. Anz., pp. 474-84, 1891, and pp. 1-5, 1892.)

Dr. von Ihering divides all the large freshwater Lamellibranchs (*Najades*) into two very distinct families, viz., *Unionidae* and *Mutelidae* according to the nature of their larva. The genera such as *Unio*, *Anodonta*, &c., belonging to the first, have a larva called "glochidium" with an equally-valved shell covering the whole animal, while the *Mutelidae* possess a larva of a very different nature, the shell being small and the body of the animal composed of three distinct parts.

The author then draws attention to the very close relation between the South American genus *Glabaris* and the African *Spatha*, and concludes with some remarks on distribution which are of great interest, as they differ very materially from the views of Dr. Wallace, perhaps the greatest living authority on the Geographical Distribution of animals.

Anodons according to Dr. von Ihering occur in the Palearctic, Nearctic, and possibly the Oriental Region, but are absent from the Neotropic and Ethiopian, where *Glabaris* and other *Mutelidae* take their place. The *Unionidae* and *Mutelidae* of North America show a relationship with those of Europe and Asia, but those of South America consist of two separate elements which were produced by a totally different distribution of land and water during the secondary period.

The first, which he calls the Chileno-patagonian element, is related to New Zealand. The other has no connection with North America, but only with Africa, and the author believes that there existed without doubt a land-connection between Africa and South America, and between the Chileno-patagonian continent and New Zealand during the Mesozoic Period. South America, as we find it at present, has originated from a fusion of various continents during tertiary times.

Molluscan Fauna of Porto Rico. (Journ. de Conch., pp. 1-71, 1892.)

II. Crosse has one of his admirable and exhaustive articles on the land and freshwater mollusca of Porto Rico. He enumerates 128 species, 105 being land and 23 freshwater. The former analyse as follows:—*Glandina* 5, *Selenites* 1, *Hyalina* 6, *Helix* 19, *Gaotis* 3, *Clausilia*, *Spiraxis*, *Simpulopsis*, *Lineria* and *Pseudobalca*, 1 each, *Bulimulus* 7, *Macroceramus* 3, *Cylindrella* 3, *Pupa* 2, *Strophia* 2, *Leptinaria* 3, *Stenogyra* 10, *Succinea* 3, *Vaginula* 1, *Attagalomatoma* 3, *Choanopoma* 3, *Cistula* 3, *Chondropoma* 4, *Helicina* 9, *Stastoma* 1, *Melampus* 4, *Pratipes* 1, *Blanneria* 1, *Truncatella* 1. Removing the last four genera, which can hardly be considered to belong to the land fauna proper, we obtain a total of 98 species. The freshwater species are:—*Limnaea* 1, *Planorbis* 10, *Ancylus* 2, *Physa* 1, *Apleta* 1, *Ammicola* 1, *Neritina* 3, *Dreissensia* 1, *Eupera* 2, and *Cyrenella* 1.

The affinities of the island are, in the main, with San Domingo, of which it is, geographically speaking, a fragment. It has also relations, less well marked, with Jamaica and Cuba, and, to a still less extent, with the Lesser Antilles. The presence of a single *Clausilia*, and of the genus *Gaotis* is very remarkable; they occur here alone in the West Indies.

Land Mollusca of Halmahera Isle. (Nachr. Deutsch. Malak. Gesell., pp. 41-50, 1892.)

B. Strubell gives a list of land species recently found at Halmahera Isle (between N. Celebes and Waigiu). They are: *Planorbis* 3, (*halmaherica*, n. sp.), *Georochus* 1 (*chondrodes*, n. sp.), *Phania* 2, *Alborsia* 1 (*pseudocorasia*, n. sp.), *Leptopoma* 2 (*halmahericum*, n. sp.; *crenillabre*, n. sp.). The relations of the island appear to be with Waigiu rather than with Celebes. One specimen of the excessively rare *Phania lampas*, Müll., was procured.

Additions to the Mollusca of Nossi-Bé. (Nachr. Deutsch. Malak. Gesell., pp. 53-58, 1892.)

Dr. Boettger adds to his previous list the following new species: --*Situla brancsiki*, *S. filomarginata*, *Tropidophora freyi*, and *Neritina rhyssulata*.

Mollusca from the Isle of Giura, &c. (Nachr. Deutsch. Malak. Gesell., pp. 59-73, 1892.)

Dr. Boettger gives a short list of species from the Isle of Giura, N. Sporades (*H. gherica*, n. sp.), and from Mt. Parnassus in Phocis.

Land Mollusca of Timorlaut Is. (Nachr. Deutsch. Malak. Gesell., pp. 81-102, 1892.)

Dr. von Möllendorff enumerates 20 species of land molluscs from Timorlaut or Tenimber Isle (between Timor and the Aru Isles). They consist of *Haliotis* 1 (*tenimbericus*, n. sp.), *Euplecta* 1 (*orientalis*, n. sp.), *Kaliella* 1, *Lamprocytis* 1, *Xesta* 1, (*nicholitzii*, n. sp.), *Trochomorpha* 1, *Patula* 1 (*brunnescens*, n. sp.), *Eulota* 3 (*hemisphaerica*, n. sp.; *tenimberica*, n. sp.; *bilaniala*, n. sp.), *Plecticulota* (new subg.) 2 (*geniatoma*, n. sp.; *teitictata*, n. sp.), *Chloritis* 3 (*rhodochila*, n. sp.; *nicholitzii*, n. sp.; *tenimberica*, n. sp.), *Corasia* 1 (*tenimberica*, n. sp.), *Amphitromus* 1 (*columnellaris*, n. sp.), *Opeas* 1, *Succinea* 1 (*decussata*, n. sp.), *Leptopoma* 1. The relations, on the whole, are rather Indo-Malay than Australian, although traces of Australian influence are not altogether wanting.

Mollusca of the Gulf of Siam. (Journ. de Conch., p. 71, 1892.)

MM. Crosse and Fischer add a number of marine species to the known fauna of the Gulf of Siam. There is nothing of special interest.

Geographical Distribution of *Ovula carnea*. (Journ. de Conch., p. 77, 1892.)

M. P. Fischer gives a note on the geographical distribution of *Ovula carnea*, Poir., hitherto known only from the Mediterranean. A single specimen has been dredged off Arcachon. Compare the occurrence of *Conus mediterraneus*, *Cyclonassa neritea*, and *Gastropferon rubrum*, on the same or neighbouring coasts.

Mollusca of E. Spitzbergen. (Zool. Jahrb., pp. 339-76, 1892.)

Dr. Krause's paper deals with a collection of 76 species, seven of which are additions to the known fauna. *Pleuroleura waltteri* is described as a new species. Its nearest allies are from tropical seas; the nearest from the neighbourhood being *Pleurophyllidia louni*.

Land and Freshwater Shells peculiar to the British Isles. (Nature, June 23rd, 1892.) R. F. Scharff.

Catalogue of the Marine Shells of Australia, &c. pt. ii. 1892. John Brazier.

Terrestrial Mollusca of the Islands of the roadstead of Marseilles. (Ass. Franc. pour l'avancement d. Sci., p. 546, 1891.) G. Contagne.

H. rotundata, v. alba at Conisborough. (Journ. Conch., p. 38, 1892.) Lionel E. Adams.

Achatina acicula at Ventimiglia. (Jy. Conch., 1892.) Rev. J. E. Somerville.

Pupa ringens in Guernsey. (Jy. Conch., 1892.) E. D. Marquand.

Amalia gagates at Withersea, Yorks. (Naturalist, p. 253, 1892.) J. D. Butterell.

Testacella scutulum near York. (Nat., p. 253, 1892.) Edward Self.

Irish L. and F. Mollusca. (Irish Nat., p. 87-90, 1892.) R. F. Scharff.

PALÆONTOLOGY.

Pliocene and Quaternary Molluscan Fauna of Cran. (Asso. Franc. pour l'Avance. d. Sci., 20th Sess., p. 383, 1891.) Paul Pallary.

MISCELLANEOUS.

Some Remarks on New Jersey Coast Shells. (Nautilus, p. 25, 1892.) John Ford.

Notes on the North American Species of Succinea. (Naut., p. 29, 1892.) T. D. A. Cockerell.

On the European Species of Pectunculus. (Il Nat. Siciliano, p. 143, 1892.) Marchese di Monterosato.

NOTES.

New Varieties of Californian Slugs. By T. D. A. Cockerell, F.Z.S., F.E.S., Curator of the Museum of the Institute of Jamaica, Kingston.

- (1.) *Frophysaon andersoni*, var. *marmoratum*. Mantle dark; marbled at sides, not banded. Body whitish, darker on back; reticulations marked in grey; back with a pale line.

This form is figured in 3rd Suppl. Terr. Moll. U.S.A., and is known by its dark, marbled mantle. It was found by Dr. Cooper at Haywards, California.

- (2.) *Agriolimax campestris*, var. *zonatipes*. Blackish-brown, except the paler sides below mantle; sole with the central area pale and the lateral ones black or blackish, in striking contrast.

Lake Merced, San Francisco Co., California (Raymond). The names, without descriptions, of both of these have been already published, the first in *Nautilus*, 1891, p. 94, the second in the same journal, 1891, p. 56.

Pleurophyllidia loveni in Britain. By F. G. Greisbach, Berlin.

I have read with interest Prof. McIntosh's note on the occurrence of this rare Mollusc in Britain, and I should be glad to learn if any comparisons have been made of the marine mollusca of Scotland and those of S.W. Norway and Sweden. Scharff, in his recent work on the slugs of Ireland, mentions that the species there are almost identical with those on the continent, both externally and anatomically, but I find no reference to the anatomy by any of the authors cited by Prof. McIntosh. I would point out that an important omission from the above-mentioned note is the record given by Messrs. Leslie and Herdman of an example of *P. loveni* taken off Dunbar, vide their "Fauna of the Firth of Forth," 1881.

EDITOR'S NOTES.

Mr. E. W. Swanton, of Sittingbourne, Dodington, Kent, requests that any conchologists who have not, as yet, communicated with him *re* the Somersetshire Conchological Society, will kindly do so as early as possible.

We invite the assistance of Malacologists in the following departments:—Fossil Mollusca and Cephalopoda.

Owing to the large number of original papers that at present are awaiting publication, we have decided to omit for the present "Societies' Proceedings," and the County Bibliographies.

THE
CONCHOLOGIST

A Quarterly Journal of Malacology.

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LONDON - - - SWAN SONNENSCHN & CO.

BERLIN - - - R. FRIEDLÄNDER & SOHN.

PRICE ONE SHILLING.

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THE CONCHOLOGIST:

A Quarterly Journal of Malacology.

Vol. II.

DECEMBER 24th, 1892.

No. 4.

REVIEW OF THE GENUS PYRULA (LAMARCK), AND DESCRIPTION OF A NEW SPECIES.

By C. B. SOWERBY, F.L.S., F.Z.S.,

London.

Owing to Lamarck's having grouped together as *Pyrula* (Pear Shells) species not only of different genera, but belonging to totally distinct families, it has been regarded as a matter of some uncertainty to which group that title should apply, most modern authors adopting it for a group of *Fuside* (*Hemifusus* and *Melongena*). Lamarck's type of the genus *Pyrula*, however, is the *Bulla ficus* of Linné, so that Woodward* rightly gives *Pyrula ficus* as the type, but wrongly gives *Myristica* (type *melongena*) as a sub-genus of the same. As is clearly shown by Dr. Fischer, the true genus *Pyrula* consists of the very well-defined group of Mollusca that has been variously called *Ficus*, *Ficula*, and *Sycotypus*. Fischer has, however, taken upon himself to amend the spelling of the name, rendering it *Pirula*, which seems to me a very unnecessary alteration.

Family DOLIIDÆ.

Genus PYRULA, Lamarck.

Synonymy.

Ficus, Klein. (non Linn.) Sowerby, Thes. Conch., vol. iv, page 109, plate 423.

Ficula, Swainson.

Sycotypus, H. & A. Adams (non Browne).

SPECIES.

***Pyrula ficus*, Linn.**

Synonymy. *P. lævigata*, Reeve, Conch. Icon., the type of the genus. It is more distinctly pyriform and smoother than any other species, and inhabits various Indian Ocean localities.

*Marnal of Melu-co.

Pyrula reticulata, Lamarck.

Synonymy. *P. ficoides*, Lam., *P. clathrata*, Rousseau, *P. fortior*, Mörch, *P. decussata*, Sowerby, as of Wood (Thes. Conch., vol. iv, pl. 423, figs. 1 and 3, not fig. 2). The more prominent spiral ridges of this species are much closer than in *P. decussata*. It inhabits various parts of the Indian Ocean as far as Japan, and a small prettily-coloured variety is found on the Mauritian Coast.

Pyrula decussata, Wood.

Synonymy. *P. ventricosa*, Sowerby, *P. reticulata*, Sowerby, as of Lamarck (Thes. Conch., vol. iv, pl. 423, figs. 6 and 7). Distinguished from all the other species by its distant spotted spiral ridges. Tryon gives the locality: "Panama to Cape St. Lucas, Lower California."

Pyrula papyracea, Say. Em. (*papyratia*).

Synonymy. *P. gracilis*, Philippi, *P. reticulata*, Sowerby (Genera of Shells). This species has been overlooked by various authors, being probably taken for *P. dussumieri*, which it resembles in form. No mention is made of it in the *Thesaurus Conchyliorum*. It, however, appears to be a good species, inhabiting, according to Tryon, Beaufort, N.C., to West Indies. It is more coarsely sculptured than *P. dussumieri*, and of a narrower form than *P. reticulata*, usually very pale in colour, almost white, but brown within.

Pyrula dussumieri, Valenc.

Thesaurus Conchyliorum, vol. iv, pl. 425, fig. 5. Synonym. *P. elongata*, Gray. A species of very graceful form, narrow, tapering, finely ridged and delicately painted, with light brown undulating streaks. Habitat: China Sea.

Pyrula tessellata, Kobelt.

Kuster (*Ficula*), plate 2, fig. 3. Synonym, *P. reticulata* var. Sowerby, Thes. Conch., vol. iv, pl. 423, fig. 2. A very pretty and easily recognised Australian species. It is smaller than any of the others and nearly white, ornamented with rows of rather distant brown spots. It has been erroneously taken for the *P. gracilis*, Philippi.

Pyrula filosa, Sowerby, nov. sp.

Testa pyriformis, solidiuscula, dilute fulvoescens, transversim fusco lineata; supra breviter conica, apice obtusiuscula; anfractus 5, convexi, spiraliter lirati, longitudinaliter filo-striati; anfractus ultimus ventricosus, liris angustis numerosis parum elevatis, alternatim fuscis, striis filiformibus cancellatis sculptus; apertura lata, fauce fusco tineta; columella sinuosa; peristoma simplex.

Long. 80, maj. diam. 48 millim.

Habitat: Hong Kong, China.

This species may readily be recognised by its numerous and regular transverse brown lines. Compared with *P. reticulata* it is more ventricose, has a more elevated spire, and its cancellating ridges are more prominent, regular, and distant. In form it more nearly approaches *P. ficus*, but in point of sculpture admits of no comparison. True specimens of this interesting species were brought by Dr. Hungerford from Hong Kong, and as far as I know these are all that have as yet been found.

NOTICE OF AN IMPERFORATE SPECIMEN OF HALIOTIS.

BY EDGAR A. SMITH, F.Z.S.,

Zoological Department, British Museum, London.

IN the "*Annals and Magazine of Natural History*" for 1888, vol. i, pp. 419-421, I gave an account of a very remarkable specimen of *Haliotis*, possessing two rows of perforations instead of the normal single series. I now beg to call attention to a specimen which, on the contrary, has not even the one series which is so conspicuous a feature in this genus. This peculiarity appears to be of the greatest rarity, for I only find that one notice of its occurrence has ever been published, nor has it been observed by any of the conchologists and others whom I have consulted.

Jeffreys* in his account of *H. tuberculata*, mentions that "Very young shells are imperforate," and that "one in Mrs. Collings' collection has no orifice, although it is an inch and a quarter in length."

The present specimen, presented to the British Museum by Dr. C. C. Claremont, is two and a quarter inches long, and evidently is also an example of the well-known species of the Channel Islands.

The "very young shells" referred to by Jeffreys as being imperforate are the mere fry, not more than two to three millimeters in length. A specimen without orifices exceeding this length must be most exceptional, for, of the thousand specimens of *Haliotis* in the Museum, not one exhibits this peculiarity, nor has it ever been observed by Mr. G. B. Sowerby and others who have had an opportunity of examining large series of this genus.

* *British Conchology*, vol. iii, p. 281.

The cause of this abnormality is a matter of mere speculation. That the animal exhibited some unusual feature is fairly certain, and it seems to me probable that the slit in the mantle, which falls in a line with the perforations, was entirely absent, or, at all events, united at the end near the outer margin of the shell. In this case, as there would be no interruption in the margin of the mantle, a slit or notch (afterwards to be perfected into a complete opening) would not be formed in the shell.

Jeffreys states that "the number of open orifices in the shell corresponds with that of the tubular folds of the mantle." In the first place, the so-called "tubular folds" are not folds, but merely tentacular filaments, and, in the paper already referred to, I have shown that in reality there are only three of these filaments or tentacles, and that they are always located in the same relative positions upon the edges of the mantle-slit. It was also pointed out that the number of open perforations indicated the length of the mantle-slit, but *not* the number of the filaments.

In addition to this interesting specimen, Dr. Claremont has also presented to the Museum three other very remarkable abnormal examples of the same species. In one there is an enormous development of the columellar surface, giving that part of the shell a solid, heavy appearance. The two other specimens are remarkable for their abnormality of form. This appears to have arisen through injuries received at an early stage of growth, the result being that they became contracted, much raised and arched over the back, with the perforation nearer the margin than usual.

A REVIEW OF THE ARIONIDÆ OF THE BRITISH ISLES.

BY WALTER E. COLLINGE,

Demonstrator of Biology, Mason College, Birmingham.

(Continued from p. 66.)

Arion celticus, Pollonera, 1887.

"*A. hortensis* affinis: dorsum mediocriter rugosum; clypeus minute granulatus: olivaceo-nigricans, utrinque nigro-zonatum, minutissime aureo-punctatum, lateribus pallide-griseis nigro-variegatis; solea pallide-flava; pedis margo pallide flavus imperfecte griseo-lineolatus; caput et tentacula nigricantia. Mucus soleae et pedis aurantiacus. Long. max. 30 mill."

It is very questionable whether this form exhibits sufficient anatomical differences to justify its being separated from *A. hortensis*. It was figured and described by Pollonera in 1887 (29), but Simroth (41), who has also examined specimens, thinks there is no difference between it and *A. hortensis*. His figure of the reproductive organs differs entirely from that given by Pollonera.

Mr. Cockerell (8) pointed out some little time ago that *A. celticus* might be expected to occur in the south-west of England or the south of Ireland. Since then I have dissected a number of forms very closely resembling Pollonera's figures and description. In April last Dr. Scharff very kindly sent me examples of Irish *Arionida*, one example of which he thought might be *A. celticus*; externally it was very like Pollonera's figure, but the general anatomy agreed with *A. hortensis*. Specimens received from the south of Oxford and from Middlesex were compared with the original figures, but anatomically they were not constant enough to warrant me in saying they were *A. celticus*, although very closely allied. I have, however, received from Mr. E. W. Swanton examples from Doddington, Kent, and from Southampton, agreeing in all particulars with the original figures and description. Specimens received from Signor Pollonera from Brest, France, agree with those from Southampton in almost every detail.

Arion cottianus, Pollonera, 1889.

"*A. hortensi proximus, a quo differt statura parvulum minore, dorso minus rugoso, solea subtiliore.*"

"*A. leviter rugosus, sordide griseus, medio fuscatus, lateraliter atrorubescens zonatus et reticulatus. Solea subtilissima, pallida; margine externo angusto (flavo?), postice nigro-punctulata, et sublineolata, ad glandulum caudalem nigrescente. Limacella nulla. Long. (in alcohol) 15 mill.*"

This interesting species was figured and described by Pollonera (30) in 1889. Mr. E. W. Swanton sent me three examples of this slug in June last from Southampton. A dissection of one made by myself agreed with Pollonera's figure and description, and Dr. Scharff very kindly made a dissection of a second specimen and agrees with my determination. The above three specimens measured respectively 35, 36, and 37 millm. when alive, and about 25 millm. in alcohol.

Arion fasciatus, Nilsson, 1822.

Limax fasciatus, Nilsson, Hist. Moll. Sueciæ, p. 3, 1822.

Arion hortensis, var. *alpicola* (partim), Férussac, Hist. Moll., pl. viiiA, fig. 4, 1823.

„ *circumscriptus*, Johnston, Edinburgh New Philosoph. Journ., p. 74, 1828.

- Arion marginatus*, Kickx, Bull. Acad. Roy. Sci. d. Bruxelles, T. iv,
p. 139, 1837.
- „ *leucophæus*, Normand, Descr. six limaces nouv., p. 6, 1852
(description insufficient).
- „ *hortensis*, var. *grisea*, Bourg., Malac. Gr. de Chartr., pl. i,
fig. 10, 1864.
- „ *dupuyanus*, Bourg., Malac. Gr. de Chartr., p. 30, pl. i,
figs. 1-4 (young examples).
- „ *bourguignati*, Mabille, Rev. et Mag. Zool., p. 138, 1868.
- „ *neustriacus*, Mabille, Rev. et Mag. Zool., p. 138, 1868.
- „ *ambiguus*, Pollonera, Contrib. a Studio delgi *Arion europei*,
p. 13, pl. ix, figs. 16-21, 1889.

BODY light grey, yellow or brown; lateral bands darker than ground colour, continued to front of mantle; head and tentacles dark or greyish blue; sole white or light yellow; foot fringe greyish-white or yellow; rugæ narrow; keel variable, distinct in young specimens.

In introducing Nilsson's *A. fasciatus* as the type of a slug found in this country, it will be necessary to enter in some detail into the history of the same, and my reasons for classing as synonyms *A. circumscriptus*, *bourguignati*, and *ambiguus*. In 1822 Nilsson described an *Arion* (*Limax*) *fasciatus*, and still later used the same name for very different species than his type, but this does not in any way invalidate his original description. In 1828 Johnston (22) described an *Arion circumscriptus*, which seems to have been overlooked by most authors until brought to light again by Pollonera. In 1868, Mabille (24) described an *Arion bourguignati* which Mr. Cockerell (7) pointed out was the *A. circumscriptus* of Johnston, and in 1889 Pollonera described an *Arion ambiguus* which I am now referring to *A. fasciatus*.

After a careful study of an exceedingly large number of specimens of all ages, I am of opinion that all the above forms are synonymous with Nilsson's type. The *A. circumscriptus* and *A. ambiguus* are not keeled, whereas the *A. bourguignati* is. In the young stages *A. circumscriptus* exhibits slight traces of a posterior keel, but the presence or absence of a keel is quite an unimportant matter, as such slight external modifications—which differ greatly according to age and environment—are insufficient for specific distinction.

Signor Carlo Pollonera has very kindly written me at some length respecting these forms, and he is of opinion that for the keeled form the name *A. bourguignati*, Mabille, must be retained, and if *A. circumscriptus*, Johnst. is not keeled, he thinks we had

better accept it for what he has described as *A. ambiguus*, which he states is an *Arion bourguignati* not keeled. Mr. Cockerell has also suggested "that it is perhaps not unlikely that *A. circumscriptus* was founded on *A. ambiguus*, rather than *A. bourguignati* proper," but he thinks that both the British and Continental forms are specifically identical. Reference to the anatomy will alone solve the problem whether these three slugs are each distinct species or forms of one species. I have not the slightest hesitation in saying that the internal anatomy of the three is identical. Forms of *A. bourguignati* received from Pollonera have been compared with the *A. circumscriptus* and *A. ambiguus* found in this country, and I fail to see any distinctions worthy of note that would specifically separate them, therefore, we have no alternative but to accept these three names as synonyms of *A. fasciatus*, Nilsson, for the type of this author was certainly an *Arion bourguignati*.

Like *A. empiricorum*, etc., it assumes, when tapped upon the head or an attempt is made to lift it, the peculiar arched form.

ANATOMY.—Whilst showing affinities with *A. hortensis*, there are certain well marked and permanent characteristics. The single vestibule is large and well developed. The free oviduct is short and seldom exhibits a broad and narrow portion. The vas deferens is considerably longer than in *A. hortensis*, slender in the upper portion, dilating a little in the lower end, but very rarely, if ever, exhibits swollen portions at its juncture with the vestibule. The receptaculum seminis is elongated, terminating in an attenuated apex, quite distinct from any other British *Arion*.

REPRODUCTION.—The eggs are deposited from April to July. The young forms are often of a light-yellow or straw colour, as described by Johnston (22).

VARIATION.—There are three well marked varieties in Britain, viz., a brown, a yellow, and a silver-grey form.

A—*neustriacus*, Mabile. This and the variety c seem to be the two forms generally met with in the British Isles. The var. *subfuscus*, Roebuck, is synonymous with this.

B—*flavescens*, Cligc. (11). A not uncommon form.

C—var. nov. *griseus*. Animal a light silver-grey with darker grey lateral bands. Bourguignat named a figure of Ferrussac's *A. hortensis*, as var. *grisea*, which is probably a form of *A. fasciatus* and not *hortensis*. Descriptions of figures, in my opinion, are not admissible in any rational system of nomenclature, and as the *grisea* of Bourguignat does not seem to have been since recorded, I am describing the above, which, as far as I can learn, is not found on the Continent.

D—*armoricana*, Pollonera. Recorded by Mr. Cockerell (6) from Sturminster Marshall, Dorset.

The known varieties may be classed as follows:—

Arion fasciatus, Nils.

No keel in adult.	Keel present in adult.
<i>v. neustriacus</i> , Mab. (brown).	<i>v. neustriacus</i> , Mab. (Continental form).
<i>v. flavescens</i> , Cllege. (yellow).	
<i>v. griseus</i> , Cllege. (silver grey).	{ <i>v. niser</i> , Poll. Not found in the British Isles.
<i>v. armoricana</i> , Poll.	

Geomalacus, Allman.

Bony sub-cylindrical; mantle and upper portion of the body black or very dark grey, spotted with yellow, these markings forming more or less interrupted stripes; head and tentacles dark grey; sole light yellow; foot-fringe brown with transverse lineoles; rugæ long and closely set; respiratory orifice at the front of the middle of the mantle; genital orifice at the base of the right lower tentacle; mucous gland at the posterior extremity of the body, opening by a transverse slit; shell solid.

This genus was established by Allman (1) in 1846. It resembles the genus *Arion* in having a caudal gland, which, however, opens transversely and not longitudinally as in the former genus. The genital orifice lies behind the base of the right lower tentacle, thus resembling the *Limacidae*. There is a solid internal shell, not unlike that found in *Limax*.

There is but one species found in the British Isles, and that occurs in Ireland only. It also occurs in the north-west of Spain and in the north of Portugal. Much rubbish has been written about the genus by French malacologists, which many years ago induced Dr. D. F. Heynemann to reply to the various observations in a masterly paper (20-21a).

Geomalacus maculosus, Allman, 1846.

Bony a glossy brown or deep grey, the mantle and back being spotted with a series of yellow or yellowish-white markings which are often close and regular enough to give it the appearance of longitudinal bands; head and tentacles dark grey; sole yellowish-white.

This interesting slug was discovered by Mr. William Andrews in the autumn of 1842, "on rocks around Lough Carrough, to the south of Castlemain Bay, Co. Kerry, in the west of Ireland." It was described by Allman in 1846.

ANATOMY.—The digestive system resembles that of *Arion*. The reproductive organs are very characteristic. There is a well developed retractor muscle which has its attachment just where the vas deferens opens into it. The vas deferens is much larger than in *Arion*, and the oviduct shorter. The penis is very long and consists of the largely-developed duct of the receptaculum seminis.

REPRODUCTION.—From the observations of Signor de Silva e Castro the eggs are transparent and exceedingly large, measuring from 5 to 7 mm. long and 3 mm. broad (41).

HABITAT.—Dr. Scharff, who has collected this slug in its natural habitat, says he found them among lichens, "The dark grey lichens, with the white or yellowish fructification, conceal the slug perfectly, and there is no doubt that we have here a most striking instance of protective colouring."

The species has been figured by Allman, Heynemann, Scharff, Forbes and Hanley, Jeffreys and Rimmer, the last three being I presume, copies of Allman's figure. The best illustrations are those of Scharff and Heynemann. There are also figures of the anatomy, Dr. Scharff informs me, in *Ann. and Mag. New York Lyceum of N.H.*, vol. xi, 1874, in a paper by Binney (the figure is completely wrong, I am informed), and also in Godwin-Austen's "*Land and Freshwater Mollusca of India*," pl. xii.

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ON THE AFFINITIES OF THE GENERA LIMAX, ARION, AND HELIX.

BY R. F. SCHARFF, PH.D., B.Sc., M.R.I.A.,
Natural History Museum, Dublin.

IN reply to my note on the affinities of the genera *Limax*, *Arion*, and *Helix*, Mr. Cockerell states that he does not think any systematic conchologist would be found to unite *Limax* and its allies with *Helix* in one family. This remark shows that Mr. Cockerell is not acquainted with the current literature on the subject, for this is the very arrangement which has been adopted in the most important work ever published on slugs, viz., that of Simroth. According to Mr. Cockerell, however, the true result of the researches of Simroth and others is that the *Arionida* are more

related to the *Helicidæ* than to the *Limacidæ*. Dr. Simroth must feel rather surprised to learn that, although he endeavoured to show in his work the close anatomical relationship of *Helix* and *Limax*, nevertheless the *true result* is that they are not related at all.

With regard to the exotic forms, it is too premature to speak of their relation to European genera before anything of their anatomy is known. The arrangement based entirely on the characters of the jaw and lingual ribbon will probably be found to be altogether at fault when the rest of the anatomy is taken into consideration.

THE BRITISH ARIONIDÆ.

BY T. D. A. COCKERELL, F.Z.S., F.E.S.,

Curator of the Museum of the Institute of Jamaica, Kingston.

NATURALLY, I have been much interested in reading the first part of Mr. Collinge's Review of the British Arionidæ. There has been a great deal of difference of opinion about the species and varieties in this group, so that anything that may be written on them is liable to provoke discussion; but the purpose of the present note is merely to refer to a few statements which seem to be in need of correction. If I am mistaken about any of them, I shall be glad to be put right.

Page 58. *Aspidoporus* should not, I think, be included in any list of slugs (vide P.Z.S., 1891, p. 221). According to *very strict priority*, it seems that *Aspidoporus*, Fitz., 1833, should replace *Amalia*; and *Clytropolita*, Heyn., the section *Pirainea*, but in both these cases the older name was not accompanied by a proper definition. I never regarded *Aspidoporus* as a genus of *Arionidæ*, doubtful or otherwise.

Phenacarion, Ckll., is a genus or subgenus of *Arioninæ*, not given in the list. It seems to me to be at best a subgenus of *Prophysaon*, but Mr. W. G. Binney, in his latest work (4th *Suppl. Terr. Moll. U.S.*), treats it as a valid genus.

Page 60. I cannot agree as to *A. empiricorum* var. *ruber*. The var. *ruber* Moq. (the prior name for which is *lamarckii*, Kal., 1851) is the bright brick-red form so common in various parts of the continent, but not found, so far as I am aware, in the British Island. Dr. Scharff refers to this form in "*Slugs of Ireland*," p. 538 and p. 555, remarking on its absence in Ireland; I gave some notes on the same variety in *Ann. Mag. N.H.*, 1887, p. 174. It occurs at least as far south as Pau, in the Basses Pyrenees, where it was found by the Rev. J. W. Horsley (in

1890), from whom I received a living specimen. In the same year Mr. F. G. Fenn brought me one alive from Echternach, Luxembourg. The ordinary red-brown form in Britain is Moquin-Tandon's var. *vulgaris*, which is generally considered to be the Linnean *rufus*. This is also no doubt Kaleniczenko's v. *joustonii* [*sic*], although the figure in Férussac quoted in connection with it represents *lamarckii*—at least in the copy at the British Museum. It is to be noted that Linné (*Syst. Nat.*, Ed. xii.) quotes a Listerian figure as representing his *rufus*, although there is also a reference to the *Fin. Succ.* It is the same in the 10th Ed., where Lister is also quoted under *Limax ater*. However, if the Scandinavian slug is really distinct from ours, the Linnean names must belong to it by preference. *L. albus*, Linn., does not appear until the 12th ed., and is based on a description by Müller. Férussac considered his *A. albus* to be Müller's species; and Moquin-Tandon's four varieties of it are evidently based on Müller's descriptions.

On page 61 there is a reference to the var. *marginellus*, Schrenk. This is, I believe, the same as v. *marginatus* and v. *swammerdamii*, and has long priority.

Page 61. I certainly did not say that var. No. 9 was near v. *hibernus*. Evidently the identifications of v. *hibernus* and v. *aterrima* have got transposed.

Page 62. I believe that Heynemann was the first to record *Arion subfuscus* as a British species, in "*Die nackten Landpulmonaten des Erdbodens*" (1885), p. 14. When it was first recognised in Britain, I wrote to Dr. Heynemann about it, and he informed me that for some time he had been aware that it existed with us.

Page 63. Why is *Arion hortensis* of Jeffreys put down as a synonym of *A. intermedius*? It is Jeffreys' *A. flavus* (*Brit. Conch.*, vol. v, p. 153) that is identical with *intermedius*.

Page 66. *Arion hortensis* var. *leucophaea* is almost certainly identical with *Arion circumscriptus*. The name has priority over *bourguignati* and *dupuyanus*.

THE BRITISH ARIONIDÆ: A REPLY.

BY WALTER E. COLLINGE,

Mason College, Birmingham.

I HAVE to thank Mr. Cockerell for his kindly expressed criticism—for his paper is hardly a series of corrections, as I will endeavour to show, and to substantiate what I have written.

Page 58.—In Mr. Cockerell's paper (P.Z.S., p. 221, 1891) he mentions *Aspidoporus*, Fitz., as a "supposed genus, and founded really on a species of *Amalia*," under the *Arioninae*. I never for a moment regarded either *Tetraspis*, Hagenm., or *Aspidoporus* as belonging to the *Arionidae*, but in reproducing Mr. Cockerell's classification, I was obliged to include them. No mention is made of the latter genus under *Amaliae* (*loc. cit.* p. 223).

Respecting the genus *Phenacarion*, Ckll., I have not, as yet, been able to satisfy myself that there are sufficient anatomical differences to constitute generic distinction.

Page 60.—Mr. Cockerell thinks the *A. empiricorum* v. *ruber*, Moq., is distinct from the red variety which occurs in this country, whereas I think the two may conveniently be referred to one variety.

Page 61.—Evidently the identification of v. *hibernus* and v. *aterrima* is incorrect, but this is Mr. Cockerell's error and not mine. It was copied direct from his MS., and unfortunately has escaped my notice or I should have made some note or correction.

Page 62.—I am wrong in speaking of Mr. Cockerell as the first to separate *A. subfuscus* from other *Arions*. Dr. Heynemann's record was unintentionally overlooked.

Page 63.—The synonym *A. hortensis*, Jeff., is, I think, correct; Jeffreys undoubtedly included *A. intermedius*, Normand, amongst his light-coloured and young *A. hortensis*.

Page 66.—Probably *A. hortensis* v. *leucophæa* is only a synonym of *A. fasciatus*—and as such I use it—but it has been regarded by many writers as a var. of *A. hortensis*, and in using the word I wished to show that if a form of *hortensis*, it was only a minor of v. *fasciatus*, Moq.

CURRENT LITERATURE.

REVIEWS.

Fauna fossile terziaria di Markusevec in Croazia. Con un elenco delle Dreissensidæ della Dalmazia, Croazia e Slavonia. Descritta da S. Brusina. (Reprinted from the Proc. of the Croatian Nat. Hist. Soc., vol. vii, 1892, pp. 113-210.)

This paper consists of four sections, viz.: Preface; I. Mollusca of the Congeria Beds; II. Mollusca of the Sarmatian Beds; III. Appendix: List of the Dreissensidæ of Dalmatia, Croatia and Slavonia. To these are added a short Postscript and an Index to the species in pts. i. and iii.

Markusevec is situated about seven and a half kilometers N.N.W. of Agram, and the Congerian and Sarmatian Beds are usually referred to the Pliocene and Miocene respectively; but in his postscript the author states that there is some doubt as to the actual geological horizon of the beds here in question.

The mollusca detailed in pt. i. from the former deposits, are freshwater, with four terrestrial examples—undetermined species of *Limax*, *Helix*, and *Succinea*, and *Cyclostoma jagia*. Altogether the list shows 110 species, of which a very large number are described as new.

The occurrence amongst them of the genus *Caspia*, established by Dybowski for species now living in the Caspian Sea, and of forms (*Baglivia* n.g.) closely approaching the *Liobaikalia* of Lake Baikal, is perhaps the most interesting fact, since it points to the probability of the Markusevec deposits having been formed under conditions similar to those now obtaining in the two inland salt-waters named.

Dr. Brusina is, however, in error when he gives 1891 as the date of foundation *Caspia*, since the first part of volume x. of the "Malakozologische Blätter" was issued in 1887, and the genus is duly noted in the "Zoological Record" for that year.

Incidentally it is pointed out under *Cyclostoma* that if Hanley's statement be correct, the recent *C. elegans*, Müll., is identical with *Tuabo reflexus*, L. So that the strict prioritarian will, we suppose, be hastening to conceal this well-known species under the designation of *Pomatias reflexus*!

Out of the twenty-two marine forms cited in the second list, only three have at present been determined, so that much cannot now be said concerning them.

The third list, or Appendix, enumerates twenty species of *Congeria* and seven of *Dreissensia*, recent and fossil, with their distribution in the regions to the south and east of Agram. It includes eleven new species, some of which appear to have been figured on certain still unpublished plates that are to illustrate an extended work on the fossil molluscan fauna of Dalmatia, Croatia, Slavonia and the adjoining Slav territories.—(BV).²

Systematic List of the Frederick E. Edwards' Collection of British Oligocene and Eocene Mollusca in the British Museum (Natural History). By Richard Bullen Newton, F.G.S., London: 1891. (Pp. 365).

So little attention has been devoted by malacologists in this country to Fossil Conchology, the subject has fallen almost entirely into the hands of a few palaeontologists. The list before us is therefore one which will be welcomed by all as coming from a competent conchologist who has had the guidance and assistance of many well-known authorities.

Besides the Edwards' Collection, there are comprised in this list the types of the Eocene Mollusca in the Bowerbank, Brander, Brown, Dixon, Gardner, Mantell, Prestwich, Shrubsole, William Smith, Sowerby, Wetherell and Wise collections; in all enumerating 255 genera and 1229 species, of which 428 are Lamellibranchs; 786, Gasteropods; and 15, Cephalopods.

It is impossible in the space at disposal to even enumerate, much less to discuss, the many important changes in classification and nomenclature that are here introduced. A few of the more important are—

<i>Axmaea</i> , Poli, 1795	has priority of	<i>Pectunculus</i> , Lam., 1799.
<i>Artica</i> , Schum., 1817	" "	<i>Cyprina</i> , Lam., 1818.
<i>Meretrix</i> , Lam., 1799	" "	<i>Cytherea</i> , Lam., 1806.
<i>Cuspidaria</i> , G. N. Nardo, 1840	" "	<i>Neora</i> , Gray, 1834.
<i>Thovana</i> , Gray, 1847	" "	<i>Dactylina</i> , Gray, 1847.
<i>Seraphs</i> , Montfort, 1810	" "	<i>Terebellum</i> , Lam., 1799.
<i>Lampusia</i> , Schum., 1817	" "	<i>Triton</i> , Montfort.
<i>Triplex</i> , Humphrey, 1797	" "	<i>Pteronotus</i> , Swainson, 1840.
<i>Sycum</i> , Bayle, 1880	" "	<i>Leostonia</i> , Swainson.
<i>Batillaria</i> , W. H. Benson, 1842	" "	<i>Lampania</i> , Gray (1840), 1847.
<i>Paludestrina</i> , d'Orbigny	" "	<i>Hydrobia</i> , Hartmann, 1821.

Generally speaking we approve of most of the changes; there are, however, several notable errors. A practice we have often condemned as childish, and unscientific, is that of naming genera, species, &c., after relations, friends, &c., or places, and we regret to find that Mr. Newton makes no exception to the bad example set by the British Museum authorities as regards this point. Where a new name has been introduced, it would have been useful to indicate that of the old genera or family, e.g., *Lampuside*, R. B. Newton (= *Tritonide*, Montfort).

In all departments of palaeontology there is a tendency to multiply species on very fine differences, and many of these in the present list might be wisely reduced. Of 585 MS. names proposed by Mr. F. E. Edwards, "it is the author's intention to describe and figure in due course, all these specimens." There is a useful Bibliography, an Appendix by Mr. George F. Harris, F.G.S., "On the Correlation Table of British with Continental Tertiary Strata," and a short preface by Dr. H. Woodward. The list is carefully and well executed. After each species is given the author's name, references to works in which there are descriptions or figures, synonyms, and the horizon and locality where it occurs.

On the whole Mr. Newton is to be congratulated on the completion of a tedious undertaking well carried out.—W. E. C.

Manual of Conchology by George W. Tryon, jun. Continuation by H. A. Pilsbry (1st Ser., pts. 53 and 54; 2nd Ser. pts. 29 and 30). Philadelphia: Academy of Natural Sciences.

Parts 53 and 54 of Series I. contain the commencement of the Polyplacophora. Many new species, principally from Carpenter's MS. are described, though we regret to notice that a large proportion are unfigured. The new species are: *Lepidopleurus granoliratus*, Cptr. (near *avellus*), *L. rugatus*, Cptr. (near *avellus*), *L. curvatus*, Cptr., *Spongiociton productus*, Cptr., *Onchopleura gemmea*, Cptr. (some-what like *Ischnochiton mertensii*), *C. armillata*, Cptr., *Callochiton princeps*, Cptr., *Stereochiton lobatus*, Cptr. (has general aspect of *Mopalia vespertina*), *Ischnochiton floridanus*, Pilsbry (allied to *I. limaciformis*), *I. fallax*, Cptr., *I. acrior*, Cptr., *I. cariosus*, Cptr., and *I. conspicuus*, Cptr. (all four near *I. magdalenensis*), *I. solidior*, Cptr., *I. asperior*, Cptr., *I. perornatus*, Cptr., *I. haldoni*, Pilsbry, *I. macgillivrayi*, Cptr. (near *I. oniscus*), *I. bisulcatus*, Cptr., *I. newcombii*, Cptr. (near *I. radians*), *I. radians* (near *I. interdistinctus*), *I. aureolinctus* (near *Tr. flexus*), *I. decipiens*, Cptr., *I. corrugatus*, Cptr., *I. cooperi*, Cptr., (near *mergensii*), *I. sinuidentatus*, Cptr. Comment on the arrangement of the sections is best reserved until publication of the introduction, &c. In Series II., pts. 29 and 30 continue and complete the Genus *Corbostyla*. A commencement is made with the supplement to the *Helicida*, advancing as far as *Microphya*—E. R. S.

ANATOMY.

The Asymmetry of Univalve Mollusca. (Journ. de Conch., pp. 117-208, 1892).

M. M. Fisher and Bouvier have a long and admirable article on this subject. They first enumerate the existing instances of sinistral mollusca, according as the "sinistrosity" is (1) generic, (2) specific, (3) monstrous, cases in which the species is indifferently dextral or sinistral being specially dealt with. The relations between the position of the internal organs and the way in which the spire is curled are then discussed. In all cases of "monstrosity," the position of the organs is found to be reversed, the pulmonary aperture, e.g., if normally on the right side, is then on the left. The same may be, and generally is, the case with all normally sinistral species; and of these, two large forms, *Ianistes boltzenianus* and *Chrysodomus contraria* are submitted, by the authors, to a detailed anatomical examination. In some cases, however, e.g., sinistral *Ampullaria*, this displacement of the organs does not take place, and it is shown that these, and similar "sinistral" species are, in reality, "ultra-dextral," that is to say, the spire is wound upside down, the apex being where the umbilicus should be, and *vice versa*. Thus *Planorbis* is really sinistral, and apparently dextral scarlariform monstrosities are only specimens in which the umbilical region has become convex. The American genus *Pompholyx*, though apparently dextral, is really ultra-sinistral, the pulmonary and genital orifices being on the left side.

The general question of the asymmetry of Mollusca is then discussed, especially with regard to its original causes. The authors incline decidedly towards the views of Spengel and Bütschli on the primitive mollusc and its developments. In crawling, as distinguished from swimming and burrowing mollusca, the growth of a shell to shield the viscera produced a displacement of balance, and the shell and the parts it covered fell over, in dextral species, to the left. Thus was

occasioned, first a compression, and then a displacement of the anus and the intestine leading to it: the position of the anus moved gradually to the fore part of the right side, while the shell settled down more to the rear of the animal. This displacement of the anus was mainly produced by an arrest of growth affecting the entire right side of the body in a narrow space situated immediately beneath the pallial border, from the mouth to the left branchia. This torsion of the anus occasioned a twist of the branchiæ through 180° , the original left branchia becoming the right, and *vice versa*, while, as regards the nerves, the visceral commissure, being involved in the twist, since it lay over the intestine, became crossed or chiasmatous. Observations of the growth of the embryo, particularly those of von Erlanger on *Paludina*, tend to confirm the truth of this rather complicated hypothesis.

Not the least interesting of the matters dealt with in this very important paper, is a most ingenious explanation of a well-known but obscure phenomenon which occurs in some species on our own shores, viz., the occurrence, in a dextral shell, of a sinistral embryonic form at the apex. This is the case with *Odostomia*, *Tulinella*, *Turbonilla*, *Mathilda*, with a few Opisthobranchs (*Acteona*, *Tornatina*, *Acteocina*), and with one genus of Pulmonates (*Melampus*). It is suggested that in these genera the embryonic shell was, as is obvious, sinistral, but that at a given period, for some unexplained reason, it changed, little by little, the direction of its inclination in relation to the axis of the body, and so became dextral.

These are but a few of the points dealt with in this extremely important and admirably-written article, which is sure to give occasion to further discussion of the theories therein set forth.—A. H. C.

The Anatomy of *Siphonaria gigas*, Less. (Arch. Zool. Inst. Wien, x. 1, pp. 71-100, 3 plates, 1892.)

Herr B. Haller's lucid and valuable paper will repay careful study by every morphologist interested in the Gasteropoda. *Siphonaria*, which has been variously regarded as a Limpet and as a Pulverate, he shows, by a complete anatomical investigation, to be an Opisthobranch, nearly allied to the *Umbrellidae*, but more primitive in many of its characters than any other member of the Opisthobranchia. The resemblance of its shell, foot, and pedal musculature to those of *Patella* he very conclusively demonstrates to be homoplastic,—an adaptation to a similar sedentary life upon rocks.

Cerebral ganglia connected by unusually long cerebral commissures. Cerebro-pedal, cerebro-placular, and pleuro-pedal commissures very short and stout, but quite recognisable. Several enormous ganglion-cells occur on main ganglia, as in other Opisthobranchs with concentrated central nervous system; apparently bipolar in cerebral, unipolar in pleural ganglia,—poles prolonged into the various commissures. Two pedal commissures, one behind other; but anterior commissure seems to be a mere pedal chiasma, where fibres of inner pedal nerves cross over into ganglia of opposite side. Two anterior visceral ganglia, connected with pleurals by long, stout commissures which pass through the cerebrals, as in *Prosobranchs*. A single posterior visceral ganglion lies asymmetrically behind right pleural, and is connected with it and with left pleural by short commissures. Innervation of various organs is fully described.

There are two hard jaws (carnivorous); radula myringoglossate, resembling especially that of *Umbrellidae*. Crop large and long (contained Ophiurids). Stomach small, spherical, receiving two hepatic ducts. Intestine long. Rectum, deep black colour; anus, middle of right side.

Mantle-cavity of large horizontal extent; opening in middle of right side by a small aperture (adaptation to rock-life).

Nephridia two: one right, one left. Right nephridium entirely in roof of mantle-cavity; ureter on its right side, on level with anus; no certain connection with pericardium. Left nephridium larger than right, bilobed,—one lobe in roof, one in floor of mantle-cavity; the common duct opens on left side of cavity, between it and pericardium, after first giving off a short funnel which opens into left corner of pericardial chamber. The presence of two nephridia in *Siphonaria* is an archaic character, unique among Opisthobranchia. The smaller size and absence of nephrosome perhaps point to incipient degeneration of right nephridium.

Generative apparatus particularly simple; peculiar absence of accessory glands. Spermatozoa and ova in separate follicles of hermaphroditic glands. Penis invaginable, grooved.

Heart obliquely situated on left side of floor of mantle-cavity: ventricle posterior, sinistral; auricle anterior, dextral. This disposition of heart's axis closely approaches that of Prosobranchia. Auricle receives two branchial veins (cf. *Umbrella*, in which Haller cites Moquin-Tandon as to existence of a posterior vein also, but degenerate).

Gills in form of a U-shaped series of plumes along posterior border of mantle-cavity, decreasing in size from right to left, and bounded internally by a venous channel, externally by an arterial channel. There is a group of particularly large plumes on right side anteriorly, separated from remainder by a transverse blood-vessel, which connects venous lacunæ of right nephridium with branchial artery.

Haller regards each gill-plume as a true ctenidium. He derives the Opisthobranchia from the Prosobranch stem, at a stage when the ctenidia, nephridia and auricles were still paired. The ctenidia then became serially repeated down each side of the body (cf. *Chiton*, where the multiplication of ctenidia is also correlated with the duplication of the branchial veins). Subsequently the entire left row of ctenidia, together with the left auricle, was lost; and *Siphonaria* is regarded as representing this stage, slightly modified in adaptation to the conditions of rock-existence. The *Umbrella*-stage is reached by degeneration of the posterior part of the complete ctenidial series, the so-called gill-plume of the Pleurobranchia being represented in *Siphonaria* by merely the right anterior group of large ctenidia. Correlated with this degeneration, the composite gill-plume of the Pleurobranchia is regarded as having migrated backwards (cf. position of anus), thus causing a corresponding rotation of the heart's axis, until the auricle came to lie behind the ventricle once more.

A special group of Tectibranchia—the Semicyclobranchia—is proposed for the reception of *Siphonaria* and any other forms that may be found to possess the complete right-sided series of ctenidia.

We may point out two objections to this ingenious theory in its present form. Firstly, we fail to verify Haller's reference to Moquin-Tandon's "Recherches sur l'Ombrelle" in regard to the existence of a rudimentary posterior branchial vein behind the gill-plume in that form. An anterior and a posterior vein are certainly mentioned; but they are equally functional, and convey the arterialed blood to the auricle from the anterior and posterior parts of the functional gill-plume respectively. Now much of Haller's reasoning depends upon the supposed existence of this rudimentary vein.

Secondly, if the mantle-cavity of *Siphonaria* is compared with the sub-pallial furrow of *Umbrella*, it may readily be seen that the position of the "ctenidia" in the former is diametrically opposed to several of Haller's contentions. The small posterior "ctenidia" on the left side in *Siphonaria* can only represent the most anterior ctenidia in *Umbrella*; for the gradual reduction of the branchial or pallial invagination in *Siphonaria* would result in the straightening out of the horse-shoe-shaped row of "ctenidia" until the apex of the left limb became anterior, and the apex of the right limb posterior in position. The mode of attachment of the large "ctenidia" in *Siphonaria* points equally to the same conclusion.

We commend these points to Haller's re-consideration.—W. G.

The Liver of Gasteropods. (Bull. Sci. de la France, etc., xxiv, 87 pp., pts. 1-6, 1892.)

Mons. H. Fischer's paper is of great interest. The various stages of development are dealt with at some length. The principal variations are noted, e.g., the symmetry of the hepatic lobes, the number of hepatic canals, &c. Although this organ can be traced from a comparative primitive condition to a somewhat complex one, M. Fischer does not think the general modifications which can be established, are sufficiently important to base generic, &c., distinctions upon.

Limax maximus v. cinereo-niger, Wolf. (Ann. and Mag. N. H., p. 425, 1892.)

Mr. Walter E. Collinge, who has lately examined British examples of this variety, confirms the remarks of Simroth and Scharff, viz., that it is but a colour variation of *L. maximus*, L., and that there are no anatomical differences in the two forms of sufficient importance to raise it to specific rank.

- Contributions to the Knowledge of the Mollusca.** (Zeit. f. wiss. Zool., liii, pp. 578-590, 1892, 1 pl.)
- Herr J. Thiele opposes Pelsencer as to the nature and homologues of the epipodium, which he regards as an organ of the lateral line, homologous with that of the Polychæta.
- Anatomy of W. Indian Helices.** (Proc. Acad. Nat. Sci. Philadelphia, p. 128, 1892.) H. A. Pilsbry.
- Anatomy of some American Molluscs.** (Proc. Acad. Nat. Sci. Philadelphia, p. 213, 1892.) H. A. Pilsbry.
- Excretory Organs of Pulmonate Gasteropods.** (Compt. rend. cxv, p. 256, 1892.) L. Cuenot.
- Colourless Globulin in Patella.** (Comp. rend., p. 259, 1892.) A. B. Griffiths.
- Histology of the Salivary Glands in Cephalopods.** (Arch. f. Mikr. Anat., xxxix, p. 596, 1892.) B. Rawitz.
- Note on a large Squid (*Ommastrephes pteropus*, Sp.).** (Jour. Mar. Biol. Ass., ii, pp. 314-321, 1892.) E. S. Goodrich.

EMBRYOLOGY AND DEVELOPMENT.

- Development of Proneomenia.** (Comp. rend., cxiv., p. 1211, 1892.) G. Pruvot.

CLASSIFICATION AND NOMENCLATURE.

- Classification of the Nudibranchiate Gasteropoda.** (Semper's Reisen im Archipel der Philippinen (2), II, 11, xviii, Wiesbaden, 1892, pp. 993-1165.)

Prof. Bergh gives in this large quarto memoir a complete and revised classification of the Nudibranchiate section of the Opisthobranchia, which latter, as is well known, he divides into three equivalent groups, the Tectibranchia, the Ascoglossa, and the Nudibranchia. His earlier sub-division of the Nudibranchia into the two sections, Kladohepatica and Holohepatica, is retained. No strict grouping of the eleven families of the Kladohepatica is attempted, although they include such different types as *Aolis*, *Phylliroe*, *Pleurophyllidia*, and *Tritonia*; but the fifteen families of the Holohepatica fall into four sections, the Doridæ cryptobranchiatae, the Porostomata, the Dorididæ phanerobranchiatae, and the Corambidæ, and of these the Porostomata (*Doriopsis*, *Phyllidia*) are especially connected with the D. cryptobranchiatae, and the Corambidæ with the D. phanerobranchiatae.

Bergh seems to regard the Nudibranchia as diphyletic, for he connects the Kladohepatica with the Aplysiidæ and Bullidæ through the Ascoglossa (*Oxynoe*, *Stiliger*, &c.), and the Holohepatica with the Pleurobranchidæ. At the same time he admits that in *Tritonia* we have a connecting link between the two great sections of Nudibranchia, and expressly states that the time is not yet ripe for determining the mutual relations between the different groups of Opisthobranchia. There is even a touch of scorn in his references to "phylogenetic incubations."

Very complete diagnoses are given (in Latin and German) of the organology of the various groups and families, and the distinguishing generic characters are given in Latin, together with complete lists of the known species and their distribution. The memoir closes with a synopsis of the classification and an index. We are ourselves inclined with Dr. Norman to believe that many of the generic distinctions, for which Bergh is responsible, will fail to stand the test of time; nevertheless, we think it incumbent to adopt them, as expressing the matured views of the most experienced and careful investigator of the group. How far the progress of investigation will confirm or modify these distinctions remains to be seen.

The frequent recurrence of the phrase, "Concerning the biological relations of these animals hardly anything is known," brings forcibly to our mind what a great field there is for the most interesting of researches at our very doors.

W. G.

A Catalogue of the Slugs of the British Isles. (Brit. Nat., Aug.-Sept., 1897.)

A number of new species and varieties are here introduced to the public for the first time, thus in the genus *Arion* four names quite unfamiliar to British conchologists appear. The first *A. lusitanicus*, Mab., resembles externally our large *A. ater* or *A. empiricum* as Mr. Collinge calls it, but it is quite distinct anatomically, and is more closely related to *A. subfuscus*. *A. cottianus*, Poll., the second addition, is allied to *A. hortensis*. Both of them are South European forms, and it is interesting to find them ranging so far north. *A. celticus*, Poll., may, according to Mr. Collinge, eventually prove to be only a variety of *A. hortensis*, but a fourth new species, *A. ambiguus*, Poll., seems to have better claims to rank as a distinct form. *Limax cinereo-niger* is relegated, as it ought to be, to the varieties of *L. maximus*, and *L. tenellus*, of which no British specimen has been seen by anyone but the late Mr. Alder, is printed in italics, so as to denote its being doubtfully native, and it will presumably altogether disappear in Mr. Collinge's next catalogue.—R. F. S.

A Revised List of the Species of British Slugs. (Iy. Conch., p. 66, 1892.)

Prior to the time (1885-6) when Mr. T. D. A. Cockerell commenced to study our British Slugs, little or nothing had been done in this country upon so important a group, in fact they had not previously received any continued and systematic treatment at the hands of a British malacologist. Naturally, therefore, we look with some interest to a revised list from Mr. Cockerell. After what he has written elsewhere we are really puzzled to understand many of his revisions, but he hopes "in due course to set forth all these in full," and we look forward with much interest for an explanation of the following points.

(1) The three species of *Testacolla* being printed in italics, would lead one to suppose that their claim to rank as British or as valid species was doubtful: (2) *Limax cinereo-niger*, Wolf, is retained as a species! Why? (3) *Agriolimax lævis*, Müll., is omitted from the list altogether. (4) *Amalia plumbea*, Moq., 1855, is introduced as a sub-species. If there are any points of importance about this form that are worthy of special note, other than as a variety, it should be raised to specific rank, but until they are described (we know of none) we cannot do otherwise than regard it as a mere colour variation. The method of giving authorities for genera and species will puzzle a many. The term "genitalia" is objectionable.—W. F. C.

Since the above was put up in type we have learnt that this list was sent to the Conchological Society of Leeds, on Dec. 18th, 1890. Mr. Cockerell has more patience than most authors, if he can wait two years for publication.

Limax filans, Hoy. (Brit. Nat., p. 272, 1892.)

Mr. T. D. A. Cockerell cites the synonymy of this slug, which has hitherto evidently been a puzzle to many conchologists. Most writers seem to have regarded it as a variety of *Agriolimax agrestis*, but Mr. Cockerell thinks that there can be no doubt but that it is a synonym of *Limax marginatus*, Müller.

Note on Cytherea convexa, Say. (Naut., p. 52, 1892.) W. H. Dall.

Observations on the Helices of New Zealand. (Naut., p. 54, 1892.) Henry A. Pilsbry.

The Classification of Lammellibranchs. (Zool. Anz., xv, p. 370, 1892.) Carl Grobben.

NEW GENERA AND SPECIES.

Hyalinea læviuscula. (Naut., p. 53, 1892.)

Dr. Storki describes a new species of *Hyalinea*—or more correctly speaking, the shell of one—from the fine drift of the Guadalupe River, at New Braunfels, Texas. It is of the size and general appearance of *Hy. minuscula*, but is more

depressed; the spire almost flat; the whorls much wider; the surface, although it appears to be quite smooth, is similar to *Hy. radiatula*. Gray, though the lines are much finer.

Veronicella dissimilis. (Journ. Inst., Jamaica, p. 134, 1822.)

Mr. T. D. A. Cockerell describes this slug from Moneague, Jamaica. Anatomically it closely resembles *V. sloanii*, Simroth.

New Species of Spondylus and Helix. (Jy. Conch., p. 70, 1892.)

Mr. Edgar A. Smith describes *S. powelli* from Madeira, and *H. (Grotorhus) hedleyi*, the latter described from a single shell, its nearest allies are mentioned, and the chief difference wherein it differs from *H. exultans*.

Additions to the Shell-fauna of the Victoria-Nyanza. (Ann. and Mag. N.H., p. 380, 1892.)

Mr. Edgar A. Smith enumerates the five species lately recorded by Dr. E. von Martens, and describes the following new species collected by the Rev. E. Cyril Gordon, and recently presented to the British Museum, *Ampullaria nyanzae*, *A. gordonii*, *Planorbis victoriae*, and *Sphaerium nyanzae*. These are the first records for *Ampullaria* and *Sphaerium* from the Lake, the latter being only sparingly met with in Africa are of interest.

On the Land Shells of St. Helena. (P.Z.S., p. 258, pl. xxi-xxii, 1892.)
Edgar A. Smith.

New Species of Diplomatina from Assam. (P.Z.S., p. 507, 1892.)
Lt.-Col. Godwin-Austen.

SHELL.

On the Mode of Growth and the Structure of the Shell. (P.Z.S., p. 528, 2 pl., 1892.)

Mr. B. B. Woodward has been investigating the mode of growth and the structure of the shell in *Velates conoides*, Lam., and other *Neritidae*. "The *Neritidae* avail themselves largely of the molluscan faculty of removing portions of the shell that may be in the way of the animal in the course of its growth, and some of them in this manner convert the interior of their tenement into a single open chamber, across which there projects from the sides, immediately behind the posterior portion of the columellar lip, a septum that takes the place of the columellar and serves as a point of attachment for the posterior retractor muscle." A series of stages are described showing the "removal of the columella and inner walls of the whorls and the development of the septum. In *V. conoides*" during the early stages of its growth the myophore is formed of the remnant of the parietal wall strengthened by shelly deposit. No trace of a prominence is perceptible at first, but by the time 3½ whorls are finished it is plainly discernible, and with the completion of the 4th whorl it attains its maximum development." The growth of the septum is now fairly rapid, it becomes thickened and pillar-like, and still later (4½ whorls) the septum only constitutes the myophore, having absorbed the columella and paires. The callus then becomes greatly thickened, and additional matter is added to the outer lip columellar and around the plane of the outer lip. Many other stages are described and figured, also the periostracum, the chemical composition and microscopical structure of the shell. Want of space prevents us from doing justice to this most interesting and valuable paper. So little has been written on the shell (worth reading) in this country, that Mr. Woodward has placed conchologists under a debt of gratitude for so careful and painstaking an investigation. A similar study on *Ampullaria* would be interesting.

W. E. C.

VARIATION.

New Varieties of Sphærium and Unio. (Brit. Nat., p. 233, 1892.)

Mr. W. A. Gain describes a var. *translucens* of *S. ovale* and a var. *major* of *U. pictorum*, the latter 127 mm. long.

U. pictorum v. ponderosus. (Brit. Nat., p. 257, 1892.)

Mr. Walter E. Collinge points out that Mr. Gain's var. *major* is synonymous with the *U. ponderosus*, Spitzl. This latter form must therefore take precedence.

Notes on Varieties. (Brit. Nat., p. 212, 1892.) W. A. Gain.

A. ater v. bicolor in Devonshire and L. of Man. (Jy. Conch., p. 77, 1892.)
W. D. Roebuck.

SPECIAL FAUNA AND DISTRIBUTION.

Marine Shells of San Pedro Bay, U.S.A. (Proc. U.S. Mus., pp. 179-220, pl. xix.-xxii, 1892.)

Mrs. Burton Williams gives a most interesting and exhaustive account of the Marine Mollusca of San Pedro Bay. An introduction prefaces the list, which enumerates 336 species. *Vitrinella williamsi*, Dall., and *Amphisa bicolor*, Dall., are new species. The list is illustrated by 38 figures, and reflects great credit on the industry and care of the authoress.

The Irish L. and F. Mollusca. (Irish Nat., Oct.-Dec., 1892.)

Dr. Scharff's interesting series of papers on the Irish Mollusca are brought to a conclusion in the December number. An important change in the nomenclature is *Helix intersecta*, Poir., = *H. caperata*, Mont. The genera *Alexia*, *Melampus*, and *Otina* are included among the Land and Freshwater Mollusca, while the generic name *Aplexa* is retained for *Physa hypnorum*.

Rare Mollusca from Co. Sligo. (Irish Nat., p. 170, 1892.)

Miss Amy Warren records the occurrence of *Montacuta dawsoni*, Jeff., in Killala Bay, and *Odostomia nitidissima*, Mont., from shell sand at Enniscrone. *Vertigo augustior* and *V. substriata*, are also mentioned as having been found in Killanley Marsh, Co. Sligo.

Notes on the Marine Invertebrate Fauna of Plymouth for 1892.
(Jour. Mar. Biol. Ass., 11, pp. 333-339, 1892.)

Mr. W. Garstang records the occurrence of various molluscs, chief of which are the Nudibranchs, *Calma glaucoides*, *Embletonia pulchra*, *Amphorina carulea*, *Antiope hyalina*, *Stiliger bellula*, *Lomanotus*, and *Idalina elegans*.

The Endemic Features of the British Slug-fauna. (Sci. Goss., p. 255, 1892.)

Mr. T. D. A. Cockerell gives a series of notes on forty-four varieties and mutations of British slugs peculiar to Britain. [Until these varieties are proved to be permanent variations and not chameleonic or temporary, or what, in a number of cases, is more likely, young stages of different slugs, but little satisfactory information will be obtained.]

Contrib. to the Authen. Records of Derbyshire. (Jy. Conch., p. 77, 1892.) L. E. Adams.

L. and F. Shells at Karachi. (Jy. Conch., p. 81, 1892.) G. W. Adams.

V. pygmæa, Extraordinary finds of. (Jy. Conch., p. 89, 1892.) R. Standen.

P. ringens in Cheshire. (Jy. Conch., p. 89, 1892.) R. Standen.

Shells from E. Bolivia and W. Brazil. (Jy. Conch., p. 90, 1892.) G. F. Ancey.

- Fusus turtoni*, N.E. Scotland. (Sci. Goss., p. 212, 1892.) James Simpson.
 The Shells of Stourport. (Sci. Goss., p. 226, 1892.) Joseph W. Williams.
 Land Shells from Co. Donegal. (Irish Nat., p. 171, 1892.) R. I. Prager.
 Land Moll. from the I. of Dominica. (Trans. Con. Acad., viii, 1892.)
 Henry A. Pilsbry.
 Note on above Article. (Trans. Con. Acad., viii, 1892.) G. E. Verrill.

PALÆONTOLOGY.

- A New fossil *Cypræa*. (Naut., p. 51, 1892.) J. H. Campbell.
 Geological Excursions in Alsace. (Feu. d. Jeune Nat., p. 11, 1892.)
 Mathiew Mieg.

TECHNIQUE.

- Preserving the Epidermis of Shells. (Sci. Goss., p. 212, 1892.)
 W. Jones, junr.
 Preparing Liver of Gastropoda. (Jy. Roy. Micros. Soc., p. 698, 1892.)
 Preparation of Nudibranchs. (Jy. Roy. Micros. Soc., p. 699, 1892.)

MISCELLANEOUS.

- Notice Néerologique sur J. R. Bourguignat. (Jy. Conch., p. 74, 1892.)
 C. F. Ancey.
 Shell Hunting in Merionethshire. (Jy. Conch., p. 78, 1892.) G. W.
 Chaster.
 Burrowing Molluscs. (Irish Nat., p. 118, 1892.) R. F. Scharff.
 Additions to the Comital Census of the L. and F. M. of Scotland.
 (Ann. Scot. N.H., 1892.) W. D. Reebuck.
 Note on *Bulimus oblongus*. (P.Z.S., p. 271, 1892.) R. J. L. Guppy.

NOTES.

A Further Capture of *Pleurophyllidia loveni* in Britain.

By Edward J. Bles, B.Sc. (Lond.), Owens College, Manchester.

The records of the capture of *Pleurophyllidia loveni* in Britain noted by Professor M. T. B. in the "Conchologist" for June, p. 21, 1892, are from the east, with one from the south coast of Britain. The only other recorded locality in Britain is that mentioned by Professor Herdman*, viz., off Dunbar, also on the east coast. It may therefore be of interest to note that I found six large specimens in a haul of the trawl taken from Dr. Murray's steam-yacht "Medusa" in Loch Striven, Clyde area, on August 29th, 1891, at a depth of 40 fathoms, bottom: fine mud. The two specimens in my possession were successfully preserved in an expanded condition by first adding alcohol gradually to the small quantity of sea-water containing them, until the animals were stupefied and no longer responded to stimuli. They were then killed in 50% alcohol, and after a couple of hours transferred to 70% alcohol. The largest now measures 40 mm. in length.

Some New and Rare Varieties of British Shells.

By Walter E. Collinge, Mason College, Birmingham.

In examining the "Hunter Barron Collection of Mollusca," in the Natural History Museum in Mason College, Birmingham, I find there are a few very interesting varieties; some are new forms, while others are rare in Britain or have not been previously recorded.

* "Conchologist," p. 57, 1892.

Helix pomatia, L., var. *sinistrorsa*.

A typical sinistral shell.

Locality: Kent?

Bulinus montanus, Drap., var. *attenuatus*.

Spire consists of four dwarfed whorls, the ultimate whorl being less than half the usual size.

Locality: Cooper's Hill, Gloucestershire.

Clausilia biplicata, Mont., var. *albina*, Btgr.

Shell perfectly white and very thin.

Locality: Osier Beds, Chiswick, London.

Cyclostoma elegans, Mull., var. *albina*, Des Moul.

A single pure white specimen.

Locality: Sandown, Isle of Wight.

Vertigo pygmaea, Drap., var. *albina*.

By George W. Chaster, M.R.C.S., Southport.

Whilst searching through a small quantity of rejectamenta from the River Trent, I met with a milk-white, semi-transparent specimen of *V. pygmaea*. The shell is evidently fresh, being very different in appearance from the weathered shells found in the same material. It has a high polish, is translucent, and its teeth do not show that chalky, opaque white appearance so noticeable in "dead" specimens of *Vertigo*. Moreover, the majority of the shells of *V. pygmaea* are fresh, whilst other species, as *V. antivertigo*, are without exception lustreless and opaque, the mouth being filled with dirt, and bear evidence that they have been dead for a considerable time.

The available literature has been searched without finding any mention of an albic variety of *V. pygmaea*, and if it should prove to be new I would suggest the above name.

Dr. Chaster has been kind enough to forward to me the above specimen, which I have carefully examined, and agree with his description. It is much more transparent than the v. *fallida*, Jeff., and whiter. The periostracum is not weather-worn in the slightest, the shell being a most perfect example.—W. E. C.

EDITOR'S NOTES.

We regret to announce the death of Mons. Arthur Morelet, who died at the Chateau de Vélars, near Digoon, on October 9th.

With the close of the year numerous suggestions have reached us respecting the Bibliography (Current Literature). After a careful consideration of the same, we have decided to make a slight alteration in the headings which, for the future, will read as follows:—(1) Malacology in General; (2) Structure and Development; (3) Variation; (4) Classification, Nomenclature, New Genera and Species; (5) Physiology, Habits and Conditions of Life; (6) Special Fauna and Distribution; (7) Palaeontology.

Greater attention will be devoted to the Foreign Literature, and an attempt will be made to give a complete Bibliography to the whole of the European and American Literature.

We again appeal to all malacologists to assist in the undertaking. Copies of authors' reprints, or a post-card giving the reference to their papers will greatly help us.

THE
CONCHOLOGIST

A Journal of Malacology.

EDITED BY

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LONDON

SWAN SONNENSCHN & CO.

BERLIN

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THE CONCHOLOGIST:

A Journal of Malacology.

Vol. II.

MARCH 25th, 1893.

No. 5.

DESCRIPTIONS OF NEW SPECIES OF HELIX, RISSOINA AND ACTÆON.

By EDGAR A. SMITH, F.Z.S.,

Zoological Department, British Museum, London.

Helix (Gonostoma) baudinensis.

Testa discoidea, late perspective umbilicata, dilute fuscescens: anfractus 4 convexiusculi, sutura profunda discreti, costis numerosis crassiusculis obliquis leviter undulatis instructi, primi duo leves, ultimus versus aperturam scrobiculo haud profundo elongato supra impressus, pone labrum constrictus, valde descendens; apertura contracta, auriformis; perist. albidum, leviter, expansum et reflexum, intus tuberculo conspicuo aliisque minore basali coarctatum. Diam. maj. 6 millim., min. 5.

Habitat: Baudin Island, N.W. Australia (J. J. Walker).



The principal features of this little species are its depressed and openly umbilicated form, the strong costulations, and the contracted dentate aperture. The shallow depression upon the upper surface of the last whorl commences behind the peristome, and, running parallel to but a little distance from the suture, extends about half-way round. The upper margin of the peristome is

indented above the conspicuous tubercle, and, between it and the suture, is arched, but very little expanded. On the contrary, both in front and at the base, it is more dilated and reflexed.

Helix (Gonostoma) collingii.

Testa orbicularis, depressa, late umbilicata, superne fuscescens, infra pallida, epidermide brevi-pilosa induta; anfractus 4-5 sub lente accrescentes, convexiusculi, sutura profunda sejuncti, lineis incrementi tenuibus punctisque minutis undique sculpti, ultimus ad peripheriam rotundatus, antice vix descendens, superne pone labrum leviter impressus; apertura fere horizontalis, rotunde triangularis; perist. superne anguste expansum, margine columellari latius reflexo, basali intus subdentato. Diam. maj. 10 millim., min. 8½, alt. 4.

Habitat: Baudin Island, N.W. Australia (J. J. Walker).



Shell flatly discoidal, with the spire only very little raised above the body-whorl, rather openly umbilicated, light brown above and pale beneath.

When in fresh condition the surface is covered with a thin shortly pilose epidermis. Worn shells exhibit innumerable minute punctures showing where the short delicate setæ have been. Whorls 4½, regularly and rather slowly increasing, moderately convex, and separated by a deep sutural line, besides the punctures, exhibiting fine lines of growth; last whorl rounded at the periphery, only very feebly deflexed close to the aperture, and exhibiting a slight depression above about the middle of the upper margin of the peristome. Aperture somewhat triangular in outline but with rounded angles, almost horizontal in position: peristome narrowly reflected above, more broadly expanded along the basal margin, especially over the umbilicus. A conspicuous tubercle or prominence occurs on the inner edge of the basal margin and a less pronounced one within the upper margin corresponding to the slight depression upon the outer surface of the whorl.

I have much pleasure in naming this very interesting species after Mr. W. E. Collinge, the energetic editor of this Journal.

Rissoina walkeri.

Testa fusiformi-ovata, crassa, turrita, alba; anfractus 8, primi quinque conum obtusum formantes, plani, haud turriti, longitudinaliter confertim costulati, spiraliter striati, tres ultimi conspicue tabulati et angulati, costis crassiusculis superne ad angulum interruptis instructi, striisque confertis tenuibus spiralibus inter

et supra costas ornati, ultimus ad peripheriam carina fortissima, rotundata, valde prominente dimidiatus, infra carinam haud costatus, modo spiraliter striatus; apertura obliqua, acute elliptica, longit. totius $\frac{1}{2}$ adæquans, superne leviter canaliculata, inferne infra columellam, canalem obliquam, distinctam formans; labrum incrassatum, arcuatum; columella obliqua, callo crassiusculo, superne labro juncto, induta. Longit. 16 millim., diam. 8. Apertura 6 longa, 3 lata.

Habitat: Baudin Island, N.W. Australia (J. J. Walker).



This very remarkable species is distinguished not only by its unusually large size, but by the tabulated spire, the strong upright costæ, and the prominent keel at the periphery. The upper portion of the spire, consisting of five whorls, forms a regular bluntish cone with sloping and unturreted sides. It is ornamented with numerous fine riblets, which, by degrees, become stronger and more remote upon the lower whorls which are conspicuously tabulated and angled above. The ribs are interrupted at the angle and there connected by a ridge which forms an elevated border. Upon the body-whorl they do not reach quite to the very conspicuous keel around the middle. The entire surface is very finely spirally striated, but usually upon the upper whorls and upon the ribs of the lower whorls in worn specimens, the striæ become more or less indistinct. They are, however, always to be seen between the costæ and upon the lower half of the body-whorl.

I have named this remarkable species after Mr. J. J. Walker, chief engineer on H.M.S. Penguin, to whom the British Museum is indebted for most valuable collections from various parts of the globe.

Actæon reevei.

Tornatella suturalis part. Reeve, Conch. Icon., vol. xv., pl. II, f. 9 a-b.

Testa breviter ovata, superne acuminata, vaseo-grisea, punctis nigris picta; anfractus 7 burriti, teviter convexiusculi, sutura subcanaliculata sejuncti, transversim sulcati, sulcis angustis, longitudinaliter striatis, in aufract. penult. 3-4, in ultimo circa 15; spira brevis, conica, acuta; apertura elongata, auriformis, longit. totius $\frac{2}{3}$ adæquans, intus seriatim obscura nigro-punctata; columella contorta, incrassata, alba, bifida. Longit. 14 millim., diam. 8. Apertura 9 longa, 3 lata.

Habitat:—?

This pretty species is shortly ovate, but with an acute spire. It has seven very slightly convex whorls, which are a trifle tabulated owing to the somewhat channelled suture; they enlarge rather rapidly and are transversely grooved; the grooves or sulci are very narrow, not equidistant (some around the lower part of the body-whorl being closer together than those above), and are crossed by lines of growth or striæ; the first groove below the suture is rather near it, thus marking off a narrow margin or fillet; three or four sulci are visible upon the upper whorls and about fifteen on the last. The aperture is elongate, inversely ear-shaped, and occupies about three-fifths of the total length of the shell. The columella is thickened, white, contorted, and grooved, so as to appear uniplicate. The general ground colour of the shell is pinkish grey or pale flesh-tint. The numerous black dots run in transverse series and also form more or less regular longitudinal rows. They are irregular in shape, but mostly squarish. The interior of the aperture is pale bluish, and owing to the thinness of the shell exhibits the external dotting.

This species, of which there are two specimens in Cuming's collection, was figured by Reeve under the name of *Tornatella suturalis*, Adams MS. It is quite distinct from the *Solidula suturalis* of A. Adams (Proc. Zool. Soc., 1854, p. 61) of which a small specimen is correctly delineated in Reeve by figure 9c. That species is longer and narrower than the form described above, of a different ground colour, and has the spiral sulci more strongly striated or subpunctate.

THREE NEW SPECIES OF SOUTH AMERICAN CLAUSILIÆ.

By E. R. SYKES, B.A., F.Z.S.,

Weymouth.

Clausilia (*Nenia*) *boliviana*, n. sp.

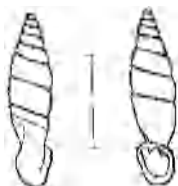
T. parva breviter fusiformis, solidula, obsolete striata, striis obliquis, confertissimis, fere membranaceis, sordide corneo-fusca, ad suturam parum pallidior, opaca, spira media parte inflatula, apex obtusiusculus. Anfr 8, superi convexiores, reliqui convexiusculi, sutura bene impressa, filomarginata, disjuncti, ultimus deorsum angustatus, sutura descendente instructus, tum modice

saluus, protractus, basi subgibboso-rotundatus, 1/3 altitudinis teste equans. Apert. magna, oblique piriformi-subquadrata, faucibus hepaticis; lamelle approximate, supera valida, marginalis, compressa, infera alte sita, tenuior, sub-horizontalis, subcolumellaris inconspicua; lunella dorsalis, valde arcuata, angusta, superne plicae principali subparallela, plicae principalis modica, lunellam introrsum non transgrediens; perist. tenue continuum, liberum, expansum, undique distincte reflexu-esculum, albidum. Long. 12 millim., Lat. 2 1/2 millim.

Habitat: Bolivia.

This species belongs to the group of *Adamsiana*, Pfr. It has appeared in catalogues as *boliviana*, Ettgr., but has never been described.

Dr. Boettger has kindly written the above description and has lent me the type specimen so that it might be figured.



Clausilia steeriana, n. sp.

T. vix subrimata, curta, cylindrica, truncata, dense striata, brunneo-fusca; anfr. (spec. trunc.) 5-6 convexiusculi, ultimus basi rotundatus, corrugatus; apertura late piriformis, intus albida; lamella supera tenuis, curta, verticalis; lamella infera valida longe intrans; in exemplis quibusdam lamella inter-lamellaris unica sub-horizontalis; lamella subcolumellaris tenuis, profunda, haud extus conspicua; plicae principalis longa, descendens; lunella arcuata; perist. album expansum, leviter incrassatum. Long. 16 1/2 millim., lat. 7 millim. Apert. long. 4 1/2 millim., lat. 4 1/2 millim.

Habitat: "On the plains near Caxamarca (Peru), under stones (Stcere)."



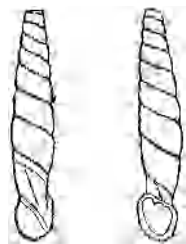
The *Clausilia* of this very interesting species is much like that of *Cl. macarana*. The specimens are in the British Museum, where they have been since 1876. The dimensions of the type specimen are given, but one of the others is slightly larger.

Clausilia perplexa, n. sp.

T. non rimata, subfusiformi-longata, truncata, tenuis, dense obsolete capillacea-striata, cornea; anfr. 9, vix convexiusculi, ultimus solutus, protractus, descendens, basi compressa, carinatus,

striatus, supra aperturam sulcatus; apertura piriformis, basi angulato, effusa; lamella supera parva, verticalis; lamella infera aequalis et oblique intrans; lunella fibularis, arcuata; plica principalis longa, tenuis, fere ad labium productus; perist album, liberum, continuum, undique paulo expansum. Long. 30 millim., lat. 5½ millim. Apert. long. 5½ millim., lat. 4½ millim.

Habitat: New Granada.



This species may be distinguished from *Cl. Dohrni*, Pfr., by its being more inflated in the middle; by its lamella supera and lamella infera being of the same size, instead of the lamella supera being much larger; by the shape of the mouth; and by the lip not being so much reflected. Type in the British Museum.

PROFESSOR SIR RICHARD OWEN, K.C.B.,
M.D., D.C.L., LL.D., F.R.S., F.L.S., F.G.S., V.P.Z.S.,
Pres. Pal., Soc. Assoc. Inst. France.

By DR. H. WOODWARD, F.R.S., F.G.S.,

British Museum (Natural History), London.

THERE has lately passed away in the quiet retirement of Sheen Lodge, Richmond Park, in his 89th year, the greatest comparative anatomist of this country, a giant among men of science, and the only man who could claim to have carried on, since the death of the illustrious Cuvier in 1832, those researches in extinct forms of animal life which Cuvier had so ably initiated in Paris in the earlier years of this century.

Richard Owen was born at Lancaster on the 20th July, 1804, just four years after Cuvier had been made Professor of Natural Philosophy in the College de France in Paris. After leaving school, Owen was sent to Edinburgh University, where he matriculated in 1824, and having duly passed his medical examinations, he came to London and was admitted a member of the Royal College of

Surgeons in 1826. He acted as dissector at St. Bartholomew's Hospital, where his skill attracted the attention of the famous Dr. Abernethy, and led to his engagement as Assistant-Curator to Mr. William Clift, at the Royal College of Surgeons, whose daughter he subsequently married, and to whose appointment, as Conservator of the Hunterian Collections, Owen succeeded at a later date.

Profiting by the opportunity to spend some time in Paris, he attended Baron Cuvier's lectures, which so fired his love of science that he speedily abandoned practise as a medical man, and turned all his attention to a scientific career. In addition to the work on the Hunterian Collections at the College, Owen acted as honorary prosector to the Zoological Society and his memoirs on the *Apteryx*; the great Ant-eater; on the Indian Rhinoceros; the Orang-utan; on the anatomy of the Cheetah; the Kinkajou; the Warthog; the Dugong; the Armadillo; the Tapir; the Hyrax; the Seal; the Beaver; the Walrus; the tree-Kangaroo; and many others, are the results of science of this period of his life. In 1834 Owen was appointed to the chair of Comparative Anatomy at St. Bartholomew's, and became "Professor." In 1835 he was elected Hunterian Professor and conservator of the Museum of the Royal College of Surgeons, and in 1836 he was elected a Fellow of the Royal Society.

Notwithstanding the arduous nature of his official work at this time, Prof. Owen managed to produce that very remarkable series of "Descriptive and Illustrated Catalogues of the Specimens of Physiology and Comparative Anatomy," of "Natural History," of "Osteology," and of "Fossil Organic Remains," preserved in the Museum of the Royal College of Surgeons (1833-40; 4to.) his "Odontography," (2 vols., 4to, 1840-45); besides a large series of separate memoirs, amongst them his contributions to "Todd's Cyclopædia of Anatomy and Physiology" (1836), see Article "Cephalopoda," &c., &c.

The great passion of Prof. Owen's life was the comparative study of recent and extinct forms of life. This led to the remarkable announcement, made in 1839, that struthious birds, as large as the ostrich, would be found in New Zealand. At that time Owen had only seen a small fragment of the shaft of a femur of a bird, but he recognised it as such, and although the greatest doubt was felt by others, his forecast proved to be true, and soon after Dr. Mantell's son sent over quite a large number of bones of the "Moa" or *Dinornis*, which furnished materials for more than twenty species and for the genera *Aptornis*, *Notornis*, *Cnemidornis*, &c., besides. These appeared from time to time in the Transactions of the Zoological Society of London, and with his memoir on the Dodo, &c., have since been

published as a distinct work. His memoirs on the extinct Marsupials of Australia, and the fossil Mammals of England, the former contributed to the Royal Society, and the latter to the Palæontographical Society, were afterwards issued as two volumes, 4to. His British fossil Reptilia in the Palæontographical volumes extend from 1848 to 1877, and embrace descriptions of 139 species.

The fossil Reptilia of South Africa form a volume of the British Museum Catalogues (4to, 1876), whilst his Memoir on the extinct Sloth (*Myiodon*), 1842, and on the *Megatherium* (1860), &c., extend Owen's researches to South America also.

But whilst engaged with the Vertebrata, Owen had also a keen interest for the Invertebrate classes of animals; one of his earliest Memoirs being that on the anatomy of the animal of the Pearly Nautilus, which appeared in 1832, and is certainly amongst the most valuable and exhaustive of Owen's Monographs.

For this, and for his description of "Certain Belemnites preserved with a great portion of their soft parts in the Oxford clay at Christian-Malford, Wilts" (Phil. Trans., 1844), he received the award of a Royal Medal in 1846, from the Council of the Royal Society.

In the Catalogue of the Fossil Invertebrata in the Museum of the College of Surgeons, Owen has also described upwards of 350 specimens of Ammonites collected by John Hunter in the last century.

In 1844, Prof. Owen communicated to the British Association two papers by Madame Jeannette Power, detailing further experiments and observations made by her on the living *Argonauta argo*, prefaced by the remarks on the relation of the animal to its shell. He also described *Rosalia*, a sub-genus of *Sepioida*.

In 1848, Prof. Owen examined and dissected a portion of *Spirula reticulata* and a unique but imperfect specimen of *Spirula peronii*, and, in 1878, he again examined and described the specimen from the Cumming Collection, which was in a more perfect state of preservation than those brought home by H.M.S. "Samarang."

Owen still adhered, in this memoir on *Spirula*, to his earlier-expressed views of the hydrostatic nature of the camerated cephalopod-shell, and that the siphuncle was related with the maintenance of the vitality of the shell*.

The establishment by Owen of the two great divisions of the class Cephalopoda, the *Tetrabranchiata*, and the *Dibranchiata*, the former embracing the Nautili, the Ammonites, and the Orthocerata;

*The contrary views, expressed by Dr. H. Woodward, F.R.S., were originally communicated to the British Association (1879), and afterwards published in the "Popular Science Review," vol. xli. No. xliii., pp. 217-180 (1875).

and the latter the Squids, Cuttles, Calamaries, Belemnites, Spirula, and Argonauts, has been maintained to the present day, and clearly proves how keen was Owen's insight in fixing on the vital characters of any group. Prof. Owen's researches on the Brachiopoda were almost equally important with those on the Cephalopoda, and many of the orders which he founded have been widely accepted by other subsequent workers.

Prof. Owen described the anatomy of the "club shell" (*Clavagella*), and showed that the great development of its mantle was an instrument capable of aiding the mollusc in the work of burrowing.

In 1837, he examined the structure of the shell of the "*Water-Spondylus*," and pointed out that the rudely and irregularly-camerated structure of its shell offered, in its mode of growth, an analogy with the chambered shell of the *Nautilus*, which, like many other molluscs, partitions off the disused portion of its dwelling when not required for the accommodation of its soft parts. By this observation Owen brought the growth of Molluscan shells into close relation, and showed that there is a common character in them all.

One of Owen's most valuable correlations was that of the fibrous hood of the *Nautilus* (composed of the *conjoined* pair of dorsal arms—which are also the *shell-secreting* arms in the Argonaut!) with the conjoined calcareous opercular valves, or *aptychi* of the Ammonite. This was proved beyond a doubt by Dr. S. P. Woodward, in 1860 (see "Geologist," vol. iii., p. 328) by the discovery of an example of *Ammonites subradiatus* with the operculum *in situ*, exactly fitting the aperture of the shell.

In 1856 Owen resigned his connection of twenty years' standing with the Royal College of Surgeons in Lincoln's Inn Fields and entered upon the position of Superintendent of the Natural History Departments of the British Museum, to which he had been appointed by Parliament. Here he continued his former scientific researches, and added largely to his palæontological memoirs*. The most valuable of these (to the general reader) was his article "Palæontology" in the "Encyclopædia Britannica" (8th edition, 1860), afterwards printed as a separate volume, and reaching a second edition in 1861. [It is only right, however, to state that Part I., "*Invertebrata*" is from the pen of the late Dr. S. P. Woodward, F.G.S. (author of the "Manual of the Mollusca"), who wrote *the entire original article* and drew the illustrations for the same, but in the second edition, passages have been added by

* The Royal Society's list of scientific papers, gives the titles of 366 separate papers by Owen (not his works).

Professor Owen to the section *Cephalopoda*. Owen acknowledged his indebtedness in a foot-note, 2nd edition, p. 114.] We refer to it because a contemporary ("Natural Science," January, 1892) has said of Part I. of this very article, "This is *one of the best examples of Professor Owen's literary power of popular exposition of technical details.*"

Professor Owen found the Natural History Collections in the old Museum at Bloomsbury, suffering from want of adequate exhibition space, especially the Geological and Mineralogical Collections, which, about that period, commenced to grow in a most alarming manner, being then made into two new and separate keeperships, the former under Mr. G. R. Waterhouse, the latter under Prof. N. S. Maskelyne.

The Recent shells suffered least of all, owing to the fact that they had already acquired *the entire floor-space* of the Ornithological Galleries, and even the accession of Mr. Hugh Cumming's famous collection found space for itself in the numerous cabinets of drawers. But the Mammals, the Osteology, the Insects, Crustacea, &c., the Bird-skins and the collection of Fishes, Reptiles, &c., in spirits, suffered all the tortures of "the black hole of Calcutta."

We are indebted to the untiring advocacy of Owen, who, in season and out of season, in his annual reports to Parliament, in his lectures, and in his pamphlets, drew attention to the great loss and inconvenience suffered by science, owing to the restricted space allotted to the Natural History collections. At last, after twenty years' agitation, a building began to arise in the Cromwell Road, which, if not all that one can desire, is at least a "palace of Aladdin" when compared with the "cramped, caged, and confined" quarters in the old building at Bloomsbury.

As Lord Kelvin said, in his speech on the 21st January, "if we owe nothing more to Prof. Owen than the gaining for the nation from its Parliament of such a building for the accommodation of its treasures of Natural History, we may say that he has deserved well of his country, and is entitled to a public memorial."

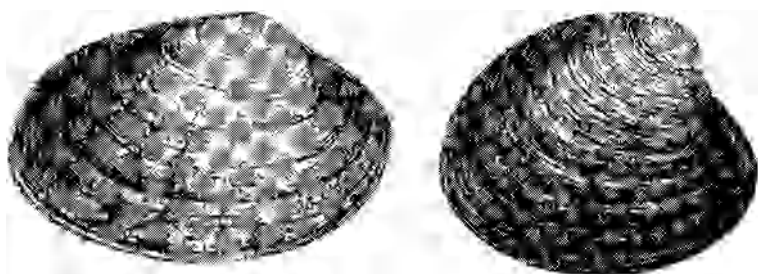
To tell of Owen's long career, of the honours conferred upon him, at home and abroad, would occupy too much space in this journal. He retired from public life in 1883, three years from the time of the completion of his new Museum. The Queen conferred upon him the honourable distinction of "Knight Companion of the Bath," but "Professor Owen" will always remain his best-known title. He died on the 18th December, 1892, and was buried at Ham, near Richmond, beside his beloved wife.

DESCRIPTION OF
TAPES VIRGINEUS, L., var. nov. VENEROIDES.

BY G. SHERRIFF TYE,

Hond-worth, Birmingham.

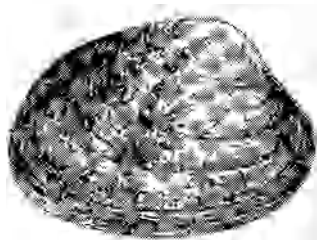
IN 1876 I collected this variety in Guernsey, and in 1890 and 1892 my son collected it from the same locality. It is a well marked and permanent form, in shape like a *Venus*, thicker in substance than the type and more ventricose, the umbones being much more



Tapes virgineus L.

T. virgineus, L., var. nov. *veneroides*.

prominent. the concentric striae are not so even and somewhat finer, the growth periods are marked by deeper grooves, and altogether it is a coarser and more ponderous shell. Colour—pink of varying intensity or pale amber; a characteristic peculiarity is the absence of the varied markings, generally seen in the type and the variety



T. virgineus, L., var. *sarniensis*, Turton.

sarniensis, Turton, which lend such a charm to the shell: if present, they are few and faint. Forms occur linking it with the type through the v. *sarniensis*, thus confirming its relationship. It is not at all uncommon at St. Peter Port, Guernsey.

I propose for it the name *veneroides* for obvious reasons.

All the British species of the genus attain to a large size in the Channel Islands. The figures, illustrating the divergence from the type through the *v. sarniensis*, do not show the maximum of growth.

NOTES ON SOME SPECIES OF LAND SHELLS FROM NEW GUINEA.

By EDGAR A. SMITH, F.Z.S.,

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THE British Museum has just been presented by Mr. H. Veitch with a few land shells from New Guinea, including fine examples of *Oxytes hercules*, Hedley, *Nanina lunsteini* and *N. cairni*, Smith, *Geotrochus zeus*, Brazier, and a new species of *Nanina* allied to *N. inclinata* Pfr.

No special locality accompanied the specimens, but from the known distribution of the species quoted, we may safely conjecture that they were collected in the southern part of the main Island within British territory.

1. *Oxytes hercules*, Hedley.*

The three beautiful fresh specimens of this species are a very fine addition to the National Collection. They are probably the first seen in this country, and only three other examples have been recorded. It seems to me doubtful whether this shell is rightly located in the group *Oxytes*, the type of which is an Indian form with a large open umbilicus. The present species is all but imperforate, agreeing in this respect with certain species of the section *Rhysota*, e.g., *R. lamarchiana*, Lea, *R. uranus*, Pfr., &c., and in geographical distribution it certainly ranges closer to those than to Indian forms. A curious resemblance to this New Guinean species is found in the West Indian *Caracollus caracolla*, Linn. The general form, number of the whorls, and the imperforate base are quite similar, but, the localities being so remote, a close relationship is not to be expected.

*Hedley, Proc. Linn. Soc., N. S. Wales (Ser. Vol. vi., p. 70, pl. 18., figs. 1-2)

2. *Nanina divisa*, Forbes.*

With this species Mr. Hedley has united as varieties, two species, which, in my opinion, may with advantage, be kept distinct, viz., *N. inclinata*, Pfr., and *N. rosseliana*, Smith. They all occur in the Louisiade Islands, south-east of New Guinea; *N. divisa* on Sudest Island; *N. inclinata* on St. Aignan; and *N. rosseliana* on Rossel Island. *N. inclinata* is a little larger than *N. divisa*, more acutely keeled, a trifle more narrowly periculate, and the aperture is longer from the umbilicus to the angulation of the outer lip. *N. rosseliana* is much larger than either of the above forms, is of a rich vinous brown tint, and is altogether different at a general glance. That the three forms possess a close relationship, and that they were derived from one original stock is perfectly evident, but having become isolated the differences which I have pointed out will probably be maintained, and in course of time possibly accentuated, and therefore I maintain that the "lumping" of these forms is not advisable. It is difficult to be consistent in one's views respecting the value of so-called species, especially when one's own species are in question. In this instance, however, putting aside all personal feeling, I think it would be better to retain the three forms, which occur on different islands, as distinct species rather than as varieties of one and the same species.

3. *Nanina infelix*, sp. nov.

Testa depressa, carinata, superne leviter conica, angustissime perforata, subtenuis, dilutissime fuscescens, subtus pallidior et nitida; anfractus 6, regulariter crescentes, lineis incrementi obliquis arcuatis, sculpti, convexiusculi, sed supra suturum impressi vel concavi, ultimus ad peripheriam acute carinatus, utrinque carinam impressus, antice haud descendens, inferne politus, radiatim tenuiter striatus; apertura mediocris, ad carinam angulata; peristoma simplex, margine supero tenui, inferiori arcuato, umbilicum versus leviter incrassato et reflexo.

Diam. maj. 24 millim., min. 21, alt. 12. Apertura 12 lata, 7½ alta.

This species from the mainland is about the same size as *N. divisa* from Sudest Island. It is more narrowly perforated, has a higher and more conical spire, and has no spiral striae like that species.

Mr. Hedley has mentioned a variety of *N. divisa* (var. *minor*) also from the mainland, "resembling the type in outline but smaller and lighter in colour." This may be the same as the form described above, the more conical spire and the absence of spiral sculpture having been overlooked.

*Hedley, loc. cit., p. 73.

ON THE
RELATIONS OF HESSE'S *DOTO UNCINATA*
TO THE GENUS *HANCOCKIA*.

BY WALTER GARSTANG, M.A., F.Z.S.,

Marine Biological Association, Plymouth.

HAVING recently had occasion to refer to M. Hesse's "Mémoire sur douze Mollusques Nudibranches nouveaux, recueillis en rade de Brest,"* I have been surprised to find, hidden under the unobtrusive heading *Doto uncinata*, the description, accompanied by three coloured figures, of an animal belonging to a much rarer and still more interesting genus than that to which M. Hesse has assigned it. The species, in fact, belongs very clearly to the genus *Hancockia* of Gosse† (= *Govia*, Trinchese.‡)

M. Hesse gives the following as the chief characteristics of his species:—Body elongated, of an intense carmine-red; frontal veil thin, provided on each side with an anterior trilobed appendage, bordered with green; rhinophores simple, of a clear green colour, arising from a conical sheath (wider above than below), with a rounded and entire margin, and of a carmine-red, bordered with green; "branchial lobes," four on each side, of relatively small size, each having an incised appearance and being composed of four hooked tubercles set over against one another, and together bringing about a resemblance to a developing fern leaf ("comme cela se voit dans la préfoliation des frugères"); colour of lobes carmine-red with a border of clear green; foot sharply truncated posteriorly; total length 5 mm.

M. Hesse draws attention to the exceptional peculiarities of his interesting capture; and his description and figures, moreover, are so clear and good that it is most remarkable to find that Prof. Bergh in his recent revision§ has disposed of *Doto uncinata* as a mere synonym of the common *Doto coronata*. The structure of the veil and especially of the pleuropodial ("branchial") lobes, together with

*Journ. de Conch., (2) xiii., 1875, pp. 308-314. Plats xii., xiii.

†Ann. Mag. Nat. Hist., (2) xx., 1877, pp. 216-219. Plate xi.

‡Mem. R. Acc. Sci. Inst. Bologna, (2) vii., 1886, pp. 173-181, one plate.

§System der Nudibranchiaten Gastropoden. Sempers' Reisen im Archipel der Philippinen (2) vi., xviii., 1867, p. 3646.

the posterior truncation of the foot, are most unusual characters, and are at once sufficient to indicate the natural position of the species within the genus *Hancockia*.

The distinctive features of the few recorded specimens of *Hancockia* (= *Gorvia*) have recently been tabulated in a most useful manner by Mr. Gamble,* and the smaller details are to be gained from the original papers of Gosse, Trinchese, and Gamble already cited. *Hancockia uncinata* (Hesse) apparently agrees with *H. eudactylota* (Gosse) in possessing a greenish epidermis, for this is the probable interpretation of the "clear green borders" which Hesse ascribes to the oral and pleuropodial papillæ in his specimens—a probability rendered very strong after a glance at the original figures. But *H. uncinata* differs from *H. eudactylota* and from *H. viridis* (Trinchese), and agrees with *H. rubra* (Tr.) in the absence of projections from the margins of the rhinophoral sheaths. Moreover, judging from Hesse's description and figures, *H. uncinata* differs from all the other species of the genus in possessing only three velar processes on each side, in the conspicuousness of the eyes, in the non-lamination of the rhinophores, and in the deep subdivision of the pleuropodial lobes into four close-set finger-like processes. It is possible that the two first of these differences are due to the immaturity of Hesse's specimens. It is also very probable that Hesse has described the rhinophores as simple from his having noticed only the "smooth columnar tips" of these structures, the peculiar basal bulb, which bears the rhinophoral laminae in *Hancockia*, having been retracted within the sheath. Criticism leaves us, therefore, only the very deeply incised character of the pleuropodial lobes (see Hesse, pl. xiii., fig. 3) in *H. uncinata* as unique within the genus. It is impossible at present to say whether even this feature is one of specific value. Mr. Gamble's specimen of *H. eudactylota* (7 mm. long.) comes nearest to Hesse's individuals in point of size, and it is significant that the incisions in the lobes are relatively deeper in his specimen (see his fig. 3) than in the larger individuals figured by Gosse (i.e., figs. f, g) and Trinchese (i.e., figs. 1, 6, 7). For the present, however, it is advisable to regard *H. uncinata* as a species distinguishable from the others by the character in question, especially as the habits of Hesse's specimens were altogether different from those which have been recorded for the remaining species. The latter have been invariably taken among algæ, and seem to have been phytophagous; while Hesse's specimens were greedily carnivorous, and were taken at Brest in

* Ann. Mag. Nat. Hist., (6) 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 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September, 1851, upon Hydroids (**Antennaria (sic) indivisa* and *Tubularia tricoides*) growing on the submerged guns of the frigate "Républicain," "qui, en sortant de la rade de Brest pour combattre les Anglais, se perdit, le 25 décembre 1794, sur la roche Maingant."

NOTE ON NOMENCLATURE.

By R. BULLEN NEWTON, F.G.S.,

London.

AN alteration in zoological nomenclature, when not supported by unimpeachable evidence, is surely open to severe criticism. The law of priority has been recently set aside in a paper published in the *Proceedings of the Zoological Society*, London, October 1st, 1892, entitled "On the Mode of Growth, and the Structure of the Shell in *Velates conoides*, Lamk." The name of the shell, hitherto so familiar to all students of the Paris Basin Eocene Mollusca as *Velates [Nerita] schmidelianus*, has been changed, on the supposition that the binominal system was not adopted by Chemnitz when, in 1786, he founded this species, in his famous work known as the "*Cochylien-Cabinet*." We are at a loss to comprehend how the author of this paper could have come to so erroneous a conclusion except by mistaking the value of Chemnitz's original description, which is headed with "*Nerita schmideliana sinistrorsa, fossilis*." Now the words "*sinistrorsa fossilis*" indicate the group to which the shell belongs, as it must be remembered that certain forms are being described which come under the division called "*Cochlæ petrificatæ sinistrorsæ*," and, so far as the meaning is concerned, their position in the sentence is immaterial, for we find that on p. 24 of the "Register" to this volume (ix., part i., pp. 24, 130), they are transposed, "*sinistrorsa*" standing last. Referring to the text itself, we find that Chemnitz uses some complimentary phrases in honour of his friend "Herrn D. Schmidel," after whom he states, ". . . habe ich die Neritam Schmidelianam genannt." We need not dwell further on extracts, for this one is sufficient to prove that the names employed there, and actually printed in Roman type to emphasize their value, are in perfect harmony with all our modern notions of binomial nomenclature.

Whilst congratulating the author on his carefully prepared paper, we must warn him against violating in future so important a maxim as the law of priority.

*By this name seems to be meant the *Antennularia indivisa* of Lamarck, which is the *Antennularia antennaria* of modern zoology; *Tubularia tricoides* is a name unknown to me.

ON THE NOMENCLATURE OF VELATES SCHMIDELIANUS.

By B. B. WOODWARD, F.G.S., F.R.M.S.,

British Museum, London.

I REGRET equally with Mr. Newton the disappearance from the list of the name *Velates schmidelianus*; alas! it was the very same laws of priority which he professes to champion, but so manifestly does not understand, that compelled the sacrifice. If anyone will take the trouble to turn to the early volumes of Martini and Chemnitz they will at once see that the binomial system is completely ignored therein, and it is only by chance that such an allusion in the text as that quoted by myself and referred to by Mr. Newton is made: moreover the descriptions, as he rightly terms them, are in one type: the first words read straight on with the rest, and there is no heading nor are there italics as misquoted by Mr. Newton in his note. It is manifest to any reasonable person that one cannot pick out a chance phrase in the text and ignore the fact that in the whole of the rest of the volume the authors obviously still adhered to pre-Linnæan methods, and were "wont to indicate a species not by a *name* comprised in one word, but by a definition which occupied a sentence," a method distinctly condemned in the Rules of Zoological Nomenclature as set forth in the British Association Reports for 1865 (p. 30).

It was only after careful deliberation, and with the advice of Mr. Edgar A. Smith and other competent naturalists, that the change in name was reluctantly made. In conclusion, I feel it my duty to warn the Law of Priority against Mr. Newton, who, in the guise of an over-zealous friend, has of late succeeded in doing much to damage the character of that otherwise respectable regulation.

ON THE STRUCTURE AND AFFINITIES OF SOME EUROPEAN SLUGS.

By WALTER E. COLLINGS,

Mason College, Birmingham.

FROM an experience gained by the examination of an exceedingly large number of British and Continental slugs, during the past three years, I am more than ever convinced of the fallacy of separating species on fine distinctions in any one system of organs, or from the

external morphology. It is only necessary to allude to the re-establishment of Nilsson's *Arion fasciatus*¹ for what has since been termed *A. circumscriptus*, Johnst., *A. bourguignati*, Mabiille, and *A. ambiguus*, Poll., and to the placing of the *Limax cinereo-niger*, Wolf,² as a variety of *L. maximus*, L., to illustrate my argument. In placing a sole reliance upon the reproductive system, I see a danger—it is upon this system that most of the species during the last few years have been founded—fairly constant as it is, certain slight anatomical variations are constantly occurring, as well as the comparatively unimportant ones due to age, season, habitat, &c., and if we are to arrive at conclusions of any value, malacologists must agree to allow a species to vary within a certain range, and to place less reliance upon the external morphology and lingual ribbon. Unless this is done, the malacologist of the future will be surrounded by a burdensome nomenclature and innumerable difficulties. The shell, in the slugs, is likewise of little or no service for generic or specific distinction, being liable from many causes to great variation. In the *Testacellidæ* and *Limacidæ* far too much importance has been attached to this structure.

Whether we shall ever agree upon a more rational method of creating new species of the Mollusca in this country it is difficult to say, but, I think it is slowly but surely occurring to many, what a great waste of time and energy is being spent by malacologists in this country upon purely secondary systematic points, and the little attention bestowed upon the more important morphological and embryological ones.

Our knowledge of the European slugs is mainly due to the works of Simroth, Lessona, Pollonera, and Baudouin, and if we hope to arrive at any true knowledge of those of our own country, it must be by careful comparisons with the Continental forms. I hope from time to time to describe in the "Conchologist" the more interesting forms that pass through my hands. For most of the specimens here described, I am indebted to the kindness of Signor Carlo Pollonera, of Torino, and for whose valuable criticism and assistance I offer my best thanks.

Arion subfuscus, Drap.

Locality: Vegesach bei Bremen.

These specimens were smaller, darker, and more uniform in colour than any specimens I have seen in the British Isles. Signor Pollonera informs me, however, that it is a species which, in

¹ Conchologist, 1869, II., p. 77.

² Annals and Mag. N. H., 1869, p. 425.

Italy, is subject to great variation. Accompanying the above were examples of the variety *fasciis-obsolētis*, from the Vallie du Cervo Piémont.

Arion fuscus, Müller, 1774.

Locality: Vegesach bei Bremen.

Beyond that this form is much smaller than *A. subfuscus*, Drap., and has the lateral bands darker and more prominent, I fail to see why it is separated from that species. The differences in the anatomy of the reproductive organs—which are the only ones—are but slight, and certainly not such as would justify it to rank as a species.

VAR. **stabilei**, Pollonera.

Locality: Maccugnaga, Val Anzasca, Piémont.

This form was described as a distinct species by Pollonera in 1885,³ but later was very rightly relegated to varietal rank.⁴

Arion citrinus, Wester.

I have not seen examples of this species, but from Westerland's description⁵ I think it is only a variety of the *A. fuscus*, Müll., without the lateral bands. I shall esteem it a great favour if some malacologist will favour me with a few examples for dissection.

Arion rubiginosus, Baudon, 1868.

Locality: St. Saulge, France.

Unfortunately these specimens were not in a suitable condition for anatomical examination. Probably allied to *A. subfuscus*.

Arion celticus, Pollonera.

Locality: Brest, France.

These agree externally with the specimens I have previously examined from the South of England.⁶ I have made repeated examinations of the anatomy of this form, and from the variable nature of the same, I feel it is impossible to regard it as a good species. Pollonera thinks that the differences in the reproductive organs and lingual ribbon are sufficient to separate it from *A. hortensis*, Fér.; but even were these differences constant, which I have not found to be the case, they are so slight that I think it better to regard it as a variety of *A. hortensis*, as I have done with a form varying in a similar manner, viz., the variety *caeruleus*, Cligé.⁷

³ El-nacimoll. rev. Piém., p. 28, Ari. Ann. Sc. Torino, 1885.

⁴ Spécie nuove e mal conosciute di *Arion* europei, Ilid. p. 15, 1889.

⁵ Exped. celt., 1871, p. 25.

⁶ Cerchologist, 1866, 2^o, p. 77.

⁷ Ibid., p. 26.

Arion alpinus, Pollonera.

Locality: Rivarossa, Piemont.

When Pollonera first described this species I had many doubts as to whether it was not a young form of *A. hortensis*. The specimens, however, which he has so generously sent me, have enabled me to make a very careful examination of the internal structure, from which I am inclined to support its specific distinction.

The rugæ of this species are interesting, and quite unlike those of any other *Arion* I am acquainted with. They are small, flat (?) and oblong, and arranged in distinct longitudinal rows.

Arion fasciatus, Nils.

— *A. bourguignati*, Mabille.

VAR. **miser**, Pollonera.

These specimens are from the Vallie du Grand St. Bernard. They show a prominent keel, and a distinct lateral band continued along each side of the mantle.

VAR. **neustriacus**, Mabille.

From Rivarossa. Similar in all respects to our British specimens.

Arion lusitanicus, Mabille, 1868.

Arion rufus, Morelet, Descr. Moll. Port., 1845, p. 29.

Arion lusitanicus, Mabille, Rev. et Mag. Zool., 1868, p. 134.

Arion lusitanicus, Pollonera, Nuove contrib. a. studio d. *Arion europæi*, 1889, p. 405, figs. 1-6.

Arion lusitanicus, Simroth, Die Nachtschnecken d. Port. Fauna 1891.

Arion lusitanicus, Collinge, Review of the *Arionida* of the Brit. Is., 1892, p. 7.

I have previously recorded this slug as a British species. At the request of a number of malacologists I am giving a description of what could be made out from the spirit examples I had. Possibly these will require some slight corrections when fresh material is examined.

A. lusitanicus may at once be distinguished from *A. empiricorum*, Fér., from the fact that it has only a single vestibule leading from the generative orifice. The vas deferens is unusually long and exhibits a distinct differentiation between the upper and lower portions. The retractor muscles are attached to the lower portion of the

oviduct and to the receptacular duct, this duct commences as a dilated tube, narrowing until it expands to form the receptaculum seminis, which organ is similar to that in *A. empiricorum*. The oviduct is short and opens into the vestibule as a broad tube, thus differing from both *A. empiricorum*, Pér., and *A. ater*, L.

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The first meeting of the above Society was held on Feb. 27th, at 67, Chancery Lane, London, W. H. Hudleston, F.R.S., in the chair, when there was a large attendance. After the election of officers, the following resolutions were submitted and carried :—

1. That the Society be called "The Malacological Society of London."
2. The annual subscription to be 10s. 6d., and the entrance fee 10s. 6d., this latter was suspended until the close of the year.
3. The meetings to be held from November to June, on the second Friday in each month, at 8.0 p.m.

The Council were requested to draw up the rules of the Society and the same will be submitted at the next meeting, April 14th.

The membership of the Society is already over seventy.

NOTES.

Clausilia (*Stereophaedusa*) *valida*, Pfr., var. nov. *fasciata*.

Cl. valida var. β Pfr., Zeit. f. Malak., p. 106, 1849.

" " " Mon. Hel. Viv., iii., p. 591.

Habitat: Lieu-Chien.

Castanea, ad suturam luteo fasciata, apertura intus fusca, lamella sub-columellaris non tam emersa quam in forma typica.

This variety differs from the type in its dark chestnut colouring with light yellow sutures, in place of the uniform yellow; the lamella sub-columellaris is not so prominent, and the interior of the mouth is dusky in place of white. The shell is more inflated than the typical form.

I have a specimen from the Morelet Collection, and there are two in the British Museum from the Cuming Collection. Probably many others are known. — E. R. SYKES, B.A., F.Z.S.

Note on the Genus *Phenacaron*.

On page 86 of the December number, Mr. Collinge refers to the questionable validity of this genus. Full information regarding it may be found in Mr. W. G. Binney's 3rd and 4th Suppls. to Terr. Moll. U.S. (1890 and 1892), where the two known species are figured, with their genitalia, &c. It may, however, be worth while to publish the following notes on the subject, which I wrote before I left Colorado, but have kept in MS. When these were written, Mr. Binney's latest work, in which a different view is taken, had not appeared.

PHENACARION.

This genus, founded on *foliolatus*, Gould, and var. *hemphilli*, W. G. Binney, may be regarded as a subgenus of *Prophysaon*. The presence of a mucous-pore can hardly perhaps suffice to distinguish a genus, and there are no other characters of generic value.

In Europe, the subgenus *Iselia*, Bourguignat, of *Daudebardia* is founded on a similar distinction.

Some forms seem rather intermediate between *Prophysaon* proper and *Phenacaron*. Mr. Binney writes that five out of fifty examples of a *Prophysaon* found by Mr. Hemphill on San Juan Island, show some sort of a caudal pore. *Prophysaon andersoni*, J. G. Cooper was supposed to have some sort of a caudal pore, and indeed, a living example of form *marmoratum* sent me by Dr. Cooper had a kind of pit at the tail, probably a rudimentary pore.

A specimen of *foliolatus*, found by Mr. Hemphill at Seattle, and sent to me by Mr. Binney, seemed to have a distinct functional pore, which appeared in the contracted slug as a crescentic groove, with its concave side upwards. Mr. Binney sent me some specimens of *foliolatus* var. *hemphilla* from near the mouth of the Chehalis River, but they were very much dried up. So far as I could judge, they seemed of the same species as *foliolatus*, but the figure and description in Mr. Binney's 3rd Suppl. Terr. Moll. of *hemphilli* certainly appear to indicate a distinct species.

It is now regarded as a distinct species by Mr. Binney. — T. D. A. COCKFELL, F.Z.S., F.E.S., Institute of Jamaica, Kingston, W.I.

Some New Forms of Slugs.

(1) *Prophysaon andersoni* var. *suffusum*, v. nov., 25 millm. long (in alcohol), like *P. hemphilli*, but reticulations of body more sub-divided, regular, and distinct. Colour grey-black, without markings, sides and edge of mantle paler. Sole pale greyish ochreous, conspicuously transversely wrinkled. Jaw dark, ribbed. Genitalia as in *P. hemphilla* (which I consider a variety of *andersoni*), penis-sac remarkably short and thick, not at all tapering; hermaphrodite gland black, imbedded in liver.

Chehalis, Washington, U.S.A., one specimen, collected in 1889 by Mr. Hemphill, and sent to me by Mr. W. G. Binney.

(2) *Prophysaon fasciatum* var. *obscurum*, v. nov. 20 millm. long (in alcohol), like the typical form, but penis-sac narrower and more tapering, and colouration different. Mantle black, with pale marbling at edges; body grey, very dark above, with obscure dark lateral bands. Sole dark grey.

Chehalis, Washington, four specimens collected with the last, and sent to me by Mr. Binney.

(3) *Eulimax brandtæ* var. *subunicolor*, v. nov. Length 34 millm. (in alcohol). Yellowish-ochre, unicolorous, except slight greyish mottling on the back. Keel same colour as body, as also the spotless mantle and unicolorous sole.

Caucasus: one specimen in British Museum.—T. D. A. COCKERELL, F.Z.S., F.E.S., Institute of Jamaica, Kingston, W.I.

On the Identification of *Pisidium nitidum*, Jenyns.

Experience has proved to me that not one conchologist out of every twenty really understands what the *Pisidium nitidum*, Jenyns, is, and in still fewer collections is it rightly represented. What is usually termed *nitidum* is a glossy form of *P. pusillum*, which is not at all uncommon. *P. nitidum* is the rarest of our British *Pisidia*, and the only species that may be described as always possessing a distinctly white foot. This organ in *P. amnicum*, Mull., *P. fontinale*, Drap., *P. henslowianum*, Shepp., and *P. cinereum*, Alder, being usually tinged more or less with grey, while in *P. pusillum*, Gmel., and *P. nitidum*, Hald. (= *P. roseum*, Jeffreys) it is often orange-yellow or rose-colour, otherwise there is nothing of special note about the foot or mantle, the latter, like that of most of the *Sphaeriida*, is fringed with a grey line.

The most distinctive external feature, perhaps, is the form of the siphon. It is a short funnel-shaped tube, the mouth of which is palatous, crenated, and distinctly plicated. "These appearances," says Jenyns, "are not always obvious, unless the siphon is protruded by the animal to its utmost extent; the mouth of the tube, which is rendered very dilatable in consequence of the plaits, then becomes fully expanded, and the irregularity of its partially reflexed margin is rendered distinctly visible." After the animal has been killed in boiling water, by a little careful manipulation, and with the aid of a pocket lens and a couple of fine needles, most of the above-mentioned features can be easily made out.

The shell is smaller than that of *P. pusillum* and seldom varies. It is thin, and marked with numerous fine regular, concentric striae; the epidermis is very thin and extremely glossy, the umbones are prominent, broad, blunt, and swollen, encircling them are three or four yellowish-white coloured striae, marking them off somewhat conspicuously; the anterior side is somewhat truncate and rounded; the posterior side very slightly produced, abruptly sloping downwards, and the ventral margin rounded.—WALTER E. COLLINGE.

CURRENT LITERATURE.

In order to make the following Bibliography as complete as possible, the Editor invites the assistance and co-operation of British and foreign authors. All communications should be addressed to The Editor, the "Conchologist," Mason College, Birmingham, England.

MALACOLOGY IN GENERAL.

Simroth, H.—Bronn's Klassen und Ordnungen des Thier-Reichs. iii. Mollusca. Re-written by Dr. H. Simroth. Parts I. and II. pp. 1-66. Leipzig, 1892.

Simroth commences the new edition of Bronn's "Mollusca" with a review of the history of Malacology. He recognises three eras:—(1) The prehistoric (or culinary!) era, as evidenced by the shell-mounds of prehistoric man; (2) the era of collection and crude systematisation, from Aristotle to nearly the close of the

8th century; and (3) the last 100 years. This third era is divided into two periods:—(a) pre-Darwinian—characterised by the application of anatomy to systematic work (this might, in our opinion, have well been termed the Cuvierian period); and (b) the post-Darwinian—characterised by the morphological and other investigations pursued in the light of the doctrine of descent.

These investigations have given rise to the publication of numerous antagonistic or supplementary schemes of Molluscan classification, and Simroth gives a very useful series of synopses of the more important of these schemes. We eagerly look forward to the succeeding numbers of this new edition of Bronn's invaluable work.—W. G.

Tomlin, B.—*Rissoa membranacea*, Adams. Brit. Nat., 1892, p. 257.

STRUCTURE AND DEVELOPMENT.

André Emile.—Sur les téguments de *Zonites cellarius*. Zool. Anz., 1893, xvi., pp. 39-40, one figure.

The author briefly describes the occurrence of a number of peculiar little pits in the skin on the right side (only) of the body in *Z. cellarius*. They are invaginations of the ectoderm, either simply pyriform or slightly branched; but their function is altogether uncertain.

Collinge, Walter E.—On the Absence of the Male Reproductive Organs in two Hermaphrodite Molluscs. Journ. Anat. and Phys., 1893, pp. 237-8.

Erlanger, R. v.—Mittheilungen über Bau und Entwicklung einiger marinen Prosobranchien. I. Ueber *Capulus hungaricus*, Zool. Anz., 1892, xv., pp. 465-468.

The author finds that *Capulus hungaricus*, like most Monotocardia, is provided with a "nephridial gland"; and he has attempted, by an embryological investigation upon this form, to ascertain the truth of R. Perrier's hypothesis, that the nephridial gland is the homologue of the definitive left (primitive right) nephridium of the Dictocardia and Heterocardia.

It cannot, according to Erlanger, be the homologue of the primitive right nephridium, because strong evidence tends to show that it is the primitive right nephridium which retains its function in Prosobranchs provided with only one nephridium. It is quite possible, however, that the gland corresponds to the primitive left nephridium; in which case a pair of nephridia, or at least a pair of nephridial rudiments, should be demonstrable in the embryos of such forms as *Capulus*, which possess a nephridial gland and a single nephridium in the adult.

The chief observations made by the author are as follows:—In the segmentation of the ovum a typical 4-cell stage occurs. The mouth appears to correspond to the part of the blastopore which is last kept open. From the point where stomodæum meets archenteron a coelomic pouch (really paired?) projects on each side. This breaks down, and pericardium and nephridium are derived from a common rudiment which is built up from the mesoblast on the right side of the still symmetrical larva. This rudiment migrates to the left and dorsally; and soon differentiates into pericardium (in which the heart develops) and nephridium. The latter is an unpaired epithelial sac. The actual origin of the "nephridial gland" could not be observed; but the author, failing to establish Perrier's hypothesis, inclines to the view that the gland is a differentiation of the tissue of the nephridium, or an ectodermal gland-formation, which has secondarily fused with the nephridium.

In the general development of gut, mantle, and shell, *Capulus* resembles *Eythia*. Internal *Urniereu* are absent; a large pale nucleated ectoderm-cell on each side behind the velum represents the so-called external *Urniere*. Larva transparent; velum highly developed; foot provided with an operculum (absent in adult); shell wound as in other veligers (unwound and symmetrical in adult).

Erlanger, R. v.—II. Ueber einige abnorme Erscheinungen in der Entwicklung der *Cassidaria echinophora*. Zool. Anz., 1893, pp. 1-6, 3 figures.

The author finds that in *Cassidaria echinophora* only a very small percentage of the deposited ova develop normally and arrive at the veliger condition. The majority undergo irregular segmentation, and ultimately serve as food for the normal embryos, or perhaps occasionally develop into dwarf-embryos. Out of some 300 ova laid in each capsule, the number of normal embryos and larvæ is only from 4 to 12; and of diminutive abnormal embryos from 2 to 4. The occurrence of this large proportion of malformations in the development of *Cassidaria* is attributed by Erlanger, not to the possible failure of fertilisation, but to the overcrowding of ova in the egg-capsules.

Erlanger, R. v.—Bemerkungen zur Embryologie der Gastropoden.—I. Ueber die sogenannten Urnierren der Gastropoden. Biol. Centr., 1893, xiii. i., pp. 7-13.

Erlanger summarises our knowledge of the provisional kidneys (*Urnieren*) of larval Mollusca. They may be either entirely ectodermal (marine Prosobranchs), entirely mesodermal (Opisthobranchs), or composed of both mesodermal and ectodermal elements (freshwater Prosobranchs, Pulmonates, Lamellibranchs). He regards them all as homologous organs, bearing somewhat the same relations to the segmentation cavity as do the permanent nephridia to the coelom. They are homologous with the excretory organs of Rotifers, and their co-existence with permanent nephridia is by no means to be regarded as evidence of incipient metametism.

Grobben, C.—Beiträge zur Kenntniss des Baues von *Cuspidaria (Neora) cuspidata*, Olivi, nebst Betrachtungen über das System d. Lamellibranchiaten. Arb. Zool. Inst. Wien, 1892, x. ii., pp. 1-46, 4 pls.

Prof. Grobben gives an admirable account of the anatomy of *Cuspidaria cuspidata*, supplementary to, and in one or two details correcting the previous observations of Pelseneer and Dall upon species of the same interesting genus. In the main, however, Pelseneer's lucid interpretation of the structure of *Cuspidaria* is confirmed. The characteristic "branchial septum" is here perforated by five pairs of slits, provided with valves on their dorsal margins, as described by Pelseneer. Its surface is formed by a low pavement epithelium covered by a cuticular coating. Cilia are absent except in the immediate region of the branchial slits. The septal muscles are composed of long, flattened, unicellular fibres, which, unlike those of the other muscles, are transversely striated. Grobben agrees with Pelseneer in homologising the septum with the right and left lamella of the typical bilamellate gill plumes, the outer lamella of each side having degenerated, and the gill-axis being represented by the lateral union of septum and mantle. The fused lamellæ have lost, however, both branchial structure and respiratory function; and have become converted into an accessory muscular arrangement for producing a respiratory current. The transverse striation of the septal muscles indicates a power of rapid contraction. By alternate contraction and relaxation, the septum probably acts like the piston of a suction-pump, water entering through the branchial siphon, passing into the upper chamber through the valvular slits, and out again through the exhalent siphon.

The nephridia consist each of a dorsal and a ventral limb connected posteriorly, but their structure is somewhat peculiar.

The former is a broad, flat, lobulated and glandular sac, opening by a small aperture in its floor anteriorly into the mantle-cavity; the two nephridial sacs are anteriorly in open communication with each other through a short transverse connecting duct. The ventral limb of each nephridium is a narrow non-glandular opening in front into the pericardium by a ciliated funnel; the nephridial tube lies buried in the floor of the glandular sac and seems to have been overlooked by Pelseneer in *C. striata*.

Circulation is effected without blood-vessels through a series of sinuses. The blood is arterialised, not in the branchial septum, but in the lacunae of the internal lamella of the mantle. The ventricle lies with its posterior part immediately above the rectum, but is not penetrated by it, as it is in *C. rostrata* (Pelseneer).

C. cuspidata is diceious. The testis is provided with an accessory gland, probably mistaken by Pelseneer for an ovary in *C. rostrata*. Pelseneer's conclusion that *C. rostrata* is hermaphrodite is probably erroneous.

The author approves of Pelseneer's formation of a group "*Septibranchia*" for the genera *Poromya*, *Slenia*, and *Cuspidaria*; but, owing to the near affinity of these genera to the *Anatinidae*, he would give the group the value of a sub-order at most, certainly not of a sub-class, as proposed by Pelseneer. Grobben's views upon the general classification of the Lamellibranchiata are noted on p. 124.—
W. G.

Hecht, E.—Remarques sur quelques moyens de défense des Eolidiens. Compt. Rendus, 1892, pp. 746-8.

Henscher, J.—Anatomy and Histology of *Proneomenia sluiteri*. Vierteljahrshchr. Nat. Ges. Zurich, xxxvii. pp. 148-61.

Jhering, H. von.—Der Gastung *Hyalina*. Nach. Deutsch. Malak. Gesell., 1892, pp. 132-40.

Mazzarelli, G.—Ricerche anatomiche sul *Lobiger Serradifalci*, Calcare. Boll. Soc. Nat. Napoli, 1892, pp. 98-101.

Preliminary to the next memoir and containing an abstract of the chief results. The liver is, however, described as unramified and solid like that of Tectibranchs, whereas in the latter paper it is stated to consist of ramified tubes packed closely together.

Mazzarelli, G.—Ricerche sulla Morfologia della Oxynoidea. Mem. Soc. Ital. Sci., 1892 (3) ix., pp. 1-33, 3 plates.

This is a valuable contribution upon the anatomy of *Lobiger* and the relations of the Oxynoidea to the Tectibranchia and Ascoglossa, between which groups the family holds an intermediate position.

Pharynx provided with a uniserial radula, a radular sac for the fallen teeth (ascon of Ascoglossa), and an enormous cecum with muscular walls corresponding to the *Saugtröpfel* of Beigh. Only one pair of salivary glands (= the first pair of Ascoglossa). An oesophageal diverticulum. *Liver* compact, as in Tectibranchs, but composed of branching tubes as in Ascoglossa.

Mantle-cavity distinct, resembling, like the *shell*, that of the Bulloidea. *Gill* folds depending from roof of mantle-cavity, and lying below the nephridium. It represents a ctenidium in process of disappearance. *Nephridium* posterior, in roof of mantle-chamber, highly lobulated, provided with a long ciliated veno-pericardial canal, and opening into mantle-cavity near anus by a simple pore. The nephridium thus differs from that of Ascoglossa and resembles that of many Nudibranchia. Nephridial lobules surrounded by blood lacunae. The blood which traverses the lacunae between nephridium and gill passes anteriorly to enter the auricle. The ventricle gives off the aorta which is without any dilatation at its origin.

The *nervous system* is concentrated and resembles that of the Ascoglossa. There are two cerebral, two "visceral" (= pleural), and two pedal ganglia. There are also two buccal ganglia, but neither optic nor tentacular ganglia. There is a branchial ganglion; and a distinct "Spengel's organ" lies in immediate contact with it, as in Bullidae and Aplysidae.

The *foot* is provided with a diffuse anterior pedal gland. The two pairs of pleuropodial swimming lobes are innervated from the pedal ganglia.

The *generative organs* are fundamentally Ascoglossan, but are remarkable in possessing a complete separation of the hermaphrodite gland into an ovary and

a testis (cf. *Tergipes capellinii*, Trinchese). This arrangement is a further development of the condition which Maffarelli finds in the Pleurobranchidæ,* and in *Pelta* (= *Runcina*), where the ova and spermatozoa arise in separate follicles.

The author concludes that the Oxynocidæ represent the most primitive Ascoglossa, derived phylogenetically from the more primitive Tectibranchs (Bulloidea), near the point of origin of the Pleurobranchia. The Ascoglossa are not "specialised Æolids" (Pelseneer); but the possible origin of the Æolids from the Ascoglossa (Bergh) remains to be decided.

Rawitz, B.—The Structure of the Posterior Salivary Glands in the Cephalopods. *Arch. f. mikr. Anat.*, xxix., pp. 596-611.

Thiele, J.—Beiträge zur Kenntniss der Mollusken. II. Über die Molluskenschale. *Zeit. f. wiss. Zool.*, lv., pp. 220-51, 1 pl.

Starting with the shell of *Chiton* the author carefully describes its structure and its relationship to that of the underlying mantle. The shell consists of four layers: Periostracum, Tegmentum, Articulamentum and Hypostracum. The periostracum is produced by the outerside of the mantle edge, the tegmentum arising from its inner side.

Turning next to *Arca*, he discusses the triple fold in the mantle edge and the part played by it in the formation of the shell, which last consists of two layers: Ostracum and Hypostracum. The tegmentum of *Chiton* is equivalent to the ostracum, whilst in the Pelecypoda there is no layer corresponding to the articulamentum.

In *Lithodomus dactylus* the ostracum consists in great part of pearl as in *Nucula*.

The author has investigated the structure of the shell of *Patella* and finds that in *P. carukia* the outer layer is like that of *Arca*. In *Nautilus* the deposition of hypostracum is confined to the limits of the muscular impression and the septa, and the author considers that muscles are never attached to any other layer.

The paper concludes with a review of the more recent literature: it is a pity, however, the author has not looked up the older writers.—B.V.

VARIATION.

Cockerell, T. D. A.—The Soft Parts of Snails. *Journ. Inst. Jamaica*, 1893, pp. 178-9.

Gain, W. A.—Notes on Varieties. *Brit. Nat.*, 1892, p. 254.

Gredler.—*Helix pomatia*. L., v. nov. *gratiosa*. *Nachr. Deutsch. Malak. Gesell.*, 1892, pp. 174-5.

Sykes, E. Ruthven.—On some Monstrosities of *Littorina rudis*, Maton. *Proc. Dorset N.H. and A.F. Club*, 1892, xiii., pp. 191-8, 1 pl.

CLASSIFICATION, NOMENCLATURE, NEW GENERA, AND SPECIES.

Adams, L. E.—The examples of *Zonites cellarius* in the Montague Coll. at Exeter. *Journ. Conch.*, 1892, p. 119.

Ulrich, T. A.—A New Land Shell from Sumatra. *Nautilus*, vi., p. 90.

Boettger, O.—New *Stenogyra* from W. Africa, and a new *Aperostoma* from Honduras. Nachr. Deutsch. Malak. Gesell., 1892, pp. 202-4.

Dr. Boettger describes, under the new section *Pseudoglossula* (created for the reception of such forms as *calabarica*, Pfe., from W. Africa), *P. heteracea* (Cameroons), and *P. subcrenata* (Akkra), also *Aperostoma goldfussi*, from N. W. Honduras.

Grobben, C.—Das System der Lamellibranchiaten. Zool. Anz., xv. pp. 371-5.

This paper is practically an abstract of the concluding section of Grobben's memoir on the anatomy of *Cuspidaria* (*vide supra*), and reference should be made to the complete memoir for a fuller statement of the arguments here employed. The author discusses the value in Lamellibranch classification of modifications in the structure of the gills. He regards Pelseener's attempt to found a system based exclusively upon gill-structure as unsuccessful, just as unsatisfactory as systems based exclusively upon the type of hinge. The scheme which he adopts commends itself to us as a temperate compromise between Neumayr's system founded upon the shell, and Pelseener's based upon anatomical grounds. The chief features of Grobben's system will be found in the synopsis here given:—

Class: LAMELLIBRANCHIATA.

Sub-class i.—Protobranchiata.—Neumayr's *Palæoconcha*, together with *Nuculida*.

„ ii.—Desmodonta.—*Myida*, *Septibranchia*, *Gastrochneida*, &c.

„ iii.—Ambronodonta.

Order 1.—Eutaxodonta.—*Arcida* only.

„ 2.—Heterodonta.—*Astartida*, *Solenida*, *Donacida*, &c.

„ 3.—Schizodonta.—*Trigonida*, *Najada*.

„ 4.—Anisomyaria.—*Aviculida*, *Mytilida*, *Pectinida*, *Ostreida*, *Anomida*, &c.

The author leaves the mode of subdivision of the Desmodonta to be decided by further researches.—W. G.

Hartman, W. H.—Catalogue of the Genus *Partula*. Nautilus, vi., pp. 73-6 and 97-9.

Hedley, C.—On the Genus *Perrieria*. Proc. Linn. Soc., New South Wales, vii., pp. 311-13.

Mr. Hedley states that *hayardi*, Ad. and Ang., is the type of *caliaxis*, and not *exigua*, as stated by Fischer in his manual [Fischer only stated that the *exigua* was an example of *caliaxis*, not that it was the type] and proposes that *Perrieria* (1878) should include *clausiliformis*, Tap. Canefri, and *australis*, Forb., of which latter he states that *exigua* is only a synonym. He is convinced that *exigua* did not come from the Solomon Islands.—E. R. S.

Jhering, H. v.—Ueber *Atopos*. Nachr. Deutsch. Malak. Gesell., 1892, pp. 140-4.

Jhering, H. v.—*Naiades* from San Paulo, &c. Arch. für Naturgesch., Jahr. 59, pp. 45-140, pl. iii-iv.

Jordan, H. K.—Report on some species of the genera *Buccinum*, *Buccinopsis*, and *Fusus* dredged off the S.W. of Ireland. Proc. Roy. Ir. Acad. ser. 3, vol. ii., pp. 391-6.

Martens, H. v.—New species of L. and F. W. Moll. from Uganda and the Victoria Nyanza. Sitz. Ber. d. Ges. Nat. Fr. zu Berlin, 1892, pp. 15-19.

Martens, H. v.—Four new African Shells. Ibid., p. 181.

Melville, J. Cosmo.—Notes on *Cypræa chrysalis* and *C. amphithales*. Journ. Conch., 1892, p. 120.

- Melville, J. Cosmo, and Ponsonby, J. H.**—Descrs. of 13 new species of Terrestrial Moll. from S. Africa. *Ann. and Mag. N. H.*, 1893, pp. 19-24, pl. iii.
- Nelson, W., and Standen, R.**—Obs. on the Misplacement of the Names of type and var. in *Hy. pura*. *Journ. Conch.*, 1893, pp. 151-3.
- Pilsbry, H. A.**—A new Marine Gasteropod from New Jersey. *Proc. Acad. N. S. Philad.*, 1892, p. 328, pl. xiv.
- Pilsbry, H. A.**—On *Acanthopleura* and its sub-genera. *Nautilus*, vi., pp. 104-5.
- Pilsbry, H. A.**—A new Trochid from Japan. *Ibid.*, pp. 105-6.
- Rosen, C.**—L. and F. W. Moll. from Transcaspia. *Nachr. Deutsch. Malak. Gesell.*, 1892, pp. 121-126.
- Simpson, C. T.**—On the Revision of the *Unionide*. *Nautilus*, vi., pp. 78-80.
- Simroth, H.**—*Vaginula schneideri*. *Beson. Ab. Betrich. d. Naturf. Gesell.*, 1892.
- Simroth, H.**—Einige Bemerkungen zu vorstehenden Aufsatz. *Nachr. Deutsch. Malak. Gesell.*, 1892, pp. 144-9.
- Simroth, H.**—Ueber einige Raublungenschnecken des Kankasus. Leipzig, 1892, 14 pp., 1 p.
- Smith, Edgar A.**—Descr. of a new sp. of *Nucula*. *Journ. Conch.*, 1892, p. 110.
- Smith, Edgar A.**—Descr. of a new sp. of Slug from S. Africa (*Apera burnnupi*). *Ann. and Mag. N. H.*, 1893, pp. 465-6.
- Stearns, F. E. C.**—Prelim. descrs. of new Moll. from W. American Regions. *Nautilus*, vi., pp. 85-9.
- Sterki, V.**—*Bifidaria*, a new sub-genus of Pupa. *Ibid.*, pp. 99-101.
- Westerlund, Dr.**—New Land Moll. from the Palearctic Region. *Nachr. Deutsch. Malak. Gesell.*, 1892, pp. 185-201.
- The following are described, without figures, as new species—*Xerophila mutua*, *X. penula*, *X. adina*, *X. horridula*, *X. embryonata*, *Macularia leucochila*, *Maistas hispalensis* (all from Seville); *Yorquilla refuga* (Palermo), *T. homala* (Sicily), *T. retracta* (Seville), *Pupilla hamata* (Italy); *Ferussacia virginea* (Seville), *Cacilianella gattoi*, *C. melitensis*, *C. pollonera* (all from Malta); *Bulinus clathratus* (Seville), *Pomatias erchicus* (Sicily), *Neritina mixta* (Seville), and a number of new varieties, which we refrain from transcribing. What useful purpose is attained by the publication of these so-called new species, we are at a loss to imagine. Nothing is better calculated to degrade the true interest of the science, and to heap up difficulties for those whose task it will be in future years to consign these fanciful creations to the obscurity they deserve.—A. H. C.
- Woodward, B. B.**—Classification of the Pelecypoda: Fischer's Families rearranged in accordance with Pelseneer's Scheme. *Ann. and Mag. N. H.*, 1893, xi., pp. 156-9.
- Wright, S. H. and B. H.**—On the Revision of the American *Unionide*. *Nautilus*, vi., pp. 80-1.

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- Cockerell, T. D. A.**—Slugs injuring coffee plants. *Notes from the Mus. Inst. of Jamaica*, 1893, No. 34.
- Dean, Dr.**—The Physical and Biol. Char. of the Natural Oyster Grounds of S. Carolina. *Bull. U. S. Fish Comms.*, 1892, pp. 335-61, pls. lxii-lxvii.

- Long, F. C.—Collecting *Pal. contracta*. Nat. Journ., 1892, p. 52.
- Simroth, H.—Ueber Mimicry einer *Psychide* einer *Clausilie*. Natw. Wochenschr., vii., p. 407.
- Taylor, G.—Notes on *Arnaea sacharina* (L.). Nautilus, vi., pp. 89-90.
- Wolton, F. W.—The Life-history of *A. ater* and its power of self-fertilisation, Journ. Conch., 1893, p. 158.

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- Adams, L. E.—A theory as to the possible introduction of *Hy. (Paludestrina) jenkinsi*. Journ. Conch., 1893, pp. 148-50.
- Adams, L. E.—*Hyalina glabra* in Northamptonshire. Ibid., p. 150.
- Anon.—Marine Moll. of Killala Bay. Irish Nat., 1893, p. 55.
- Boettger, C.—Die Meeresschnecken der mittleren Liukiu. Nachr. Deutsch. Malak. Gesell., 1892, pp. 153-68.
- Commerces with the enumeration of 12 land species. Of these the following are new:—*Ennea (Microstrophia) densecostata*, and *Trochomorpha fritzei*. There is nothing very remarkable among the marine species, which are all of a pronounced Indo-Pacific type. *Monilea fritzei* is described as new. The new species are not figured.
- Broeme, Dr.—Zur fauna von Lugano. Ibid., pp. 171-3.
- Caziot.—Terr. Moll. de Bandon., Feuil. d. Jeu. Nat., 1893, pp. 61-2.
- Durrant, H.—Shells near Dudley. Nat. Journ., 1892, p. 56.
- Elgar, H., and Lamb, H.—List of L. and F.M. occurg. in the Maidstone dist. Journ. Conch., 1893, pp. 154-7.
- Gain, W. A.—The Moll. of Nottinghamshire. Brit. Nat., 1893, pp. 3-5.
- Garstang, W.—On some new or rare Marine Animals discovered on the Coast of Devonshire. Rpt. and Trans. Dev. Assocn., xxiv., pp. 377-86.
- Hart, H. C.—*Spirula*, *Ianthina*, and *Veletta* at Lough Swilly. Irish Nat., 1893, p. 55.
- Heathcote, W. H.—*Acicula lineata*, v. *alba*. Sci. Goss., 1893, p. 47.
- Herdman, W. A.—Sixth Ann. Rpt. of the L'pool Marine Biol. Comm., &c., 1893, pp. 1-55, pls. i-vi.
- Hey, W. C.—Conch. Notes fr. W. Ayton and Scarborough. Nat., 1892, p. 368.
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- Krause, A.—*Helix ericetorum* and *H. candicans* from Landsberg. Sitz. Ber. d. Ges. Nat. Fl. zu Berlin, 1892, p. 141.
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- Mackay, H.—In search of Shells. Nat. Journ., 1892, p. 49.

- McMurtrie, J.**—Notes on the L. and F. Moll. of the Is. of Uigg. *Journ. Conch.*, 1892, p. 113.
- Mariens, E. v.**—On the L. and F. Moll. collected by Dr. Stuhlmann in N. E. Africa. *Sitz. Ber. d. Ges. Nat. Fr. zu Berlin*, 1892, pp. 175-81.
- Milne, J. N.**—*Planorbis riparius*, Westr., an addition to the British Fauna. *Irish Nat.*, 1892, p. 192.
- Oldham, Charles.**—Additions to the South Devon List of L. and F. Moll. *Journ. Conch.*, 1892, p. 108.
- Pilsbry, H. A.**—Notes on a coll. of Shells from the State of Tobasco, Mexico. *Proc. Acad. N.S. Philad.*, 1892, pp. 328-41, pl. xiv.
- Rope, G. T.**—Notes on some L. Shells coll. at Much Hadham, Herts. *Zool.*, 1893, p. 1.
- Scharff, R. F.**—Our new *Planorbis*, *P. reparius*, Westr. *Irish Nat.*, 1893, p. 55.
- Scharff, R. F.**—*H. nemoralis* in the Pyrenees. *Journ. Conch.*, 1893, p. 157.
- Scott, T.**—*Eledone cirrosa* in the Firth of Forth. *Ann. Scot. N.H.*, 1893, p. 50.
- Sampson, F. A.**—Shells of William's Canon, Colorado. *Nautilus*, vi., p. 102.
- Sargent, F. E.**—Annotated list of Alabama Land Moll. *Nautilus*, vi., pp. 76-8.
- Warren, Amy.**—Contrib. towards a list of the M. Moll. of Killala Bay, Ireland. *Journ. Conch.*, 1892, p. 98.

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- Amalitzky, W.**—Ueber die Anthracosien der Permformation Russland. *Palæontographica*, xxxix., pp. 125-212, 5 pls.
- Describes many new species of *Carbonicola*, *Anthracosia*, *Palæomutela*, n. gen. (with hinge like *Mutela*), *Oligodon*, n. gen. (with similar hinge) and *Najadites*.
- Brusina, S.**—Ueber die Gruppe der *Congerina triangularis*. *Zeit. d. Deutsch. Geol. Gesel.*, 1892, xlv., pp. 488-97. *C. hocnensi* and *ornithopsis*, n. sp.
- Canavari, M.**—*Spirulirostrina levisatoi*. N. gen. and n. sp. of fossil cephalopod from the Tertiary of Sardinia. *Bull. Soc. Mal. Ital.*, xvi., p. 65, 1 pl.
- Resembles *Belosepia* and *Belemnosis* in some points; it is, however, devoid of any true rostrum, whilst the phragmaccone is of considerable length. Siphon median and ventral. Exterior ornamented with minute granulations.
- Crandall, O. A.**—Post Pliocene Shells. *Nautilus*, vi., p. 103.
- Dall, W. H.**—Determination of the dates of publication of Conrad's "Fossils of the Tertiary Formation," and "Medial Tertiary." *Bull. Phil. Soc.*, Washington, 1893, xii., pp. 275-40.
- Futterer, K.**—Die oberen Kreidebildungen d. Umgebung d. Lago di Santa Croce in der Venetianer Alpen. *Palæont. Abhandl. N.F.*, ii., p. 124, 12 pls.
- Hudleston, W. H.**, and **Wilson, E.**—A Catalogue of British Jurassic Gastropoda. pp. xxxiv. and 147, London, 1892.

- Loewinson-Lessing, F.**—Les ammonées de la zone à *Sporadoceras Munsteri*, dans les monts Goubertinskya Gorz. Mem. Soc. Belg. d. Géol. vi., pp. 15-25, 1 pl.
- Oppenheim, P.**—Ueber innere Gaumenfalten bei fossilen Cerithien und Melaniaden. Zeit. d. Deutsch. Geol. Gesell., xlv., pp. 439-46, fgs.
- Oppenheim, P., and Beyrudi, E.**—Neue Fundpunkte von Binnenmollusken im Vicentinischen Eocän. Ibid., pp. 500-3.
Three species of *Helix*, *Planorbis*, *Melanopsis*, *Cyclotus*, and some new forms not yet described.
- Picaglia, L.**—Molluschi terrestri e fluviali viventi nelle Provincie di Modena e reggio. Bull. Soc. Mal. Ital., xvi., pp. 83-129.
An exhaustive monograph, with list of Tertiary forms.
- Picard, K.**—Ueber *Balatomites andersshanus*, n. sp. Zeit. d. Deutsch. Geol. Gesell., pp. 483-7, 1 pl.
- Siemiradzki, J. von.**—Die oberjurassische Ammoniten-Fauna in Polen. Ibid., pp. 447-82.

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- Stein, Dr. J. G. Am.**—Obituary Notice of. Nachr. Deutsch. Malak. Gesell., 1892, pp. 175-6.

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- Durrant, H.**—Collecting, Preserving, &c. L. and F. S. Nat. Journ., 1892, p. 66, 1893, pp. 77 and 89.

EDITOR'S NOTES.

On another page we give details of the first meeting of the Malacological Society, which is now an established fact and an active and vigorous body.

We understand that Mr. Suter is about to publish a new list of the Land and Freshwater Mollusca of New Zealand, in which the old list of 125 species will be raised to 178.

The Editor tenders his grateful thanks for the valuable assistance rendered or promised by the following authors and institutions who have so generously responded to his request for assistance in the 'Current Literature':—Drs. Simroth, Kobelt, and Brusina, W. H. Dall, Carlo Poljona, H. A. Pilsbry, and T. D. A. Cockerell; the Authorities of the British Museum, the National Museum, Washington, D.C., the Smithsonian Inst., the Institute of Jamaica, W.I., and the Royal Malacological Society of Belgium.

THE
CONCHOLOGIST

A Journal of Malacology.

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THE CONCHOLOGIST is published every quarter day, and issued to
 Subscribers only.

The pre-paid Annual Subscription is 4s. 4d.

Messrs. FRIEDLÄNDER & SOHN, BERLIN, receive Subscriptions for the Continent.

All Communications should be addressed—

W. E. COLLINGE, MASON COLLEGE, BIRMINGHAM.

THE CONCHOLOGIST:

A Journal of Malacology.

Vol. II.

JUNE 24th, 1893.

No. 6.

"MIMICRY" OF LAMELLARIA PERSPICUA.

By W. A. HERDMAN, D.Sc., F.R.S., &c.,

Professor of Natural History, University College, Liverpool.

ABOUT twenty years ago Giard pointed out that the mollusc *Lamellaria perspicua* may be found associated with various compound Ascidians, and is then protectively coloured so as to form an excellent example of what he at that time called direct defensive mimicry.

Lamellaria perspicua is not uncommon round the south end of the Isle of Man, and is frequently found under the circumstances described by Giard; but I met lately with such a marked case on the shore near the Biological Station at Port Erin, that it seems worthy of being placed on record. The mollusc was on a colony of *Leptoclinum maculatum*, in which it had eaten a large hole. It lay in this cavity so as to be flush with the general surface; and its dorsal integument was not only whitish with small darker marks which exactly reproduced the appearance of the *Leptoclinum* surface with the ascidioxozoids scattered over it, but there were also two larger elliptical clear marks which looked like the large common cloacal

apertures of the Ascidian colony. I did not notice the *Lamellaria* until I had accidentally partly dislodged it in detaching the *Leptoclinium* from a stone. I then pointed it out to a couple of naturalists who were with me, and we were all much struck with the difficulty in detecting it when *in situ* on the Ascidian.

This is clearly a good case of protective colouring. Presumably the *Lamellaria* escapes the observation of its enemies through being mistaken for a part of the *Leptoclinium* colony; and the *Leptoclinium* being crowded like a sponge with minute sharp-pointed spicules is, I suppose, avoided as inedible (if not actually noxious through some peculiar smell or taste) by carnivorous animals which might devour such things as the soft unprotected mollusc. But the presence of the spicules evidently does not protect the *Leptoclinium* from *Lamellaria*, so that we have, if the above interpretation is correct, the curious result that the *Lamellaria* profits by a protective characteristic of the *Leptoclinium* for which it has itself no respect, or to put it another way, the *Leptoclinium* is protected against enemies to some extent for the benefit of the *Lamellaria* which preys upon its vitals.

DESCRIPTION OF A NEW SPECIES OF ACROPTYCHIA.

BY EDGAR A. SMITH, F.Z.S.,

Zoological Department, British Museum, London.

(Pl. 1. figs. 1 to 4.)

LAST June I had the privilege of describing in this Journal¹ a very remarkable form of *Acroptychia* and of making some observations on the other species belonging to the genus. I now have the pleasure of characterising another new form, the fourth belonging to the group. Like the known species, this also comes from Madagascar, where it was collected by the Rev. W. Deans Cowan, at Mahanovo.

Acroptychia albocincta.

(Pl. 1. figs. 1-2.)

Testa turbinata, constricta umbilicata, fusco-olivacea, ad peripheriam linea pallida cincta; aufractus 6 convexi, regulariter et sub lente accrescentes, striis spiralibus tenuibus numerosis

¹ The "Conchologist," 1892, vol. ii. pp. 22-23.

lineisque incrementi obliquis decussantibus sculpti; primi 2-3 fusco-purpurei, ultimus paulo pone labrum subconstrictus, ibique epidermide dilute fusciscente amictus; umbilicus haud pervius, constrictus; apertura magna, livido-carnea, linea pallida externa bipartita; peristoma ad marginem tenue, intus leviter incrassatum, sublata expansum, livido purpureum vel pallidius.

Operculum paucispirale, corneum, aureum, aufractibus 4-5 constitum. Diam. maj. 9 millim., min. 6 $\frac{1}{3}$, alt. 9. Apertura cum perist. 5 $\frac{1}{2}$ lata.

This interesting species is about the same size as *A. notabilis*, Smith, but differs in form, colour, sculpture, and other respects. There are three examples of it in the British Museum, which show but very slight variation in any of its specific features. The indistinct constriction, about 2 $\frac{1}{2}$ millim. from the peristome, is more or less defined by a dark brown stripe, and, between the stripe and the lip, the whorl is covered with a striated buff or luteous epidermis. The peristome is hardly continuous, but the extremities are connected by a very thin callus. The operculum is quite of the same type as that of *A. metableta*, and *A. aequivoca*, that is, horny, like that of the genus *Cyclophorus*, and paucispiral like that of *Cyclostoma*, which is shelly.

I take this opportunity of giving a figure of *A. notabilis* which was unillustrated at the time when it was described (*vide* Pl. I. figs. 3-4).

ON THE GEOGRAPHICAL DISTRIBUTION OF THE LAND AND FRESHWATER MOLLUSCA OF THE MALAGASY REGION.

BY THE REV. A. H. COOKE, M.A., F.Z.S.,

Fellow and Tutor of King's College, Cambridge.

THIS interesting and in some respects isolated region includes Madagascar with its attendant satellites Bourbon, Mauritius, and Rodriguez, and the Seychelles and Comoro groups. No land mollusca are known from the Amirantes, the Chagos, or from Aldabra.

The special characteristics of the region are the great development of the carnivorous land mollusca (*Ennea*, *Gibbus*), the occurrence of a considerable number of true *Helicidae* of great size and beauty, and the prominence of the genus *Cyclostoma*. In the two latter of these points, the region stands in complete and pronounced contrast to the whole of the Ethiopic province. The points of individuality will be better brought out by a survey of the separate islands, since in several cases their fauna exhibits considerable divergence.

(a) THE MADAGASCAN SUB-REGION.—The land mollusca of the great island of Madagascar, although as yet imperfectly known, possess a striking individuality, and, even if considered quite apart from its other zoological features, would be quite sufficient to separate it off, in a decisive manner, from the mainland of Africa. Two of the chief characteristics of the Ethiopic province are the paucity of its operculate and of its *Helix* fauna; Madagascar is especially distinguished by the rich development of both these groups. For size, colouring, and beauty of shape, the *Helicidae* in the two subgenera *Ampelita* and *Helicophanta*, rival, if they do not surpass, any in the world. They are quite peculiar to this sub-region, not a trace of them occurring on the Mascarenes, Seychelles, or even on the Comoros. Their nearest relationships appear to be with the *Acavi* of Ceylon and the great *Pandæ* of N.F. Australia. As is usual when *Helix* is well developed, the *Zonitidae* (*Naninidae*) are proportionately few, not more than a dozen being known to occur. The peculiar feature of the operculate fauna is the exceedingly rich development of *Cyclostoma* proper (54 sp.), of which Madagascar may be regarded as the metropolis. Many of the species are of great size and of striking beauty of ornamentation. Unlike its *Helicidae*, this genus is not restricted to Madagascar; several species occur on the mainland, six on the Comoros, one on the Seychelles, and 12 in Mauritius and Bourbon. The subgenera *Acroptychia* and *Hainesia* are peculiar. There is nothing remarkable about the rest of the operculate fauna, *Lithidion*, *Otopoma* and *Cyclophorus* all being represented on the mainland. *Omphalotrochis*, so abundant on the Mascarenes, does not occur.

The African *Bulimini* (*Pachnodus* and *Rachis*) are each represented by two species, but *Achatina*, so abundant on the mainland, is comparatively scarce. Two other groups of *Buliminus*, *Leucotenia* and *Clavator*, are quite peculiar. The presence of a single *Kaliella*, specifically identical with a common Indian form, is very remarkable.

The fresh-water molluscan fauna of Madagascar contains further unmistakable traces of Indian relationship. Thus we find two species of *Paludomus*, a genus whose metropolis is Ceylon, India, and Further India, and which is barely represented on the Seychelles and in the Somali region of the African mainland. The genus *Melanatria*, which is quite peculiar to Madagascar, has its nearest affinities in the Cingalese and East Indian faunas. Two species of *Bithynia* occur, another genus whose metropolis is India, and which is quite strange to tropical Africa. Several of the *Melania* are of a type entirely wanting in Africa, but common in the Indo-Malay region. Not a single one of the characteristic African fresh-water bivalves (*Mutela*, *Spatha*, *Aetheria*, *Galatea*, &c.) has been found in Madagascar. On the other hand, certain African genera of gasteropoda, such as *Cleopatra* and *Isidora*, occur, indicating, in common with the land mollusca, that an ultimate land connection of Madagascar with Africa must have taken place, but that it occurred at an immeasurably remote period.

NOSSI BE AND NOSSI COMBA.—The Mollusca of these two small islands, which lie off the N.E. of Madagascar, are well known. They show, as would be expected, close relationship to Madagascar itself, the great *Helicidae* and *Cyclostomidae* both occurring freely, together with a single *Melanatria*. *Omphalotropis*, not yet recorded from Madagascar, but abundant in the Mascarenes, is found, this being the extreme of its westward range. Perhaps the most remarkable feature is the occurrence of two species of the Indian genus *Sitala* (which may therefore be looked for in Madagascar), and one of *Geostilbia*.

MOLLUSCA OF MADAGASCAR.*

<i>Ennea</i>	9	...	<i>Achatina</i>	3	...	<i>Cleopatra</i>	2
<i>Urocyclus</i>	2	...	<i>Opeas</i>	2	...	<i>Anipullaria</i>	6
<i>Helicarion</i> (?)	1	...	<i>Subulina</i>	3	...	<i>Cyclophorus</i>	2
<i>Macrocyclus</i> (?)	1	...	<i>Vaginula</i>	3	...	<i>Cyclotus</i> (?)	1
<i>Kaliella</i>	1	...	<i>Limnæa</i>	2	...	<i>Cyclostoma</i>	54
<i>Nanina</i> (inc. sed.)	9	...	<i>Planorbis</i>	3	...	<i>Otopoma</i>	5
<i>Ampelita</i>	35	...	<i>Isidora</i>	3	...	<i>Iithidion</i>	1
<i>Helicophanta</i>	17	...	<i>Melania</i>	7	...	<i>Acroptychia</i>	3
<i>Pachnodus</i>	2	...	<i>Melanatria</i>	4	...	<i>Hainestia</i>	3
<i>Ruhis</i>	2	...	<i>Paludomus</i>	2	...	<i>Unio</i>	1
<i>Lancotenin</i>	2	...	<i>Vivipara</i>	1	...	<i>Corbicula</i>	2
<i>Levator</i>	2	...	<i>Bithynia</i>	2	...	<i>Sphærium</i>	1
						<i>Pisidium</i>	1

* Those contained in this list, 18 sp. "*Helix*," 2 "*Budweya*," and 11 "*Cyclostoma*," were first described, but not figured, in Bull. Soc. Philom. (7) x. (1866), pp. 124, 130, 187.

THE COMORO ISLANDS.—This isolated group of islands, lying at the extreme north of the Mozambique channel, and about midway between Madagascar and the mainland, exhibit sufficient peculiarity in their fauna to warrant their being considered apart from Madagascar. About one hundred species are known, almost all of which are peculiar. The principal feature is the rich development of *Ennea* (30 species). On the whole the group shows rather more relationship to Madagascar than to the mainland. Thus we have six species of true *Cyclostoma*, and only one *Achatina*, while among the fresh-water genera is *Septaria*, which is characteristic of the whole Malagasy sub-region, but is absent from the mainland. The *Helicidæ* are all of insignificant size. It is interesting to note that the Comoros furnish a good instance of the rule that operculate genera are almost invariably widely distributed, while the genera of *Helix* are not unfrequently very restricted; thus the Madagascan *Cyclostomata* occur, not only on the Comoros, but on all the adjacent groups and even on part of the mainland, while the *Helices* are absolutely restricted to Madagascar itself. Peculiar to the group is the remarkable genus *Cyclosurus*, an operculate shell of which only the two first whorls are spirally coiled, while the rest are produced in a long tube. *Cyclotopsis* and *Geostilbia* indicate affinity with the Palearctic region.

MOLLUSCA OF THE COMOROS.

<i>Ennea</i>	30	...	<i>Hamorus</i>	2	...	<i>Assimineæ</i>	3
<i>Urocyclus</i>	2	...	<i>Opeas</i>	3	...	<i>Melania</i>	2
<i>Helicarion</i>	1	...	<i>Subulina</i>	13	...	<i>Cyclophorus</i>	4
<i>Helix</i> (? subg.)	9	...	<i>Geostilbia</i>	2	...	<i>Cyclosurus</i>	1
<i>Buliminus</i>	6	...	<i>Succinea</i>	1	...	<i>Cyclostoma</i>	6
<i>Pupa</i>	3	...	<i>Vaginula</i>	4	...	<i>Otopoma</i>	4
<i>Achatina</i>	1	...	<i>Planorbis</i>	2	...	<i>Cyclotopsis</i>	2
						<i>Septaria</i>	2

(b) THE MASCARENE SUB-REGION.—The Mollusca of the Mascarene Islands (Mauritius, Bourbon, Rodriguez) and of the Seychelles are thoroughly well known, and form an interesting group, quite distinct from, though related to, those of Madagascar. There are recorded from Mauritius 113 species, from Bourbon 45, from Rodriguez 23, and from the Seychelles 34, a certain number of sub-fossil species being included and "introduced" species excluded.*

* *Helix aspersa* and *Achatina fulica* have been introduced into Mauritius and the Seychelles; *H. similans* into Mauritius and Rodriguez. *H. pulchella* and *Ach. puzosera* into Mauritius alone; *Ennea bicolor* into Bourbon and the Seychelles.

Of the 113 Mauritian species 104 are land and 9 fresh-water. Of the former, 78, of the latter none, are peculiar, while of the remaining 26, 14 are common to Bourbon only, 1 to Bourbon and the Seychelles, 3 to the Seychelles, and 1 to Rodriguez, leaving a total of only 7 land mollusca, or about 7 per cent., occurring out of the group. Such a percentage can only be paralleled in the case of some of the West Indian islands, and sufficiently attests the extreme isolation of Mauritius even from its giant neighbour Madagascar.

Of the 45 species known from Bourbon, 40 are land and only 5 fresh-water. Of the 40 land species, 18 are peculiar, and 24 common to Mauritius only.

Rodriguez, as its position would lead us to expect, is more isolated. Of its 23 species, 19 are land and 4 freshwater. Of the former, 15 are peculiar, of the latter only one, while of the 4 remaining land shells, 2 are common to Mauritius only, and one to the whole group.

Of the 34 species known from the Seychelles, 27 are land and 7 freshwater, 21 of the former and 3 of the latter being peculiar, while of the remaining 10, 6 are peculiar to the whole group.

To put these results in a tabular form, we have:—

	Total sp.	Land sp.	Freshwater		Peculiar to group.
			sp.	Peculiar.	
Mauritius ...	113	104	9	78	102 (90 p.c.)
Bourbon ...	45	40	5	19	38 (84 p.c.)
Rodriguez ...	23	19	4	15	21 (95 p.c.)
Seychelles...	34	27	7	24	30 (90 p.c.)

The mollusca of the group, regarded generally, may be considered to exhibit three distinct elements—(i.) *Indigenous*, (ii.) *Madagascan*, (iii.) *Indian and Australasian*.

(i.) *Indigenous Element*. The genus *Pachystyla*, a group of the *Naninidæ*, is quite peculiar to these islands, where it forms the main portion of the land snails proper. It attains its maximum in Mauritius (17 sp.), being represented by 5 sp. in Bourbon and one subfossil sp. in Rodriguez, while in the Seychelles it does not occur at all. But the principal feature of the Mascarene group is the extraordinary development of the carnivorous genus *Gibbus*, which is closely allied to the *Ennææ* of tropical Africa, so largely represented in the Comoros, but not in any special sense a marked feature of Madagascar. *Gibbus* has as many as 27 species (24 pec.) in Mauritius, 8 (6 pec.) in Bourbon, 4 (3 pec.) in Rodriguez; in the Seychelles it is wanting, but is replaced by *Edentulina* and

Streptostele. This genus is thus quite peculiar to the Mascarenes proper, not even occurring, according to our present information, in Madagascar, and must therefore in all probability, together with *Pachystyla*, have been developed when these three islands became finally separated from Madagascar, and were still, if not intimately united, at all events much larger and nearer together than they now are.

(ii) *Madagascan Element*. The principal link between the Mascarene subregion and Madagascar (which is by no means as strong as we should expect), is found in a part of the operculate land fauna. *Cyclostoma*, so richly represented in Madagascar, is present (with *Otopoma*) in several fine living forms, and the number of subfossil species is a clear indication that this group was, not long ago, much more abundant, for, of the 16 *Cyclostoma* known from Mauritius as many as 10 are subfossil. Bourbon has 3 sp., Rodriguez 4, and the Seychelles 1. The operculates, as a whole, form a decided feature of the land fauna, thus in Mauritius there are 32 species, or more than 28 per cent. of the whole.

(iii) *Indian and Australasian* affinities are unmistakably present in the Mascarene fauna. From some points of view, the group looks like a fragment of Polynesia transplanted to the western shores of the Indian Ocean. Thus we have *Omphalotropis* profusely represented, a genus especially characteristic of small islands, which does not occur in Madagascar or Africa, Ceylon or India, but first appears in the Andamans and Nicobars, is sparingly distributed in the Malay Archipelago, and becomes abundant in the New Hebrides, the Viti and Society Islands. The two *Helicinae* (Mauritius and Seychelles) represent a genus whose distribution is to some extent identical with that of *Omphalotropis*, while the single *Leptopoma* (possibly a *Leptopomoides*) is also of strongly eastern relationship. *Cyclotopsis*, *Cyathopoma*, and *Geostilbia* are markedly Indian genera. *Microcystis* is Indian and Polynesian. *Patula* and *Tornatellina* are Polynesian only, the nearest recorded species of the latter being a straggler from the Philippines. *Hyatimax*—and this is a very striking fact—occurs nowhere else but in the Andamans and Nicobars, and on the Aracan coast. The nearest relation to the Seychelles *Mariaella* appears to be the Cingalese *Tennentia*. Not a single representative of these eleven genera has been found even in Madagascar.

The fresh-water mollusca (omitting the *Neritidae*) are: Mauritius 9 species, Bourbon 5, Rodriguez 4, Seychelles 6, with only 15 species in all. The one *Planorbis* is probably identical with an Indian

species, while the *Vivipara* is regarded by some as a mere variety of *V. bengalensis* Lam. The *Isidora* is of a distinctly African type, and may have been introduced. The *Lantzia*, which is entirely peculiar to Bourbon, is probably* closely allied to the very remarkable *Camptonyx*, which is exclusively Indian. It lives† in wet moss at an altitude of upwards of 3,600 ft. Two of the *Melania* (*scabra* Müll, *amarula* Lam.) are of an Indian type, which does not occur in Africa. The *Paludomus*, although specifically identical with the single African species (which significantly occurs in the Somali district), belongs to a genus otherwise confined to India, Ceylon, further India, and Sumatra. Owing no doubt to the paucity of permanent streams, no fresh-water bivalves occur. Among the *Neritida* is a single *Septaria*, which is common to the whole group, except Rodriguez. This genus again, though occurring in Madagascar, is entirely strange to the African continent, and is abundantly represented in the Palearctic and Australasian regions.

It appears then, on the whole, that the Mascarenes proper are, as we should expect, very closely connected, while the Seychelles stand considerably apart, with a fauna of markedly Indian affinities. Thus *Pachystyla*, *Gibbus* and *Omphalotropis*, the prominent features of the Mascarene fauna, are entirely absent from the Seychelles, while *Cyclostoma* is represented by only one species. On the other hand, 4 sp. *Pachnodus* and 1 *Streptaxis* indicate an African element in the Seychelles fauna, while the development of the remarkable genus of *Helix*, *Stylodonta*, relates them to the great *Helices* of Madagascar. At the same time their Indian and Polynesian affinities are abundantly attested by the *Cyathopoma*, *Leptopoma*, *Helicina*, *Patula*, and *Paludomus*. It would seem probable that when the closer connection which at one time undoubtedly existed between India and Eastern Africa began to be less continuous,‡ the Mascarene group was first severed from what ultimately became Madagascar, while the Seychelles, and perhaps the Comoros, still continued united to it. The Comoros, which lack the great *Helices*, separated off from Madagascar first, while the Seychelles continued in more or less direct union with that island sufficiently long to receive the progenitors of *Stylodonta*, but became disunited at an exceedingly remote period.

* G. Nevill, Handlist I, p. 275.

† J. de Sussanne, *Rév. Mag. Zool.*, 2 S. xxiii, pp. 206.

‡ It is by no means implied that *unbroken* land communication between India and Madagascar, across the Indian Ocean, ever existed. A series of great islands, whose remains are marked by the Clages and other banks, would be quite sufficient to account for the results now found there. See especially Medlicott and Barford, *Geology of India*, Vol. I, p. lxxvii.

Further exploration will probably effect little which will change our views of the permanent relationships of the Mascarenes or Seychelles; it will in all probability tend to emphasise the Indian element in the molluscan fauna of Madagascar.

MOLLUSCA OF THE MASCARENES AND SEYCHELLES.

	Mauritius.	Reunion.	Rodriguez.	Seychelles.
<i>Streptaxis</i>	—	—	—	1
<i>Strepiostele</i>	—	—	—	1
<i>Edentulina</i>	—	—	—	2
<i>Gibbus</i>	27	8	4	—
<i>Mariella</i>	—	—	—	1
<i>Mirocystis</i>	7	3	—	2
<i>Pachystyla</i>	17	5	2	—
<i>Patula*</i>	3	1	—	2
<i>Pella†</i>	3	5	—	—
<i>Stylodonta</i>	—	—	—	2
<i>Pachnodus</i>	—	—	—	4
<i>Rarhis</i>	1	—	—	—
<i>Pupa</i>	1	2	2	—
<i>Vertigo</i>	3	2	—	2
<i>Opus</i>	2	1	—	2
<i>Subulina</i>	—	—	1	—
<i>Geostilbia</i>	2	—	—	1
<i>Cionella</i>	1	—	—	—
<i>Tornatellina</i>	1	1	—	—
<i>Succinea</i>	1	1	1	1
<i>Hyalinax</i>	2	2	—	—
<i>Vaginula</i>	1	1	1	1†
<i>Limnaea</i>	1	—	—	—
<i>Lantsia</i>	—	1	—	—
<i>Planorbis</i>	1	—	1	—
<i>Isidora</i>	1	—	—	—
<i>Physa</i>	1	1	—	1
<i>Melania</i>	4	3	3	4
<i>Paludomus</i>	—	—	—	2
<i>Vivipara</i>	1	—	—	—
<i>Leptopoma</i> (?)	—	—	—	1
<i>Cyathopoma</i>	—	—	—	1
<i>Cyclostoma</i>	11	2	4	1

* Some regard these as *Trochomorpha*. If so, they constitute an addition to the Australasian element.

† Perhaps better classified as *Nanina*, subg. *inc.*

1 Heymann (Jahrb. Deutsch. Malak. Gesell. xii. 1882, p. 82) adds four more species, but their specific value needs confirmation.

	Mauritius.	Bourbon.	Rodriguez.	Seychelles.	
<i>Otopoma</i>	5	...	1	...	1
<i>Cyclotopsis</i>	1	...	—	...	—
<i>Omphalotropis</i>	14	...	5	...	3
<i>Helicina</i>	1	...	—	...	—

LIST OF AUTHORITIES.

For Madagascar:

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 Ancey, Bull. Soc. Mal. Fr., 1890, p. 343.
 E. A. Smith, P.Z.S., 1882, p. 375; Conchologist, 1892, p. 92.
 Mousson, Journ. de Conchyl., 3 Sér., xxii., p. 37.
 Crosse and Fischer, *ibid.*, xx., p. 139; xxii., p. 54; xxviii., p. 100;
 same authors in Grandidier, Hist. de Madagascar.
 Mabile, Bull. Soc. Mal. Fr., i., 139; Bull. Soc. Philom. (7), x.,
 1886, p. 124, 182.
 Poirier, Bull. Soc. Mal. Fr., iv., p. 195.

For Mauritius, &c.:

- Von Martens in Möbius, Beiträge zur Meeresfauna der
 Mauritius, &c.
 Heynemann, Jahrb. Deutsch. Malak. Gesell. xii., 1885, p. 83.
 Morelet, Journ. de Conchyl., 3 Sér., xxii., p. 85.
 Crosse, *ibid.*, xiv., p. 221.

DESCRIPTION OF A NEW SPECIES OF LATIRUS.

By G. B. SOWERBY, F.L.S., F.Z.S.,

London.

Latirus maximus, sp. nov.

(Pl. 1, fig. 5.)

Testa fusiformi-turbinata, solida, ponderosa, laevigata, fusca, vel albida, fusco irregulariter strigata et vittata; Spira breviter turrata, obtusa, sutura irregulariter impressa; anfractus obtuse angulati, costis obtusis latis muniti; anfractus ultimus spiram superans, sub-quadratus, irregulariter vel sub-obsolete costatus, infra medium constrictus, basin versus spiraliter sulcatus, breviter caudatus; apertura subovata, fauce alba, tenuissime lirata; columella albo-callosa, leniter granulata, plicis inconspicuis. Long. 90 maj. diam., 50 millim.

Habitat: I. S. Thiago, Cape de Verd Islands (Eudel).

This is the largest species at present known of the genus; a remarkably stout, ponderous shell, somewhat approaching the genus *Turbinella*. It is evidently a *Latirus*, although the columella plicæ characteristic of the genus are wanting, or at least invisible; probably they are covered up by the thick callous deposit. In *L. gibbata* (Gmel.), which seems to be the nearest ally to this species, the plaits are only visible in the younger specimens.

Two specimens of this remarkable new *Latirus* were collected in May, 1873, at the above locality, by the late Capt. Eudel.

DESCRIPTION OF A NEW SPECIES OF MITRA.

BY JAMES COSMO MELVILL, M.A., F.L.S.,

Prestwich, Manchester.

Mitra idæ, sp. nov.

(Pl. 1, fig. 6.)

M. testâ elongato-cylindriâ, ponderosâ, nigrâ epidermidè omninò cunctâ, spirâ obtusâ fusiformi, anfractibus septem, transversim regulariter arctissimè punctato-striatis punctis minutis, ultimo anfractu in medio usque ad basin leviore, aperturâ oblongâ, labro exteriorè recto, intus lævi, cinerascente, columellâ quadriplicatâ. Long. 2.25 in. Lat. .75 in.

Habitat: Point Loma, Lower California (Miss Ida Shepherd).

This interesting species belongs to a section of the genus which has its headquarters on the western shores of North America and Mexico, and of which *M. lens* (Wood) may be taken as the type, all the species possessing a black or dark brown epidermis, and being more or less decussate or punctostriate, and it is not unlike the recently described *M. fultoni* (E. A. Smith) from the same locality. Differentiation, however, seems easy between them. *M. fultoni* exhibits a more distant transverse punctuation, the pitting being both deeper and wider, the whorls are also ventricose, and the spire more acuminate, and attenuate in comparison. The outer lip, too, is more effuse than in *M. idæ*. With *M. caliginosa* (Reeve) both species show more affinity, but here, again, the transverse sulci are more regular, and scarcely punctate.

I have seen nearly thirty specimens of this new form, and a good many also of *M. fultoni*, all keeping well to their individual characteristics. It is with great pleasure that I associate with

this shell the name of its discoverer, Miss Ida Shepherd, whose indefatigable exertions in collecting the mollusca of her country have been crowned with so much success, and are so much appreciated by American and other Conchologists.

ON THE GENERIC NAME TO BE APPLIED TO THE *NERITA AURITA* OF MÜLLER AND OTHER ALLIED SPECIES.

By EDGAR A. SMITH, F.Z.S.,

Zoological Department, British Museum, London.

IN his monograph of the family *Melaniidæ*, Dr. Brot has arranged a certain number of species under the genus *Claviger*, which was proposed by Prof. Haldeman¹ for *Melania aurita* (Müller) and *M. tuberculata*, Rang. He rejects the generic name *Vibex*, which has been used by some authors, and was published by Oken in 1815, on the ground that it had a different scope. *Vibex* was adopted by Gray in 1840, 1841, and 1842 in the different editions of the "*Synopsis of the contents of the British Museum*," where it appears merely in the systematic list of genera of Mollusca, so it is impossible to know what he included in it. In his "*List of Genera of recent Mollusca*,"² judging from the species quoted, his *Vibex* evidently is equivalent to *Claviger*. The name *Vibex*, according to Scudder,³ was also employed in the year 1815 by Rafinesque⁴ for another group of mollusca. Mr. Sykes has kindly consulted for me the work in which Rafinesque has described his genus, and it appears that it was founded for a group of the family *Cassididæ*.

The object of the present paper is to point out that neither of the names *Vibex* or *Claviger* can be retained for this group of *Melanians*. According to Phillippi⁵ the genus *Vibex* was created by Oken for the reception of the *Strombus fluviatilis* of Rumph. This species is figured by the latter author in his "*Amboinische Raritäten-kammer*," pl. xxx., fig. P., and described on p. 101. It is a long, slender, smooth shell, of the same type as *M. hastula*, Lea.

¹ American Journ. Sci. and Arts, 1840, vol. xlii., p. 216.

² Proc. Zool. Soc., 1842, p. 113, N. l. 227.

³ Nomenclatur Zool., p. 251.

⁴ Anat. de la Nature, p. 145, 116 (15).

⁵ Handbuch Conch., 1. d. Mal., p. 468.

Herrmannsen" erroneously considers *Vibex* of Oken the same as *Potamides* of Brongniart, described for a Paris Basin fossil, *P. lamarchii*. I have referred to Oken's work⁷ and find a short generic description on p. 258, and on p. 260, the species referred to it is thus quoted: "1 Art. V. fluviatile, Buccinum." This is followed by a short specific description, and then comes a final sentence: "Hieher Strombus palustris, Vibex, ater, Murex molucanus." It will thus be seen that the *V. fluviatile* must stand as the type of Oken's genus. As the word *Buccinum* follows, it may be presumed that he referred to the *Buccinum fluviatile* of Gmelin,⁸ which was founded upon Rumph's *Strombus fluviatilis*, and his description is applicable to that shell. This, as I have already stated, appears to be one of the long, slender shells referred to Oken's genus *Vibex* by Woodward and others cannot be brought under that genus, and as the name *Claviger* is preoccupied for a long-recognised genus of Coleoptera,⁹ it becomes necessary to find another name for the group. I therefore suggest that of *Pachymelania*.

The synonymy of the genus will stand as follows:—

Pachymelania, Smith, 1893.

- = *Claviger*, Haldeman, Amer. J. Sci. Arts, 1842, vol. xlii., p. 216 (non *Claviger* of Preysler, 1790, a genus of coleopterous insects).
- *Vibex*, Gray, P.Z.S., 1847, p. 153 (non *Vibex* of Rafinesque, 1815, or of Oken, 1815, the latter including species of *Melania*, *Faunus*, and *Terebralia*).
- = *Vibex*, Woodward's Man. Moll., 1851, p. 131.
- = *Vibex*, H. and A. Adams's Gen. Moll., vol. i., p. 303.
- *Vibex*, Chenu's Man. Conch., vol. i., p. 292.
- = *Claviger*, Brot's Monog. *Melaniidae* Conch. Cab., ed. 2, p. 359.
- = *Claviger*, Fischer's Man. Conch., p. 701.

The species included under this genus by Brot are:—1, *byroni*, Gray (= *byronensis* emend.); 2, *aurita*, Müller; 3, *balteata*, Philippi; 4, *matoni*, Gray; 5, *hippocastanum*, Reeve; 6, *gramulosa*, Lamarck; 7, *fastigiella*, Reeve. Of these species it is very doubtful if the three last belong to the group, and *balteata*, in my opinion, is merely a variety of *aurita*, which is a most variable species.

⁷ Ind. Gen. Mus., vol. ii., p. 69.

⁸ Lehrbuch der Naturgeschichte, Zoologische Theil, 1815, 16.

⁹ Syst. Nat., p. 3504.

⁹ Claviger Preysler Verzeichniss Böhmischer Insekten, 1790, p. 69.

PROFESSOR Dr. CARL SEMPER.

By Dr. H. SIMROTH,

Gohlis, Leipzig.

SEVERAL weeks ago Dr. Carl Semper, Professor of Zoology and Comparative Anatomy in the University of Würzburg, died after a long illness. He was born in Altona in 1832, and a member of a family much interested in Natural History. Although he attained prominence in almost every department of zoological science, the greater part of his work was malacological. He was one of the very few and rare malacologists whose work and influence advanced science in all its branches, anatomical, embryological, systematical, geographical, &c. His dissertation, for which he obtained his doctorate, entitled "*Beiträge zur Histologie der Pulmonaten*," is a most comprehensive work and still represents the basis of our knowledge. Embryologically he worked out the ontogeny of *Ampullaria*, and in the journey he undertook to the Philippine and Pala Islands, the anatomical and geographical distribution of the Gastropoda was one of his chief researches. In the great work "*Reisen im Archipel der Philippinen*," in which the Opisthobranchiata were described by Bergh and the Neurobranchia by Kobelt, Semper described the *Zonitidae*, *Helicidae*, and *Vaginulidae*, also much material from other localities and the dorsal eye in *Oncidium*. This latter piece of work was of interest in that the relation of the dorsal eye of *Oncidium* with that of the Vertebrata was dealt with, and inasmuch as they are said to be defensive against the attacks of the *Perioptalmi*, which live in the same tidal region. It is to be highly regretted that he could not finish his work upon the anatomy of the Molluscan nephridium as he intended.

Biological investigation was his occupation, his very successful experiments upon the growth of young *Limnæa*, showing their dependence upon temperature and quantity of water, are known to all. In later years he constructed with much pleasure a vivarium to breed tropical molluscs, *e.g.*, *Bulimus*, &c.

Under his superintendence much malacological work was done, *e.g.*, the embryology of *Bithinia* by Sarasin. When once convinced of the correctness of his meaning, Semper was occasionally a severe critic, as in the controversy with Jhering on the morphology and systematic range of *Peronia*.

On the whole, Semper had a high opinion of malacology for the solution of general zoological and biological problems. Writing to me several years ago, he emphasised the fact that he had commenced his career by malacological work. His treatise on "Pulmonate Anatomy" is the finest and most extensive we possess upon the subject, and all malacologists will deeply regret the loss of so devoted and brilliant a worker.

ON THE HABITAT OF THE GENUS EPHIPPODONTA (TATE).

BY C. H. MATTHEWS,

Yorke Town, South Australia.

In the early part of 1886, my friend Mr. J. G. McDougall, an ardent naturalist—since deceased—brought me several specimens of *Ephippodonta lunata* (Tate), at the same time stating where and under what conditions he had found them. Other specimens were sent to Prof. Ralph Tate, of Adelaide University, who provisionally described them as *Scintilla lunata*, and included the species in his monograph forming part of the Royal Society's Proceedings for 1886, the habitat recorded therein—"creeping on rocks at extreme low tide"—being very vague. In the Society's Proceedings for 1888, a supplement was given by Prof. Tate, and he there figured another species discovered under similar conditions by Mr. McDougall. The new species he named *McDougallii*, after the finder.

The additional specimens furnished by Mr. McDougall enabled Prof. Tate to establish the new genus, *Ephippodonta*, so-called "in allusion to the cardinal teeth riding as it were one on the other by their tips, and not interlocking." This habitat now supplied was more accurate, being "on the mud-formed burrow of a species of shrimp sheltering beneath large stones, between tide-marks."

In company with Mr. McDougall, during the Christmas holidays of 1890, I took both species near the original locality. Since then I have discovered this handsome genus in two other localities, thus proving that its range is not so restricted as was feared. It is still, however, rare and difficult to obtain.

In the original locality the rock—our common limestone—was evidently too hard for perforation, hence the burrow was built upon it; but in my latest find the shrimp (*Axius plectorynchus*, Strake) has made a hole in the rock, a calciferous sandstone. This burrow is lined with a tenacious brown mud, composed of excrementitious matter; and, in addition to the mud lining, there is always more or less present an orange-coloured sponge which I have never found elsewhere. Upon the mud or sponge, and adhering very closely, are found the *Ephippodonta*. They quickly form a pit-like depression by means of their foot, and appear almost covered by the mud. I have also taken off the burrow, and only there, all the three species of *Mylitta* known to us, viz., *deshayesiana*, *tasmanica*, and *gemmata*; as likewise a species of *Kellia*.

The burrows are found at all angles, but chiefly horizontal, they are perfectly circular and vary in diameter from half an inch to an inch and a half. It is rare to find more than one shrimp in a burrow. During the winter months, say from about March to July, I have found the burrows completely filled with minced seaweed, of such kinds as clothe the rocks beneath which the shrimp lives. Is this a provision for the stormy season? Upon removing the chopped up weed one occasionally finds immense numbers of minute *Ephippodonta* lining the burrows.

[Mr. Matthews has sent over in illustration of his paper specimens of *Ephippodonta* in spirit; also specimens of the shrimp, burrow, sponge, &c. All the above have been presented to the Natural History Museum, South Kensington. It is hoped that a paper on the anatomy of the genus may shortly be published.—E. R. SVKFS.]

THE MALACOLOGICAL SOCIETY OF LONDON.

April 14th, 1893.—Dr. Hy. Woodward, F.R.S., &c., in the chair.

There were eight new members proposed for election, the rest of the evening was devoted to discussing and passing the Rules of the Society.

May 12th.—Dr. Hy. Woodward, F.R.S., &c., in the chair.

Dr. Paul Fischer and Mr. Ph. Dautzenberg were, amongst others, proposed as members of the Society.

Lieut.-Col. H. H. Godwin-Austen, F.R.S., &c., read a paper "On the Molluscan Genus *Paryphanta*, and on the Anatomy of *P. hochstetteri*, Pfr." "Descriptions of Six

New Species of Land Shells from Annam" were read by Mr. Edgar A. Smith, F.Z.S. Mr. G. B. Sowerby, F.I.S., F.Z.S., read a paper on *Carinaria*. A communication was read by Mr. S. J. Da Costa on *Bulimulus felix*, Pfr., and *B. mombielinus*, Crosse.

NOTES.

Eulima curva (Jeffreys MSS.) Monterosato, in British Seas.

Mr. Marshall (Journ. Conch. vi. p. 161) has recorded the occurrence of *Eulima latipes*, Watson, from the Land's End and the Scilly Isles in 1888 and 1890. I am only conversant with the shells collected in 1890, as I was then in the Scilly Isles with Mr. Burkill. *Eulima curva*, it may be mentioned, was described from Sicily, and has been found at other places in the Mediterranean and in the Bay of Biscay. I put aside the improbability of a species only known from North Australia being found on the English coast, and the fact that both Mr. Watson and Mr. Smith (as Mr. Marshall states) considered that the shells were not *E. latipes*, and I proceed to a comparison of the two. Our shells differ from *E. latipes* in size, being larger. They also differ in the shape of the mouth which is much elongated, while in *E. latipes* it is pear-shaped. The curvature of the axis of the shell towards the apex is very much greater in our shells, and the last whorl is gibbous. In all these particulars they agree with *E. curva*, with which they are, I have no doubt, identical, and which Mr. Marshall does not seem to have considered.—E. R. SYKES, B.A., F.Z.S.

A New Locality for *Hyalinia clymene*, Shut.

In his "*Testarca Atlantica*," Wollaston records the only then known habitat of *Hyalinia clymene*, Shut.—viz., near Carachico, in Teneriffe (where it is still to be found). It may be of interest to note that this species also occurs under similar conditions in a garden near the little town of Rambla, on the same side of the island.—JOHN H. POSSONEY, F.Z.S.

Notes on *Agrilolimax lævis*, Müller.

A very pertinent example, illustrating the little value in the Slugs of external form and markings for the purposes of identification, has just come under my notice, which I think is worthy of record.

In a consignment of slugs recently received from my valued correspondent, Mr. E. W. Swanton, of Sittingbourne, I found one of a light purplish-brown colour, with small black dashes on the sides of the body. It had a large mantle, a very prominent keel, and measured 25 millim. in length. At first I doubted very much if it could be referred to *Agr. lævis*. Its size, peculiar colour, and unusually prominent keel, did not resemble anything in my collection. In consequence, a careful examination was made of the anatomy, from which there can be no further doubt but that it is a large keeled specimen of this species.—WALTER E. COLLINGS.

Further Records from Kent.

In looking through my note-book for 1890-91, I find a number of records, &c., which may prove of interest.

On March 21st, 1891, I found specimens of *Helix hispida* var. *nana*, Jeff. This variety has a strong labial pit. In May, I obtained at Worthing a fine specimen of the variety *albina* of *Clausilia laminata*, and two examples of *H. pomatia*, var. *alba*, also several examples of the var. *brunnea*. This latter variety is a local one, but very plentiful. They were generally larger than the type. At Wychling I found two examples of *H. aculeata* which has not

previously been recorded for East Kent. Through inadvertency, I caused it to be recorded for West Kent (see "Conchologist," 1891, vol. i., p. 32). The sentence should read "*Helix aculeata* in East Kent."—E. W. SWANTON.

Note on the Land and Freshwater Molluscs of Suffolk.

In the catalogue of the land and freshwater shells of Suffolk, by the Rev. Carleton Greene,* the following species, which the writer recently collected in that county, are not recorded.

Amalia gages, Drap., and *Vitrea draparnaudi*, Beck, St. Margaret's, Ipswich; *Paludestrina ulva*, Pen., Woolver Stone Park, Ipswich. Several other species were turned up in the neighbourhood of Ipswich, for which that locality is not given in the list, including *Limnaea agrestis*, L.; *Amalia marginata*, Drap.; *Vitrea glabra*, Stud.; *V. nilidula*, Drap.; *V. pura*, Ald.; *V. fulva*, Müll.; *Arion hortensis*, Fér.; *Helix pygmaea*, Drap.; *H. concinna*, Jeff.; *H. aspersa*, Müll.; *Coch. lubrica*, Müll.; *Pupa umbilicata*, Drap.; *Vertigo pygmaea*, Drap.; *Ancylus lacustris*, L.; *Planorbis vortex*, L.; *P. contortus*, L.; *Physa fontinalis*, L.; and *Spharium lacustre*, Müll.

It were well, perhaps, to take the present opportunity of pointing out that in the list above mentioned, and many others, notably one in the "Irish Naturalist" which appeared recently, the compilers take no pains to arrange their genera in an order based on the result of modern investigation, such as would be found in a standard work on the Mollusca. For instance, the affinities of *Arion* with *Helix* must be fairly well known. Why, then, place it between *Vitrea* and *Testacella*, or separate it from *Helix* by these genera, with *Limax*, *Vitrina*, and *Succinea*?—WILFRED MARK WEBB, F.L.S., Demonstrator in Biology, Essex County Council.

Testacella scutulum, Sly.

It may be interesting to note that while making some recent investigations on the anatomy of this species, which, in reality, is distinct from *T. halotidea*, the writer came across an individual from Buckhurst Hill, Essex, in which the right upper tentacle was completely absent, the lower one of the same side being slightly enlarged. The male portions of the reproductive system were also much reduced, the tubes of the penis being mere threads.—WILFRED MARK WEBB.

Limnaea stagnalis monst. *scalariformis*.

The pond on Chislehurst Common where the variety *elegantula* is found has been almost dried up, and my brothers have succeeded in finding three more scalariform specimens, one of which is considerably more so than the one figured in "Science Gossip." Altogether, five scalariform shells have been found in this little pond, which is never more than 35 ft. across, and is now in danger of being altogether dried up. The animal of the var. *elegantula* has much more of the yellow tint than the type, the sides of the foot being quite orange in some specimens, the colour shading off into the darker colour of the rest of the body. The tentacles are also yellowish. I have obtained a specimen of *Pisidium fontinale* var. *cinerea* in the same pond, as well as a number of *Spharium lacustre*. [I found this note among my papers; it was written many years ago. The pond in question is by the side of a road that runs across Chislehurst Common from Prickend. It would be interesting if some conchologist would visit the spot now, and see whether the var. *elegantula* is still there.]—T. D. A. COCKERELL, F.Z.S., F.E.S.

On the Occurrence of *Cyclostrema millepunctatum*, Friele, off the Isle of Man.

The systematic dredging operations which have been carried on by the Liverpool Marine Biology Committee, under the direction of Professor Herdman, have added very greatly to our knowledge of the fauna of the district. Even in Conchology, well worked as the Irish Sea might be supposed to have been, additional records are constantly turning up, almost every excursion bringing to light some form not previously noted in the lists.

* Proc. Suffolk Inst. of Archaeol. and N. H., 1891, vii., pt. 3

From a series of dredgings made at Whitsuntide I was fortunate enough to receive two small bags of material. One, containing washed dredgings taken in 46 fathoms, 9 miles W. of Conrady Head, Isle of Man, appeared to the naked eye to consist of dead bivalves and clean sand. Upon examination it yielded, amongst other species, *Odostomia scille*, *Scrobicularia nitida*, *Lepton squamosum et nitidum*, *Limna losombri*, hundreds of "live" *Rissoa soluta* (rarely found in the district except in a dead condition), and two minute shells which could not be identified with any known British species. All the Gastropods recorded for the district, of which it seemed possible for them to be the fry, were carefully examined, in most cases the fry or very young shells being studied. As even then they could not be named, it was deemed advisable to submit them to Canon A. M. Norman, who kindly inspected them and informed me that they were examples of *Cyclostrema millepunctatum*, Friele, which had been procured during the Norwegian North Atlantic Expedition at one station, viz., Stat. 192, Lat. 69° 46' N., Long. 16° 15' E., in 649 fathoms. The Manx shells were compared with one of Friele's types which is in Canon Norman's collection, and were found to agree in all points except size, their diameter being only one-fourth to one-third of that of the Norwegian specimen.

The shell is easily recognisable from our other British *Cyclostremata* by the sub-angulation of the under part of the whorls, and by the remarkable sculpture, which consists of numerous spiral rows of extremely minute punctures.—GEO. W. CHASTER, M.R.C.S., &c.

Note on *Limnæa glabra*.

There is and has been for some years a general opinion amongst certain Conchologists that this interesting species of *Limnæa* is slowly but surely becoming rarer in this country; it will, therefore, possibly be of interest to such to learn that I have recently collected examples in two ditches at Hall Green, near Birmingham, one of which I had previously searched. In the larger of the two ditches it was plentiful and in company with *Physa hypnorum* and a few *L. peregra*. The shells are mostly fine examples and in company with equally fine decollated specimens.—JAMES MADISON, Birmingham.

The Slug Fauna of Lancashire.

I have recently received from Knowsley near Liverpool, three consignments of Slugs, which from their variety and number are of interest and, I think, worthy of record.

There were one hundred and seventy-five slugs in all, representing eleven species and thirteen varieties. The list is as follows:—*Arion empiricorum*, Fér., and vars. *ruber*, Moq., *bicolor*, Moq., *bocagei*, Simroth; *A. subfuscus*, Drap., and var. *griseus*, Moq., *caeruleus*, Clge.; *A. fasciatus*, Nils., and vars. *flavescens*, Clge., *griseus*, Clge.; *Testacella haliotiden*, Cuvier; *Limax maximus*, L., and var. *marmoratus*, Ckll.; *L. marginatus*, Müll., (= *L. arborum*, B. Ch.); *L. variegatus*, Drap., and var. *rufescens*, Moq.; *Agriolimax agrestis*, L., and vars. *griseus*, Ckll., *nigra*, Morelet; *Amalia soaverbyi*, Fér., and var. *nigrescens*, Ckll.—WALTER E. COLLINGE.

CORRECTION:—On page 119, line 7, for *Enlimax brandti* read *Limulax brandti*.

CURRENT LITERATURE.

In order to make the following Bibliography as complete as possible, the Editor invites the assistance and co-operation of British and foreign authors. All communications should be addressed to the Editor, the "Conchologist," Mason College, Birmingham, England.

MALACOLOGY IN GENERAL.

Pilsbry, H. A.—Tryon's Manual of Conchology, ser. i., pt. 55; ser. ii., pt. 31. Philadelphia. Academy of Natural Sciences.

Part 55 contains the Polyplacophora. Thirteen new species are described; five only are figured, which is disappointing in a "fully illustrated" monograph. An excellent artificial key to *Chiton* (*sensu stricto*) is provided; the species, however, are grouped geographically, which is the most convenient method. Part 31 continues the supplement to the *Helicidae* up to *Helix (candidula)*. The following, though not so marked, seem new: *Trachycystis*, a section of *Phasis*, Albers; and *Trochomorpha neglecta* (allied to *T. hartmanni*, Ufr.).—E. R. S.

STRUCTURE AND DEVELOPMENT.

Anon.—The Hermaphroditism and Viviparity of the Oysters of the N.W. Coast of the U.S. *Ann. and Mag. N. 11.*, 1893.

Bergh, R.—Opisthobranches provenant des campagnes du yacht l'Hirondelle. Résultats des Camp. Sci. accomplis sur son yacht par Albert Ier, Prince Souverain de Monaco, Fasc. iv., pp. 1-40, Plates i-iv., Monaco, 1893.

Anatomical descriptions of various Atlantic Opisthobranchs, including a new genus, *Pleurobranchillus*. The author corrects a few mistakes made in his memoir on the *Marseniade*. For list of species described see page 149.

Böhmig, L.—Zur feineren Anatomie von *Rhodope verrani*, Kölliker. *Zeit. f. wiss. Zool.*, 1893, lvi., i., pp. 40-116, pls. iii-vi.

Böhmig gives the results of an elaborate investigation into the minute anatomy of this aberrant little creature. Ranked as a Gastropod by Kölliker, *Rhodope* was excluded from the Mollusca by Trinchese and Bergh, and consigned by them to the Turbellaria, from which group Lang referred it back again to the Mollusca. Böhmig here satisfactorily shows that the central nervous system, the alimentary, excretory, and reproductive systems of *Rhodope* conform to types which are certainly not Turbellarian, and which closely approach those exhibited in the Nudibranchiate Gastropoda. The impression that Profs. Lankester and Lang were perfectly correct in regarding *Rhodope* as a highly degenerate Nudibranch is emphatically strengthened by a perusal of the present memoir. The only serious difficulty attending this view is the absence of a veliger-stage from the life-history of *Rhodope*,—an extreme abbreviation of development which is, nevertheless, not without its parallel in other groups.—W.G.

Bouvier, E. L.—Observations nouvelles sur les affinités des divers groupes de Gastéropodes. *Comptes Rendus*, 1893, cxvi., pp. 68-70.

Hitherto, the Prosobranchia have been sharply separated from the Opisthobranchia and Pulmonata on account of the chistoneurous nature of the nervous system.

M. Bouvier, in his interesting paper, states that he has for some time felt convinced that they formerly were united by some transitional form. In *Acteou solidulus* he not only finds a transitional form between the Prosobranchia and Opisthobranchia, but also one which closely connects this latter group with the Pulmonata. In *Acteou* the nervous system is decidedly chistoneurous, as in the Prosobranchia. The author discusses the various problems that arise in tracing the descent of the Opisthobranchia and Pulmonata from the Prosobranchia.

We trust that a further detailed account of so interesting a piece of work will be forthcoming. The absence of illustrations detracts from the value of the paper.—W. E. C.

Fischer, P., and Bouvier, E. L.—Sur l'enroulement des Mollusques univalves. *Journ. de Conchyl.*, 1892, pp. 234-45.

A reply to Dr. Pelseneer's paper. Mention is made of the fact that, as pointed out by Dall, several species of abyssal *Calliostoma* have the larval shell sinistral.

Fischer, H.—Note sur l'enroulement de la coquille des embryons des Gastéropodes. *Journ. de Conchyl.*, 1892, pp. 309-13.

Lankester, E. Ray.—Notes on the Cœlom and Vascular System of Mollusca and Arthropoda. Quar. Journ. Micro. Sci., 1893, xxiv., pp. 427-32.

Pelseener, Paul.—L'Asymétrie des Mollusques univalves. Journ. de Conchyl., 1892, pp. 229-33.

Dr. Pelseener continues the discussion on the asymmetry of univalves, with particular reference to the operculum of *Atlanta*, and the dextrosity and sinistrosity of *Cavolinia*.

Thiele, J.—Ueber die Kiemensinesorgane der Patelliden. Zool. Anz., 1893, xvi., 412, pp. 49, 50.

The author finds a patch of modified sensory epithelium on the side of the body anteriorly, between mantle and foot, in *Patina pellucida*, *Patinella deaurata*, and *Patella carulea*; and briefly describes its relations from serial sections through *P. pellucida*. The sense-organ is supplied with a slender nerve from Spengel's olfactory ganglion, and is thus put into the same category as Spengel's olfactory organ (*osphradium*), of which, indeed, it may be a portion.

VARIATION.

Belt, Anthony.—On the Band and Colour Varieties of *H. nemoralis* and *H. hortensis* in Faling and Ilanwell. Rept. and Proc. Faling Micro. and N. H. Soc., 1892, pp. xvii.-xviii.

Ford, John.—Description of a new form of *Cypræa*. Naut., 1893, vi., p. 112. *Cypræa cruenta*, Gmel., var. nov. *gregori*.

Moore, J.—*Helix nemoralis* with an umbilicus. Sci. Goss., 1893, p. 93.

Moore, J.—Variety of *Vitriina pellucida*. Sci. Goss., 1893, p. 93.

Cockerell, T. D. A.—On a new species of *Aplysiide* from Jamaica. Ann. and Mag. N. H., 1893, pp. 218-20.

Cockerell, T. D. A.—*Aion occidentalis*: an apparently new species. Journ. Conch., 1893, p. 192.

Collinge, Walter E.—On the Variety *cinereo-niger*, Wolf, of *Limax maximus*, L. Ann. and Mag. N. H., 1893, pp. 286-7.

Dautzenberg, Ph.—Descr. d'un *Perideris* nouv. (*P. lechatelieri*), provenant du Dahomey. Journ. de Conchyl., 1892, p. 297.

Drouet, H.—Description de deux *Unios* nouveaux du bassin de l'Oronte. Rev. Biol. du Nord de la France, 1893, pp. 285-88 and figs.

U. barroisi, near *U. episcopalis*, and *U. tinctus*.

Fischer, P. and H.—Diagn. d'esp. nouv. de Moll. Céphalopodes recueillis dans le cours de l'Expéd. scien. du Talisman (1883). Journ. de Conchyl., 1892, pp. 297-300.

Diagnoses of two new Octopus (*sponsalis* and *ergasticus*) from N.W. Africa (Talisman collection), with woodcuts of the anterior extremities of the copulating arm.

CLASSIFICATION, NOMENCLATURE, NEW GENERA, AND SPECIES.

Ancey, C. F.—Remarques sur quelques espèces nouv. d. genre *Buliminus* avec. descr. de plusieurs espèces nov. de ce genre. Bull. d. Soc. Zool. de France, 1893, xviii., pp. 35-40.

Bergh, R.—Opisthobranchs provenant des Campagnes du yacht 'Hirondelle'. Resultats des Camp. Sci. accomplis sur son yacht par Albert Ier., Prince Souverain de Monaco, Fasc. iv., pp. 1-40, plates i.-iv., Monaco, 1893.

Prof. R. Bergh here deals in his usual thorough manner with the Opisthobranchs collected during the cruise in the Atlantic of the Prince of Monaco's yacht "Hirondelle." Three species are new to science, and one of these is made the type of a new genus *Pleurobranchillus*. The following is the complete list:—*Cratena fructuosa*, n.sp., *Fiona marina*, Forsk., *Scyllaea pelagica*, L., *Euplocamus atlanticus*, n.sp., *Doriopsis limbata*, Cuv., *Pleurobranchus plumula*, Mont., *P. aurantiacus*, Risso, *Pleurobranchillus morosus*, gen. et sp. nov., *Marsenia (Lamellaria) perspicua*, L. The three first species were taken at the surface among Sargasso, and, in the case of *Fiona*, on *Lanthona* and wreckage; the rest came from sandy bottoms varying in depth from 130 to 189 metres. The new genus (? sub-genus) *Pleurobranchillus* agrees with *Pleurobranchaea* in every character of importance, but approaches *Pleurobranchus* in the position of the anus and genital papilla and in the degree of ramification of the pyaline gland. The foot in the new genus appears not to exceed the mantle in width; so that *Pleurobranchillus* seems to be related to *Pleurobranchaea* in much the same way as is *Pleurobranchus* to *Oscanius*. It is to be regretted, however, that Bergh does not include among his numerous figures a sketch of the external form of *P. morosus*. In addition to the type species, Bergh refers *P. brockii*, Bgh. (from the Indian Ocean) to the new genus.—W. G.

Crosse, H.—Études Malacologiques sur les Genres nouv. ou peu connus. Journ. de Conchyl., 1892, pp. 279-92, pl. iv.

In commencing these studies, M. Crosse writes (a) on the genus *Hungerfordia* (a remarkable form of *Palaina* from the Pelew Islands with a single species); (b) On the new genus *Geothauma*, proposed for *Opisthostoma grandispinosum*, G. A., from Borneo; (c) On *Heudeia* and other neighbouring forms, intermediate between *Helicina* and *Proserpina*; (d) On the genus *Bathybembix*, proposed for *Bembix*, Wats. preoccupied with a list of species known. (See Smith, E. A.).

Hedley, C.—*Schizoglossa*: a new genus of carnivorous Snails. Proc. Linn. Soc. N.S.W., vii., pp. 387-91, pls. ix.-x.

A new genus for *Daudebardia noviseolandica*, Pfr. The description is: "Shell worn on the tail, incapable of containing the body, and reduced to the function of a shield to the lungs and heart, rudimentary, paucispiral, nacreous within, columella excavated in a pit for the reception of the shell muscle. Animal lacking rachidian teeth." Very insufficient grounds for a new genus, and the more surprising coming from an anatomist of Mr. Hedley's standing.—W.E.C.

Kobelt, W.—Diagnosen neuer griechischen Arten. Nachr. Deutsch. Malak. Gesell., 1893, pp. 43-6.

The new species are *Malacaria pantocratoris*, Bröm., *Campylaea pteroloke*, Kob., and *C. eliaea*, Kob.

Melville, J. Cosmo.—Descr. of 25 new species of marine shells from Bombay. Proc. Manchester Lit. and Phil. Soc., 1893, vii. pp. 52-67. pl. 1.

Moellendorff, O. F. von.—On the supposed New Zealand species of *Leptopoma*. Proc. Linn. Soc. N.S.W., 1892, vii., pp. 385-6.

Moellendorff, O. von.—Materialien z. Fauna d. Philippinen: x. Die Gattung *Hemiglypta*, von Müll. Nachr. Deutsch. Malak. Gesell., 1893, pp. 1-20.

Von Möllendorff proposes a new genus *Hemiglypta*, with type *H. blainvilliana*, Lea, in place of *Hemiplecta*, Alb., which originally included species of *Hemitrichia* and *Rhysota*, and whose type species (*humphreysiana*, Leach) is proposed by von Martens is a *Rhysota*. Besides the type, nine species are enumerated from the Philippines, viz. *moussoni*, Semp., *semperi*, Mf., *conchoni*, Mf., *mayonensis*, Müll., *semiglobosa*, Pfr., *globosa*, Semp., *infrastrata*, Mf., *cuvieriana*, Lea, *microglypta*, Mf.

Morlet, L.—Descr. de l'espèces nouvelles, provenant de l'Indo-Chine. Journ. de Conchyl., 1892, pp. 315-29, 2 pls.

Figures are given of species described by L. Morlet (since deceased) in the Journ. de Conchyl. of 1891 and 1892, and the following new species are described and figured: *Chloritis remoratrix*, *Clausilia paviei*, *Cl. dautzenbergi*, *Glossula navièi*, *Cyclophorus toruatus*, all of L. Morlet.

Pilsbry, H. A.—Description of a new sp. of *Bulinus*, Naut., 1893, vi., p. 116.
A link between *Diplomorpha* and *Placostylus*.

Pilsbry, H. A.—Note on the *Helices* of the "Biologia Centrali-Americana." Naut., 1893, vi., 117-18 and 128-29.

Pilsbry, H. A.—Preliminary Outline of a New Classification of the *Helices*. Proc. Acad. Nat. Sci., Phil., 1892, pp. 387-404.

A very important contribution to the subject, which in the space at disposal it is impossible to review in the present number.

Pollonera, Carlo.—Studi sulle *Xerophilii*. Bull. d. Soc. Mal. Italiana, 1893, xviii. (Reprint pp. 1-46, pl. 1-11).

An able and interesting paper on this genus. The following species are new: *X. inelegrus*, *impolita*, *indigena*, *indefinita*, *apparens*, *nostra*, *himerensis*, *bayayi*, *lamarmoræ*, *drepanitana*, *infima*, and *dexterior*. Most of the species are figured, as well as several interesting varieties.

Roehuck, W. D.—The Specific Rank of *Limax cinereo-niger*, Wolf. Ann. and Mag. N. H., 1893, pp. 225-28.

Rolle, H.—Diagnosen neuer Landschnecken. Nachr. Deutsch. Malak. Gesell., 1893, pp. 33-5.

Describes the following new species: *Planispira tietzeana* (Halmahera), *Amphidromus kobelti* (no locality), *Bulinus longulus* (Palestine).

Simpson, C. T.—A new *Anodonta*. Naut., 1893, vi., pp. 134-5.

Smith, Edgar A.—Note on the Genera *Geothauma* and *Cyrostropha*. Ann. and Mag. N. H., 1893, pp. 284-5.

Smith, Edgar A.—On a Small Collection of Land-Shells from Palawan and Halabac, Philippine Islands. Ann. and Mag. N. H., 1893, pp. 347-53, pl. xviii.

Smith, Edgar A.—Descriptions of New Species of Land-Shells from Borneo. Journ. Linn. Soc., xxiv., pp. 341-52, pl. 25.

The new species are: 1 *Nanina*, 3 *Sitala*, 1 *Cyclophorus*, 5 *Lagocheilus*, 5 *Opisthostoma*, 6 *Diplommatina*, 2 *Arinia* (the first recorded from Borneo), 2 *Georissa*.

Woodward, B. B.—Classification of the Pelecypoda: Emendatory Note. Ann. and Mag. N. H., 1893, p. 335.

Wright, Berlin H.—The *Unio* Muddle. Naut., 1893, vi., pp. 113-116.

Wright, B. H.—Notes on *Unio coruscus*, Gould. Naut., 1893, vi., p. 126.

PHYSIOLOGY, HABITS, AND CONDITIONS OF LIFE.

Bruyne, M. de—De la phagocytose observée, sur le vivant, dans les branchies des Mollusques lamelibranchs. Comptes Rendus, 1893, cxvi., pp. 65-68.

Cockerell, T. D. A.—Slugs injuring coffee. Naut., 1893, vi., p. 127.

- Fischer, P.—Filtration de l'eau par les Mollusques. Journ. de Conchyl., 1892, pp. 375-6.
- Kew, H. Wallis.—The Faculty of Food-finding in Gastropods. Naturalist, 1893, pp. 145-59.

SPECIAL FAUNA AND DISTRIBUTION.

Ancey, C. F.—Faunes malacologiques de l'Afghanistan et du Belouchistan. Bull. d. Soc. Zool. de France, 1893, xviii. pp. 40-47.

Byne, L. St. G.—A Contrib. towards a list of the Marine Moll. of Teignmouth. Journ. Conch., 1893, pp. 175-88.

Cockerell, T. D. A.—The Small Grey Slug in Jamaica. Notes fr. the Mus. Inst. of Jamaica, 1893, No. 37.

Mr. Cockerell records the occurrence of *Agriolimax agrestis* from Cinchona, Jamaica. It seems probable that the eggs or Slugs have been introduced in the soil or roots of imported living plants. This is the first record for the species from the West Indies, and adds another locality to the world-wide distribution of this Slug.

Cockerell, T. D. A.—Additions to the Fauna and Flora of Jamaica. Journ. Inst. of Jamaica, 1893, i, pp. 256-262.

Collinge, W. E.—Some Notes on the Irish Slugs. Irish Nat., 1893, pp. 148-9.

Cooper, J. E.—*Vatvata piscinalis* m. *sinistrorsum* at Hunstanton, West Norfolk. Journ. Conch., 1893, p. 174.

Crosse, H., and Fischer, P.—Note sur le genre *Holospira*, Martens, et sur la distrib. géogr. d. espèces dont il se compose. Journ. de Conchyl., 1892, pp. 256-78; pl. v.

Sixteen species of this genus (which is now given generic value) are enumerated and figured with notes on their geographical distribution.

Crosse, H., and Fischer, P.—Note sur le *Neritina picta*, Sowerby. Journ. de Conchyl., 1892, pp. 292-3.

The name of *N. usurpatrix* is proposed for *N. picta*, Sby. (1832), which is preoccupied by Yérisac in 1825 for a fossil species.

Crosse, H. and Fischer, P.—Diagnoses Moll. Republicæ Mexicanæ et Guatemalæ incolarum. Journ. de Conchyl., 1892, pp. 294-96.

Diagnoses of two new *Uniones* (*usumasmita*, *yrabalensis*), an *Anodonta* (*rhapalensis*), a *Neritina* (*sargi*), and a *Bulinulus* (*chaperi*).

Dall, W. H.—Additional Shells from the Coast of Southern Brazil. Naut., 1893, vi., pp. 109-12.

Delap, A. H.—Additional Localities for Irish L. and F. Moll. Irish Nat., 1893, ii., p. 84.

Dautzenberg, Ph.—Contribution a la Faune Mal. des îles Sècheltes. Bull. de Soc. Zool. de France, xviii., pp. 78-84.

Fischer, P.—Note sur la faune terr. et fluv. de l'île d'Hainan (Chine). Journ. de Conchyl., 1892, pp. 313-15.

Species new to the island.—*Unio* 2, *Opeas* 2.

Gain, W. A.—The Mollusca of Nottinghamshire. Brit. Nat. 1893, pp. 46-48.

[Garstang, W.]—Notes from the Marine Biological Station, Plymouth. Nature, 1893, weekly.

Berghia caruleosens, February 16th, p. 375; *Hero formosa*, May 4th, p. 13; *Sepia rupellaria*, May 18th, p. 61, &c.

- Hedley, C.**—On the Origin of the Land Snail fauna of Queensland. *Naut.*, 1893, vi., pp. 124-5.
- Hedley, C.**—The Range of *Placostylus*. *Proc. Linn. Soc. N.S.W.*, vii., pp. 335-39.
The distribution of *Placostylus* is New Caledonia, 34 species; Solomon Isle, 16; New Hebrides, 3; Fiji, 16; New Zealand, 1; Lord Howe Isle, 1. The conclusions of the author are (1) the Archipelagoes of Solomon, Fiji, New Hebrides, Loyalty, New Caledonia, Norfolk Isle (?), Lord Howe, and New Zealand form one province to be called the Melanesian Plateau; (2) this plateau derived its fauna from Papua via New Britain and not from Australia; (3) New Zealand and New Caledonia were early separated from the northern Archipelagoes; (4) the Fijis remained to a later date in connection with the Solomons.
- Horsley, J. W.**—*Helix nemoralis* in the Pyrenees. *Journ. Conch.*, 1893, p. 174.
- Jhering, H. von.** Observations on the Helices of New Zealand. *Naut.*, 1893, pp. 121-24. (See Pilsbry, H. A.).
- McMurtrie, J.**—Additional Notes on the L. and F. Moll. of the I. of Figg. *Journ. Conch.*, 1893, pp. 189-91.
- Marshall, W. B.**—Helices colonized in Herkimer, Co. N.Y. *Naut.*, 1893, vi., p. 126.
- Melville, J. Cosmo, and Abercrombie, A.**—The Marine Mollusca of Bombay. *Proc. Manchester Lit. and Phil. Soc.* 1893, vii., pp. 17-51.
- Morris, C. H.**—Albino Varieties at Lewes, Sussex. *Journ. Conch.*, 1893, p. 191.
- Morris, C. H.**—*Voluta piscinalis*, v. *albina* at Lewes, Sussex. *Ibid.*, p.
- Neumann, E.**—Die Molluskenfauna des Königreichs Sachsen. *Nachr. Deutsch. Malak. Gesell.*, 1893, pp. 47-63.
- Oldham, Charles.**—*Pisidia* near Leicester. *Journ. Conch.*, 1893, p. 167.
- Phillips, R. A.**—*Voluta cristata* in Co. Cork. *Irish Nat.*, 1893, ii., p. 112.
- Pilsbry, H. A.**—Notes upon Dr. v. Jhering's observations. *Naut.*, 1893, vi., pp. 129-30.
- Scharff, R. F.**—Mollusca from Woodenbridge, Co. Wicklow. *Irish Nat.*, 1893, ii., p. 149.
- Scharff, R. F.**—*Planorbis riparius*. A correction. *Ibid.*
Dr. Scharff having received genuine specimens of the *P. riparius*, Westr., finds that what he previously alluded to (*Irish Nat.*, 1892, i., p. 192) as being referable to this species are but large specimens of *P. crista*, v. *nautilus*.
- Simpson, C. T.**—On the Relationship and Distribution of the American *Unionide*. *American Nat.*, 1893, xxvii., pp. 353-58.
Anadonta youkensis, Lea, is united with *A. herculea*, Midd., *Unio oregonensis*, Lea, with *U. luteolus*. The type of *U. fomalicus* (said to be from Oregon) is a young specimen of the Brazilian *U. ellipticus*, Spix.
- Suter, Henri.**—Communications Conchyliologiques des Antipodes. *Journ. de Conchyl.*, 1892, pp. 245-55.
Treats of—1, the New Zealand species of *Pitys*; 2, an *Ancylus* from New Zealand; and 3, the *Limacidae* and *Arionida* of New Zealand.
- Walker, Bryant.**—The Shell-bearing Moll. of Michigan. *Naut.*, 1893, vi., pp. 135-40.
- Westerlund, C. A.**—Faunula Molluscorum Hispalensis. *Anales de la Soc. Esp. N. H.*, ser. ii., T. 1, pp. 381-90.

Dr. Westerlund still pursues the course of heaping up new (?) species, on which remarks have been made *ante*, p. 125. One or two seem the same species redescribed.

Williamson (Mrs.) Burton.—On *Clementia subdiaphana*, Cpr., in San Pedro Bay. *Naut.*, 1893, vi., p. 116.

PALÆONTOLOGY.

Cossmann, M.—Catalogue illustré des Coquilles fossiles de l'Éocène des Environs de Paris, &c. Pt. v. and suppl. *Ann. Soc. R. Malac. Belgique*. xxvi.

Although the separate copies of this concluding part of a most invaluable work were issued in July of last year, the members of the Society and subscribers to their journal have only just become possessed of copies of the volume from which it purports to be extracted. Some new genera, sections, and many new species are described and figured.

Cossmann, M.—Révision sommaire de la faune du terrain oligocène marini aux environs d'Étampes. *Journ. de Conchyl.*, 1892, pp. 330-75, 1 pl.

Dall, W. H.—Contributions to the Tertiary Fauna of Florida. Pt. ii. *Trans. Wagner Free Inst.*, iii., pp. 201-446, 1 map and pls. xiii.-xxii.

This second part of a most valuable monograph completes the description of the Gastropoda (including notes supplemental to the first part) and gives those of the Pteropoda, Polyplacophora and Scaphopoda; leaving only the Pelocypoda for another part.

Very many new species are described, also one new genus *Glyptostyla* for *G. panamensis*, n. sp. from the Tertiary of Panama. *Que fait ceci dans ce genre?*

The alternative between *Odostomia* and *Odontostomia*, the latter favoured by the author, is perhaps not quite settled yet. *Amaltheida* proposed, however, as a family name for what has hitherto been regarded as a section of *Hipponyx* cannot stand it being already preoccupied for a section of Ammonites (type genus *Amaltheus*), indeed it is doubtful if the generic form *Amalthea* can stand.

Fox-Strangways, C.—The Jurassic Rocks of Great Britain, Yorkshire. *Mem. Geol. Surv. United Kingdom*, 2 vols., London, 1892.

Vol. ii. contains very full tables of the fossil contents, the vast majority of forms being molluscan.

Hind, Wheelton.—On the affinities of *Anthracoptera* and *Anthraconya*. *Quart. Journ. Geol. Soc.*, 1893, xlix., pp. 249-75, 4 pls.

The former of these genera the author leaves in the *Mytilida*, but the latter, following Sowerby and Dawson, he places with *Unionida*. He has been fortunate in obtaining good material on which to base his conclusions. One new species of *Anthracoptera* and several of *Anthraconya* are described.

Jack, R. L., and Etheridge, R., Junr.—The Geology and Palæontology of Queensland and New Guinea. Text and Atlas, 2 vols., 8vo., Brisbane and London, 1892, pp. xxx, 768, 68 pls.

The fossils of the several formations, from the Middle Devonian up to the Post Tertiary period (inclusive) are fully described.

Four new genera are created:—*Deltopecten* type *Pecten illawarensis*, Morris; *Melismopteria* type *Pterinea macroptera*; *Pseudaricula* type *Lucina anomala*, Moore; and *Macoyella* type *Avicula parklyi*, Moore. Very many new species are described.

Lehmann, F.—Die Lamellibranchiaten des Miocäns von Dingden. I. Thl. Asiphonida und Siphonida Integripalliata. *Verhandl. N. h. Verein prems. Rheinlande*, xlix., pp. 198-241, 1 pl.

Many new species.

Whiteaves, J. F.—Fossils of the Devonian Rocks of the Islands, shores, or . . . vicinity of Lakes Manitoba and Winnipegosis. *Contrib. Canad. Palæont.*, i., No. 6, pp. 292-346.

Figures and descriptions of many new species.

BIOGRAPHICAL.

Lichtenthaler, G. W.—Obituary Notices by W. J. Raymond and Morton J. Elrod, with a portrait. *Naut.*, 1893, vi., pp. 131 and 141-43.

TECHNIQUE.

Williams, J. W.—A New Preservative Fluid for Slugs. *Sci. Goss.*, 1893, p. 93.

EDITOR'S NOTES.

Mr. Henry Crowther, late Curator of the Museum of the Royal Institution of Cornwall, Truro, and well known to all Yorkshire conchologists, has lately been appointed to the Curatorship of the Museum of the Leeds Philosophical and Literary Society.

Mr. Edward J. Bles, B.Sc. (Lond.), of Owens College, Manchester, has been appointed Director of the Marine Biological Association, Plymouth.

We understand that Mr. T. D. A. Cockerell is leaving Jamaica for the Rocky Mountains, his health being unable to stand the climate. His future address will be—Las Cruces, New Mexico, U.S.A.

The Wagner Free Institute of Science, Philadelphia, proposes to issue a reprint of T. A. Conrad's monograph of "The Medial Tertiary, or Miocene Fossils of the U.S." Prof. Wm. H. Dall and Mr. Gilbert D. Harris have consented to write a brief introduction, and to carry the work through the press. As soon as subscriptions for 150 copies are obtained, the work will be commenced.

Professor Brusina has recently been elected a corresponding member of the Zoological Society of France (Paris).

Amongst the recent elections to the Royal Society of Edinburgh, we notice the name of the Rev. John M'Murtrie, M.A., D.D.

We regret to hear of the death of Dr. Carl Semper, Professor of Zoology and Comparative Anatomy in the University of Wurzburg, on May 29th.

Current Literature.—The Editor tenders his grateful thanks to the following authors and institutions for their valuable co-operation and assistance:—J. Cosmo Melville, M.A., F.L.S., Prof. Dr. O. Boettger, G. K. Gude, F.E.S., and the Authorities of the Wagner Free Institute of Science (U.S.A.).

THE CONCHOLOGIST

A Journal of Malacology.

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THE CONCHOLOGIST is published every quarter day, and issued to
Subscribers only.

The pre-paid Annual Subscription is 4s. 4d.

Messrs. FRIEDLÄNDER & SOHN, BERLIN, receive Subscriptions for the Continent.

All Communications should be addressed:—

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THE CONCHOLOGIST:

A Journal of Malacology.

Vol. II.

SEPTEMBER 29th, 1893.

No. 7.

NOTE ON A NEW EUROPEAN SLUG.¹

BY WALTER E. COLLINGE,

Mason College, Birmingham.

THROUGH the kindness of a number of Irish malacologists, I have, during the past twelve months, examined a large series of the slugs from various parts of Ireland.

Mr. R. A. Phillips, of Ashburton, Co. Cork, has quite recently sent me some which I am unable to refer to any known species. I therefore propose to describe them as an addition to the European fauna under the name of *Arion phillipsi*. It is allied to *A. lusitanicus*, Mabilie, and also to *A. subfuscus*, Drap.

An interesting variety (*v. phillipsi*) accompanies the new species and will be described with it. With this latter form I have much pleasure in associating the name of Mr. R. A. Phillips.

As I pointed out in the "Irish Naturalist" (1893, pp. 148-9), it is very probable that a careful search amongst the Irish slugs will reveal a number of forms new to the British Isles, and possibly to science also.

¹ For figures and description see Ann. and Mag. N.H., 1893 (v. 6), xii, pl. ix.

PAPYROTHECA, A NEW GENUS OF GASTROPODA FROM THE PONTIC STEPPES OF SERVIA.¹

By SPIRIDION BRUSINA,

*Professor of Zoology in the University of Croatia and Director of the National
Zoological Museum.*

(Pl. II, figs. I to 5.)

PRELIMINARY REMARKS.

WHEN in the year 1887 I was staying in Belgrad with my friend and colleague, J. M. Zujovic, Professor of Geology and Palæontology in the University there, he encouraged me to examine the Pontic deposits of Ripanj.

Ripanj lies 25 kilometres south of the capital of the Servian kingdom, and the fossiliferous locality lies not far from the railway station. On the spot I have only collected some large specimens of *Melanopsis martiniana*, Uér.; *M. vindobonensis*, Fuchs; *Congeria subglobosa*, Partsch, &c., and have taken away some of the fossiliferous clay. From this material I have, by clearing away the clay, discovered some very interesting new species which I have described and partly figured under the names:—*Neritodonta stanae*, Brus.; *Caspia vujici*, Brus.; *Melanopsis zujovici*, Brus.; *M. losanici*, Brus.; *M. nesici*, Brus.; *M. parlovici*, Brus.; *Orygoceras fistula*, Brus.; *Planorbis lazici*, Brus.; *Pl. marinkovici*, Brus., &c. in the "Annales Géologiques de la Péninsule Balkanique, dirigées par J. Zujovic, Tome iv., Fasc. i., 1892," in one of the parts written in the Servo-Croatian language.

Besides the species just mentioned I have also collected three examples of a very remarkable genus. They were plainly diminutive little specimens, very badly preserved; but each specimen appeared different to the others. For this reason I laid these specimens on one side and made no comment on them in my above-mentioned work.

When my friend Zujovic visited me in the spring in Agram I showed him the specimens in question, and I asked him to procure for me some further clay and sand from Ripanj. I have to thank my friend that I have succeeded in finding in the material sent several, unfortunately more or less incomplete, specimens from which I have been able to obtain a better knowledge of this obscure fossil.

It is already known that the Land and Freshwater-Molluscan fauna, of the so-called Levantine and Pontic steppes of Croatia and

¹Communicated by the author and translated from the original by Herr A. Schaerer.

other south Slavonic Balkan countries, which thirty years ago was quite unknown to us,² has in the space of a generation brought to light a large number of remarkable new types, which call forth universal admiration.

It was not enough that one should discover a very large number of singular species of the genera *Unio*, *Melanopsis*, *Viviparus*, &c., but one now knows to one's gratification the genera *Fossarulus*, Neum., *Prosasthenia*, Neum., *Diana*, Cless., from the Dalmatian—or I might better say from the *Fossarulus*—Marl. Slavonia has its *Tylopoma*, Brus., *Choerina*, Brus. From the immediate environs of the capital of the Croatian kingdom, Zagreb (German, Agram). I have described the genera *Zagrabica*, Brus., *Boskovicia*, Brus., *Lytostoma*, Brus., *Micromelania*, Brus., and *Baglivia*, Brus. Of the genus *Valenciennesia*, which was first known from South Russia, we know to-day several forms from Croatia, Slavonia and Hungary. Our most remarkable genus *Orygoceras* I first discovered in the Levantine *Fossarulus* Marl of Dalmatia; afterwards I found other described species in the Pontic strata of the brother-lands Croatia and Servia. Since the publication of my monograph³ Hungarian geologists have shown that *Orygoceras* is a well distributed genus in Hungary also.⁴

Some of our genera have found universal recognition, while others even at the present time are less known. The reason is chiefly that these novelties are but slightly or not at all represented in collections. Many of our South-slavonic genera are the more interesting, since their position in the system is difficult, or not at all, to be fixed.

The number of these singular types will now be enriched by a very remarkable new one. This new genus, like *Orygoceras*, does not find its like amongst either the extinct or recent genera of mollusca.

In the first place I will endeavour to describe the form of the shell in popular language. One might describe it as having the form of a slipper with a pointed toe; it recalls the former pointed shoes (Rostratfishoes) which in the 14th and 15th centuries were called in England "Cracowes," in France "Poulaine," and in Germany "Schmahelschuhe." The best description one can give is that the genus

² Fraumfeld in 1862 described the earliest Slavonic *Paludina*, and in the year 1868 Moriz Hübnér described and figured the first species of *Unio* from Slavonia, in his great work upon the "Fossilen Mollusken des Wiener Beckens." Immediately afterwards E. Albert Bielz published, unfortunately without figures, the first local fauna from Krajowa in Rumania.

³ S. Brusina—*Orygoceras*, eine neue Gastropoden gattung der Melanopsiden-Mergel Dalmatiens (Beiträge zur Paläontologie Oesterreich-Ungarns und des Orients, 11. Bil. Wien 1852.)

⁴ Dr. J. Fethő. Das Vorkommen der *Orygoceras*-schichten im Tethys-Küstenlande. Jahresber. der. Kgl. ungar. Geol. Anst. u. Budapest 1888.

has the form of a diminutive, crushed, and very thin conical paper case¹; for it has the conical form of the case, the inrolled apex, the wide oblique, very unequal mouth, as also the groove which runs in a straight line from the apex to the mouth. I have therefore called the genus *Papyrotheca* from *πάπυρος* and *θήκη*. That *Papyrotheca* belongs to the Gasteropoda is shown us by the apex of the shell. We have, as already stated, considered the enormous multitude of extinct and living Gasteropods already collected, but can only find distantly related affinities.

In considering the form we might well find a relationship with the genus *Crepidula*, especially *Spirocrypta*, in so far that these genera and *Papyrotheca* have in common a slipper-shaped form. In particular *Crepidula* (*Spirocrypta*) *pileum*, Gabb, from the cretaceous formation of California, appears to show a certain relationship. *Spirocrypta* has also an inrolled apex, the left side of the mouth bends towards the interior and forms a broad lamella or septum, the right side also bends inwards, it reaches and partly covers the just-mentioned interior septum. Although I had no opportunity of comparing *Spirocrypta* with *Papyrotheca* in nature; it is certain that a real relationship is out of the question, for this reason, that *Spirocrypta* was a marine gasteropod, while *Papyrotheca* was an inhabitant of either fresh or brackish water.

The apex of *Papyrotheca* is formed like that of *Calyptrea chinensis* (L.), but in the *Calyptrea* it is crushed flat, as is the shell, whereas in *Papyrotheca* the apex is extended, lengthened, and therefore pointed, microscopic examination only showing that it is not sharp, but blunt, or say digitate. For this same reason, we can better compare the apex of *Papyrotheca* with that of the genus or sub-genus *Acella*, Hald., i.e., with the recent *Limnæa* (*Acella*) *gracilis*, Jay, from North America, or with the fossil *Limnæa* (*Acella*) *acuaris*, Neum., from Slavonia.

We might therefore say that *Papyrotheca* is a *Limnæa*, imitating the form of a *Crepidula*.

Already the recent genus *Lantzia*, Jous., shows a highly singular habitat amongst the *Limnæa*. Very different are also the fossil genera *Boskovicia*, Brus., *Lytostoma*, Brus., *Corymbina*, Bukowski. *Valenciennesia*, Rouss, is also related to this family, and with the *Limnæidæ*, through *Limnæa* (*Velutinopsis*, Sandb.) *velutina*, Desh. *Papyrotheca* is certainly the most distant from all, and therefore one might perhaps form a separate family of *Papyrothecidæ*, or at least a sub-family *Papyrothecidinæ*.

¹[The German "papierdite" really means a paper cornet, such as grocers use to wrap up sugar, &c., in.—TRANSLATOR.]

I have sent a few specimens to the distinguished conchologists M. Cossmann, of Paris, and Dr. O. Boettger, of Frankfurt am Main. The first wrote me: "*Papyrotheca mirabilis* ressemblerait à un Ptéropode, si le sommet n'étant pas tordu comme dans quelques genres de Gasteropodes; c'est tout à fait curieux et vraiment *mirabilis*."

Dr. Boettger wrote very strikingly: "Your *Papyrotheca* is very singular. As it is for certain a freshwater snail any relationship with the *Succinea*, *Omalonyx*, &c., disappears. Considering the thinness of the shell the existence of an operculum is likewise impossible, therefore a comparison with *Navicella* is also out of the question. There remains, consequently, but the *Limnaeidae*, and here the position between *Latia* and *Limnaea*, in my opinion, is acceptable, even though any living or fossil analogues are unknown to me."

SPECIAL PART.

Papyrotheca, gen. nov.

The shell is very frail, as if made from a slip of white paper, hardly whorled and not umbilicated, consisting of the apex and one volution. The form is a very peculiar one, and it can only be compared with a depressed *Succinea* that has adapted the form of a lengthened *Crepidula*. The apex is smooth, elongated like *Acella*, and makes but a single turn (Pl. II, fig. 3); which at once widens into a very broad mouth, this latter forming nearly the whole of the shell, and having no lips, the edges being sharp. The spindle-shaped edge which is developed directly under the apex and runs towards the mouth, forms a comparatively large lamella; this forms a rather acute angle with the hinder portion of the mouth. The external edge of the mouth is largely extended below, simple, but above opens into an acute angle, and therefore forms a septum-like lamella. This reaches the already described lamella on the spindle-shaped edge, unites with it, but only partly covers it, often leaving a distinct flat space, not unlike a deepened groove.

The shell has rather the appearance of a mussel, for it shows fine concentric, not quite regular striæ which show more on the back, while the interior of the shell is nearly smooth.

Papyrotheca mirabilis, sp. nov.

(Pl. II, figs. 1-3.)

To the description of the genus, we have only to add that the spindle plate of this species is very narrow, but the external plate—or as I have previously termed it, the septum—is very broad, and its surface is marked with a large number of fine and fairly regular wrinkles. The edge of the septum is crescentic.

The best preserved and nearly complete specimen (fig. 1) has a height of 4.5 millim., a breadth of 1.9 millim., and a thickness of 0.5 millim. The septum is about 2 millim. high. The septum of the largest, but very incomplete specimen (fig. 2) is about 4 millim.; the whole shell must consequently have been about 10 millim. in height. I do not think the species has reached larger dimensions than this or I should have been bound to have found fragments of larger and stronger apices.

This species, of which I discovered a single specimen in 1887 in Ripanj, I consider as the type of the genus. It is a very abundant form, I having this year received over fifty more or less complete examples or fragments.

Papyrotheca pseudogyra, sp. nov.

(Pl. II, fig. 4.)

This species is very much like the preceding one, and yet so very different, that although I have found only one specimen, I must consider it as a distinct form.

It is considerably smaller than *P. mirabilis*, the septum of the external edge is not crescentic but simply diagonal. I do not, however, wish to put too much weight on these circumstances, as we can probably trace the reason to the fact that this is only a half-grown specimen.

The following important facts, however, have convinced me that it is an absolutely good and separate species.

- a The whole shell is more spade-shaped.
- b Although the specimen is only very small, the apex if compared with the larger apex of *P. mirabilis* will be found to be much more blunt and puffed up.
- c In *P. mirabilis* the apex is turned a little sideways, but in this species the apex is quite straight.
- d In the apex of *P. mirabilis* there is a distinct deep wrinkle on the back, whereas in this species it forms a regular surface.
- e If the apex is magnified, say about thirty times, there appears on the side of the mouth a thread shaped wrinkle or scarcely deepened spiral, which apparently seems to separate the apex in 2-3 whorls. I say seems, because although I cannot sacrifice the only specimen, I am convinced that the said wrinkle does not correspond to any real interior whorls, but is simply a superficial spiral, which, if one cares to form a hypothesis, morphologically considered, will probably show a tendency to produce rotations.

The small shell is about 2 millim. high, 0.8 millim. broad, and a little less than 0.5 millim. thick.

Papyrotheca contraria, sp. nov.

(Pl. II, fig. 5.)

This species varies very much from *P. mirabilis*. In the first place the shell is apparently thicker, and therefore its form is not so flattened, but rather semi-cylindrical. The spindle-shaped edge forms a sharp ridge directly under the apex and runs further down, quite different from the condition noticed in the preceding species. The spindle lamella is well developed, and therefore forms a broad septum, which is not crescentic but runs diagonally across the shell as a straight line from the apex. The external edge above runs diagonally and forms a much smaller septum, which curves towards a spindle septum, it covers but little of the opposite large septum of the spindle edge, only uniting itself at the apex. For this same reason, there is absolutely no spindle groove which can be compared with *P. mirabilis*. The septum of the external edge consequently hardly deserves the name, its edge is, as has already been mentioned, diagonal, but in the opposite direction to the edge of the spindle septum, and reminds one a little of the upper part of the mouth of many *Succinea*. In other words, if one lengthened the lines of the right and left septum, they would cross and form a figure thus X.

The very imperfect specimen (fig. 5) is 3 millim. high, 1.9 millim. broad, and not quite 1 millim. thick; when complete it must certainly have been not less than 5 millim. high.

The first defective specimen, without the apex, I discovered in Ripanj in 1887. I am almost inclined to believe that this species is really scarce, and I am more inclined to believe that I have collected it at that time on another spot. It is well known that at different spots of the same horizon at the distance of a few metres one may find different species.

EXPLANATION OF PLATE II.

- Fig. 1. *Papyrotheca mirabilis*, Brus. Nearly complete specimen 4.5 millim. high, 1.9 millim. broad. Front view.
- Fig. 2. *Papyrotheca mirabilis*, Brus. The largest specimen, very much damaged and with one groove at the septum, 5.5 millim. high, 2.2 millim. broad. Front view.
- Fig. 3. *Papyrotheca mirabilis*, Brus. Fragment, 3.2 millim. high, 1.8 millim. broad. Back view.
- Fig. 4. *P. pseudogyra*, Brus. Young specimen, 2 millim. high, 0.8 millim. broad. Front view.
- Fig. 5. *P. contraria*, Brus. Fragment, 3.2 millim. high, 1.9 millim. broad. Front view. ———

All the figures are magnified. The original specimens are in the collection of the National Museum, Agram, Croatia.

DESCRIPTIONS OF TWO NEW SPECIES OF PATULA FROM ST. HELENA.

By EDGAR A. SMITH, F.Z.S.,

Zoological Department, British Museum, London.

The first of the species about to be described formed part of the collection of the late M. Emile Eudel, and was kindly submitted to me for examination by Mr. H. Fulton. In my report upon the land shells of this island¹ twelve species of this genus are enumerated, four without teeth in the aperture and eight with teeth (*Endodonta*). Of the latter, only a single species is recent or living, the rest belonging to the extinct or sub-fossil fauna. The discovery of additional existing forms is therefore especially interesting. *Helix cutteri* of Pfeiffer, the only living species previously recorded, is somewhat larger than either of those here described, and has a different armature to the mouth.

Patula (Endodonta) sexdentata, sp. nov.

Testa parva, perforata, depresso conoidea, tenuis, nitida, straminea, superne rufo tessellata, subtus rufo fulgurata; aufractus 5, convexi, lente crescentes, duo primi laevigati, caeteri costulis tenuissimis arcuatis striisque microscopicis intercalatis sculpti, ultimus ad peripheriam rotundatus, haud descendens; apertura lunaris, obliqua, lamellis duobus parietalibus, tenuibus sed prominentibus, intransibus, tribus dentiformibus prope columellam, et una gracile parva in medio palati, instructa; perist. tenue, marginibus remotis, columellari dilatato et subreflexo. Diam. max. $3\frac{2}{3}$ millim., min. $3\frac{1}{3}$; alt. $2\frac{1}{2}$.



Habitat. "Dans le cresson de l'île Ste. Hélène" (Eudel).

This species agrees rather closely with *P. pseustes*, Smith, in respect of the dentition of the aperture. The palatal lamella, however, in that species is considerably stronger, and the form of the shell is very different. *P. cutteri* has two similar parietal lamellæ, only two basal denticles, and no palatal lamella. In other respects it appears to be very similar, but a trifle larger. Water-cresses (*Nasturtium officinale*) among which it is stated by M. Eudel that this species occurs, are said to be "very common in the ravines and along the mountain streams and ponds."²

¹Proc. Zool. Soc., 1892, pt. 1: 58-70.

²Mellis, l. c. St. Helena, p. 277.

Patula (Endodonta) perarmata, sp. nov.

Testa anguste perforata, depresso conoidea, albida, superne rufo maculata, subtus rufo irregulariter strigata; anfractus 6, convexi, sub lente accrescentes, costulis tenuibus numerosis leviter obliquis instructi, ultimus haud descendens, ad peripheriam subrotundatus; apertura obliqua, lunata, intus lamellis circiter decem (tribus subæqualibus parietalibus prominentibus, una dentiforme supra columellari, circa sex inæqualibus palatalibus) instructa; peristoma tenue, margine columellari dilatato, intus valde incrassato. Diam. mag. 3 millim., min. $2\frac{2}{3}$; alt. 2.



Habitat: Diana's Peak (Cutter).

There are two specimens of this species in the Cumingian collection. They agree in all respects excepting the spire, which in one specimen is considerably less elevated than the other. The three parietal lamellæ are about equal, but of the palatal, three or four are larger than two intermediate ones.

ON CLAUSILIA VESPA, GOULD, AND ITS ALLIES.

By E. R. SYKES, B.A., F.Z.S.,

Weymouth.

In the "Journal of the Asiatic Society of Bengal" (vol. xli, p. 205), Dr. W. T. Blandford created the section *Oospira* to contain *Clausilia philippiana*, Pfr. (as the type), *vespa*, Gould, *bulbus*, Benson, and *ovata*, Blandfd.; and he also expressed his sense of the difficulty of identifying Gould's species. Mr. F. Stoliczka, in his supplement, redescribed (p. 209) *C. vespa*, and both he and Dr. Blandford gave figures of what they believed to be that species (pl. ix, fig. 15 and 15a). The specimen figured by Mr. Stoliczka is, I believe, one which has been since received by the British Museum from Mr. Theobald. There are two species in the British Museum under the name of *vespa*, Gould: one which I regard as really that species from the Hungerford Collection, and the other from Mr. Theobald, which I regard as the species and specimen described and figured by Mr. Stoliczka. What the shell is which is figured by Dr. Blandford as *vespa* is, the absence of description makes it hard to say; Dr. Blandford himself says it is hard to separate from *philippiana*, and it is probably only an elongated specimen of that species. Gould's original description* is very brief:

*Proc. Post. Soc., 1850, vol. xiv, p. 12, and in Otia Cerchi, p. 220, and Illus. Mon. Hist. Ver., vol. vi, p. 49.

"*T. solida, sinistrorsa, vespaformis, deflecta, laevis, intense rufa; anfr 6, anteriori raptim attenuato, proximo corpulento apicalibus cito descrescentibus; sutura impressa, vix marginata; apertura ovata; columella biplicata; peritremate late reflexo, rufo.*"

The description will not fit Mr. Stoliczka's shell, as in this latter the colour is not "*intense rufa*," the apex is blunt not "*anfr apicalibus cito descrescentibus*," i.e., resembles the end of a cylinder rather than the point of a cone, no whorl can be said to be "*corpulentus*," the suture is not "*vix marginata*" but simple, the aperture is not "*ovata*" but subovate, the lip is not "*late reflexus*" or "*rufus*."

On the other hand, so far as it goes, Gould's description does fit the Hungerford shell, which is not very blunt in the apex like the others of the *Oospira* section, which is a dusky red, like *philippiana*, and has a very thick and expanded dark lip.

I therefore consider Mr. Stoliczka's shell as not *vespa*; it is, as far as I know, an undescribed species, and I adopt his description of it and call it *stoliczkana*. (J. A. S. B., vol. xli., p. 209, pl. ix., f. 15.)

Clausilia (Oospira) stoliczkana, sp. nov.

Cl. testa ovato-cylindracea, ad apicem obtusa, albidā, medio subinflata, ultimo anfractu sensim attenuata, haud rimata, fusco castanea; anfractibus sex, convexiusculis, sutura simplicijunctis, transversim oblique et confertissime striolatis; apertura subovata, postice rotundate subangulata, antice late sub-effusa, intus violaceo-rufa, peritremate modice expanso, interno oblique fere recto, libero; lamellae sub-parallelae, fuscae, ad marginem attingentes; plicae palatales 8-9, suprema (principalis) longa, alterae breviores et inter se valde inaequales. Alt. 25 millim., lat. 7 millim. Apert. alt. 6½ millim., lat. 5 millim.

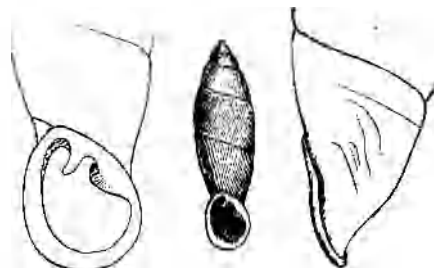
Habitat: Tavoy, Burmah.

I now redescribe the

C. vespa, Gould.

Cl. testa solida, sinistrorsa, fusiformis, medio inflata, apex obtusiuscula, subtile et indistincte decussata, haud nitida, intense rufa, ad apicem pallidior; anfr 6, apicales cito descrescentes, penultimus et ante penultimus inflati, corpulenti; sutura impressa vix marginata; apertura ovata, peritremate late et valde reflexo, rufo; lamella superior valida, obliqua, rufa, fere ad marginem attingens, l. inferior valida rufa subparallela; plicae palatales 5-6, suprema (principalis) longa, secunda brevior, descendens, reliquae parvae, subaequales descendentes. Alt. 27 millim., lat. 8 millim. Apert. alt. 7 millim., lat. 5½ millim.

The Hungerford specimen is from Hooden Koo, Salwin Valley, Burmah; Gould's type from "Tavoy."



Cl. vespa, Gould, must be withdrawn from the *Oospira* section both on the ground of shape and its sculpture (an indistinct decussation) and *Cl. stoliczkaana* should take its place.

ON THE SPECIFIC IDENTITY OF CLAUSILIA MOUHOTI, PFR., AND *C. MASSIEI*, MORLET.

By E. R. SYKES, B.A., F.Z.S.,

Weymouth.

The late Com. Morlet has described* as a new species a shell which I consider identical with *C. mouhoti*, Pfr.† I have carefully compared the descriptions and figures of the two species and have also examined the types of *C. mouhoti*. The only differences which appear to exist are that in *C. massiei*, Morlet mentions a "*flicca columellaris*," and does not mention the occurrence of any lamella subcolumellaris. The only conclusion to be come to is that Morlet was partly using the old nomenclature of Moquin-Tandon and Dupuy; if this is so the two are the same thing and the matter is much simplified. It is to be regretted that authors will not use modern terminology in such matters; the most to be recommended is that of Messrs. Smith and Woodward,‡ adapted from Boettger, Westerlund and Moellendorff. The length and breadth of the shells as given by Pfeiffer and Morlet are identical; the whorls in both cases are given as twelve; they are both from Laos. Both have a lamella, superior and inferior, and judging from the figure of *massiei* both are similarly situated. *C. massiei* has a lamella inter-

* Journ. de Conch., 1862, Vol. xii, pp. 82, 83, pl. vii, fig. 3.

† Journ. Zool. Soc., 1862, p. 275, pl. 26, fig. 2.

‡ Ann. M. g. N. H., 1866 (Ser. 6), vol. v, pp. 209-13.

lamellaris (he calls it a plica) and in a specimen I have of *mouhoti* a very small one is to be seen. Even if it were absent, this is such an uncertain characteristic as not to be specific. Both have a lunule and a single plica palatalis. There is therefore no difference existing unless it be in the relative sizes and positions of the lamellæ and plicæ. As to this I can only say that I am unable to see any. The characteristic noted by Morlet in *C. massiei*, that the surface is finely decussated, occurs equally in *C. mouhoti* and the colouration as shown in the figure is that of *C. mouhoti*.

A CHECK-LIST OF THE SLUGS.

By T. D. A. COCKERELL, F.Z.S., F.E.S.,

Professor of Entomology and Zoology, New Mexico Agricultural College.

WITH APPENDIX AND NOTES

By WALTER E. COLLINGE,

Demonstrator of Biology, Mason College, Birmingham.

THE present list is intended to include all the names, generic, specific, or varietal, which have been proposed for slugs. The writer is responsible for the arrangement, which is in accordance with his present views, but it is not supposed for a moment that it is in any degree final, and there can be no doubt that the labour of students in the near future will show many changes to be necessary. In many instances it is impossible to make sure of the correct location of a slug without such study of specimens and bibliographical research as are quite beyond the power of the compiler, situated as he is away from museum and malacological libraries. Those who have the opportunity may do good service by critically examining the doubtful names in this list, and determining their true value.

When the validity of a species or variety is doubtful, it is best in a check-list to give it the benefit of the doubt. Too great readiness to reduce names to synonymy may lead to blunders which are afterwards the source of much misunderstanding. For example, on reading Mabille's numerous descriptions, one is impressed by the fact that the author did not distinguish between specific and varietal character, and the natural tendency is to assume that none of the so-called species are valid. Yet subsequent research has shown that some of them are perfectly distinct. Again, when false synonymy has been proposed, it is often followed by author after author, when a glance at the original description by any competent

person would set matters right. In this way *Limax filans*, Hoy, *L. squammatinus*, Morelet, &c., have for years been completely misunderstood. Another difficulty relates to the limit of species. In England we find comparatively few species, and these for the most part very distinct from one another, so that we are hardly prepared for the numerous closely allied forms of Southern Europe and elsewhere. *Limax maximus* and *L. flavus*, for instance, are subgenerically distinct; and English authors having in mind such distinctions as they present, have at various times refused to recognise species or subspecies differing in less degree. Thus *Arion hortensis* and *A. fasciatus*, *Testacella haliotideae* and *T. scutulum*,¹ and other valid species, have been long confounded. When we examine the *maximus* group of *Limax*, the *gagates* group of *Amalia*, the *levis* group of *Agriolimax*, &c., the sharp distinctions between species seem to be altogether lost. In Central Europe the subspecies or species allied to *Limax maximus* are numerous and polymorphic, so that, despairing of finding good lines of separation, authors have sometimes proposed to unite them under a single name. Yet to thus confound *maximus*, *cinereo-niger*, and *geographicus*, &c., tends rather to obscure facts of great interest, and in the present list all such forms are given the rank of subspecies, which seems best to express their true standing. This gradation of forms, though so annoying to the pure systematist, is to the evolutionist full of interest, and the more carefully the units (whether species, subspecies, or varieties) are studied, the greater is the light thrown on the making of species. The slugs are by no means exceptional in furnishing such evidence of evolution, and it is very instructive to notice the way in which the difficulties of classification have been met in different groups of organisms. The student may be referred to the writings of Allen and Merriam on North American Rodents, of W. H. Edwards on *Argynnis*, of C. B. Adams on Jamaican Land Shells, of Bebb and Buchanan White on willows, of Baker on roses, &c., for similar instances.

Whereas formerly slugs were described only from external characters, the tendency now is to have little regard for any but anatomical. Here there is undoubtedly danger of error, since it is difficult to find out in many cases what is the stability of the apparent anatomical distinctions. There are plenty of "anatomical species" now on the lists which may hereafter be abolished²; and

¹ The difference between these slugs is constant and well marked, and they were only confounded so long as their structure was unknown.—W. E. C.

² In every so-called "anatomical species" which may hereafter be abolished we may count a dozen of the other species which most certainly will have to be placed as synonyms.—W. E. C.

it requires some amount of faith to believe in the distinctness of slugs which outwardly seem exactly alike.⁸ While the value of differences in the genitalia is undoubted, it does not seem proper to assume that two forms are identical because the genitalia will not serve to distinguish them. Among moths, it is known that in some genera the species are easily separated by genitalia alone, while in others undoubtedly distinct species have similar genital organs. Nothing should be more strongly insisted upon than the impossibility of applying the same tests of specific validity throughout series of genera; for characters that are generic in one place may not be specific in another.

All mutations are included, which will be contrary to the wish of some malacologists. The writer has so often expressed his views about varieties and mutations, that it would be superfluous to discuss the subject here; but it is represented that a check-list should above all things be complete, and that it is better to include everything than cripple the work by ignoring names at one's discretion—or indiscretion—as it may be. All species are numbered consecutively, and varieties and mutations are lettered. Synonyms are without numbers or letters. Synonyms and names representing probable synonyms are in old style antique. Thus *Limax santorinus* is given a number because it cannot be definitely referred as a synonym, but it is printed in italics because it is probably not a valid species. A query (?) before a species or variety does not signify that it is doubtful, but that its place in the classification is doubtful. Fossil species are enclosed within square brackets [].

LIMACIDÆ, Leach, 1820;
Turt. 1831.

LIMACINÆ, W. G. Binn., 1864.

LIMAX, L., 1758.

- Limacias*, Raf., 1815.
- Eulimax*, Moq.
- Stabilia*, Pini.
- Limacella*, Brard.
- Limacellus*, Brard, em Turt.
- Plectilimax* (err. ?).
- Gestroa*.
- Chromolimax*.
- Opilolimax*.
- Cryptopelta* (err. ?).

Subg. **HEYNEMANNIA**, Malm.

Macroheynemannia,
Simr., 1891.

- 1. *L. maximus*, L.
parma, Brard, 1815.
antiquorum (pars), Fer.
cinereus (pars), Müll.
cyreneus, Comp., 1837 (err. ?).
- a. *czernævii*, Kal.
vulgaris, Moq.
fasciatus, Pic., 1840 (nec Raz.).
- i. *bifasciatus*, D. & M.
ii. *quadrifasciatus*, D. & M.
iii. *continuatus*, D. & M.
- b. *fasciatus*, Raz., 1789.
- c. *maculatus*, Leach, 1820, ed. Gray, 1852.
krynickii, Kal., 1851.
johnstoni, Moq., 1855.
i. *lilacinus*, Roeb., 1884.

⁸ It requires still more faith to believe in the distinctness of two slugs which anatomically are identical, because the one is a different colour than the other.—W. F. C.

- d. marmoratus*, Ckll., 1885.
e. punctatus, Esmark, 1886.
f. maculatus, Picard (nec Leach).
f. cellarius, D'Arg., Moq.
g. ferussaci, Moq., 1855.
h. mulleri, Moq., 1855.
i. serpentinus, Moq., 1855.
j. aldrovandi, Moq., 1855.
k. limbatus, Moq., 1855.
l. pallido-dorsalis, Roeb. MS., Huds.
m. obscurus, Moq., 1855.
subunicolor, Roeb., sine descr.
i. nebulosus, D. & M.
n. rufescens, Moq., 1855.
o. vinosus, Baud.
p. cinereus, Roeb., ex err.
q. megaspidus, Blainv., 1817.
candidus, L. & P.
r. strobili, Pini.
s. gestroa, Pini.
i. cornaliæ, Pini.
t. concolor, Pini.
u. sordidus, L. & P.
v. bivonæ, L. & P.
w. fuscatus, Raz. (err. ?).
x. albus, Am Stein, 1890.
y. calosoma, Eis. & Stuxb.
z. giganteus, Baud.
a'. unicolor, Heyn.
b'. hareri, Heyn.
c'. tschapecki, Simr., 1886.
d'. pardalis, Simr.
e'. bocagei, Da Silva, 1875.
f'. bielzi, Simr.
g'. subunicolor, Simr.
h'. nubigenus, Bgt., 1863.
i'. abrostolus, Bgt., 1863.
2. *L. m. punctulatus*, Sordelli.
a. typus, L. & P.
b. parumpunctatus, Pini.
c. pradæ, Pini.
d. pinianus, Less.
3. *L. m. psarus*, Bgt.
b. subzonatus, Poll., 1886.
4. *L. m. genei*, L. & P.
5. *L. m. ater*, Raz.
albipes, Stab., 1864.
engadiensis, Heyn.
- b. montanus*, Leyd.
c. dubius, L. & P.
d. fasciatus, Raz.
e. pironæ, Pini.
6. *L. m. polipunctatus*, Poll., 1888.
b. raripunctatus, Poll.
7. *L. m. millipunctatus*, Poll., 1884.
8. *L. m. canapicianus*, Poll., 1885.
b. ocellatus, Poll.
9. *L. m. cinereoniger*, Wolf in Sturm, 1805.
bilobatus, J. Ray, 1851.
cinereus, (pars.) Müll., 1776.
claravallensis, Drouet in Moq., 1855.
pyrenæus, Comp.
razoumoukii, Kal.
antiquorum (pars.), Pér.
maximus, Esmark. ex err., 1886.
- a. luctuosus*, Moq.
atratus, Pini.
b. typus, L. & P.
c. maurus, Held.
niger, Moq.
d. ferussackii, (sic) Kal.
cinereus, Moq.
e. renardii, Kal.
f. transylvanicus, Heyn.
g. ornatus, Less.
h. isseli, Pini.
i. strobili (Pini?), Less.
j. pavesi, Pini.
k. camerani, L. & P.
l. stabilei, Less.
- m. leucogaster*, Mörch.
n. albipes, D. & M.
a. lineatus, Dum., 1849.
nigripes, Stab., 1864.
p. malacologorum, Colb.
g. flavescens, Wst.
r. fasciatus, Wst.
s. cinereonebulosus, Malm.
t. albus, Paasch.
10. *L. m. geographicus*, Ren.
dacampi, Meneg., 1854.
 (i.) *a. menegazzii*, L. & P.
b. amalæ, Beth.
c. punctatus, Less.

- (ii.) *d. renieri*, L. & P.
e. atratus, Bett.
f. elegans, Bett.
g. sordellii, Bett.
h. nigricans, Less.
i. sulphureus, Less.
j. calderinii, Less.
- (iii.) *k. typus*, Bett.
l. trilineolatus, Bett.
m. monolineolatus, Bett.
n. pinii, L. & P.
o. doricae, Pini (nec Bgt.).
p. fuscus, Bett.
q. taccanii, Pini.
r. gualterii, Pini.
s. maculatus, Less.
t. pallescens, Less.
u. rufescens, Less.
v. monocromus, L. & P.
w. erytus, Pini.
x. villosa, Pini.
y. turatii, Pini.
z. lineatus, Strob.
11. *L. m. erythrus*, Bgt., 1864.
 12. *L. m. subalpinus*, Less.
a. typus, L. & P.
b. garocelus, L. & P.
c. simplex, Less.
d. veronensis, L. & P.
e. eporediensis, Less.
13. *L. m. fungivorus*, Poll.
 14. *L. m. alpinus*, Fém., 1822.
 15. *L. m. monticola*, Btg.
 16. *L. modestus*, Flor., 1889 (? 1890).
 17. *L. martinianus*, Bgt., 1869.
 18. *L. maurelianus*, Bgt.
 19. *L. corsicus*, Moq.
- (i.) *a. typus*, Moq.
b. fabrei, Moq.
c. sienensis, L. & P.
- (ii.) *d. doricae*, Bgt., 1861.
e. simplex, L. & P.
f. lineatus, L. & P.
g. rubrolineatus, L. & P.
h. fuscus, L. & P.
i. brunneus, L. & P.
j. pallescens, L. & P.
k. sanguineus, L. & P.
- (iii.) *l. issellii*, Less.
m. seriatus, L. & P.
n. arthuri, L. & P.
o. zonatus, L. & P.
- (iv.) *p. callichrous*, Bgt., 1861.
q. versicolor, L. & P.
r. hybridus, L. & P.
- (v.) *s. gestri*, Less.
t. nigrozonatus, L. & P.
u. pulcher, L. & P.
- (vi.) *v. bonellii*, Less.
w. aterrimus, L. & P.
x. flavoniger, L. & P.
y. citrinus, L. & P.
z. olivaceus, L. & P.
- (vii.) *a'. ciminensis*, Poll., 1890.
 20. *L. perosinii*, L. & P.
callichrous, Less., 1880 (nec Bgt.)
a. typus, L. & P.
b. cruentus, Less.
c. formosissimus, L. & P.
d. monregalensis, L. & P.
e. venustissimus, L. & P.
21. *L. carbonarius*, Btg., 1885.
græcus, Simr.
22. *L. talschanus*, Btg.
b. tigris, Btg.
23. *L. conemenosi*, Btg.
b. multipunctatus, Btg.
24. *L. moravicus*, Ehrenb.
 25. *L. santorinus*, Letourneux, 1884.
 26. *L. eustrictus*, Bgt.
- [27. *L. polloneræ*, Sacc.
b. saxiformis, Sacc.]
- [28. *L. albucianensis*, Sacc.]
 [29. *L. pliologisticus*, Sacc.]
 [30. *L. fossilis*, Sacc., 1885.]
- Subg. MALACOLIMAX, Malm., 1868.
Malinastrum, Bgt.
Mikroheynemannia, Simr., 1891.
Ambigolimax, Poll., 1887.
31. *L. tenellus*, Nuss.
cereus, Held.
sylvaticus, D. & M.
cinctus, Heyn., 1861 (nec Müll.)
serotinus, Sch., 1848.
b. griseus.
c. xanthius, Bgt.
d. clypeofasciatus, D. & M.
e. clypeoconcolor, D. & M.
f. immaculatus, D. & M.

32. *L. subsaxanus*, Bgt.
 33. *L. cephalonicus*, Simr.
 34. *L. raymondianus*, Bgt.
 35. *L. brondelianus*, Bgt.
 36. *L. nyctelius*, Bgt.
 37. *L. valentianus*, Fer.
 38. *L. fulvus*, Norm., 1852.
 Sect. MELITOLIMAX, Poll.
 39. *L. melitensis*, L. & P.
 Subg. VITRINOIDES, Simr., 1891.
 40. *L. armeniacus*, Simr.
 Subg. LEHMANNIA, Heyn., 1863.
 41. *L. marginatus*, Müll., 1774.
 ? *sylvestris*, Scop., 1772.
 filans, Hoy, 1789.
 arboreus, F. & H., ex err.
 sylvaticus, Goldf., 1856.
 scandens, Norm., 1852.
 scopulorum, Fb., 1779.
 glaucus, Clk., 1853.
 ? *salicium*, Bouill., 1836, sine
 descr.
 limbatus, Held., 1837.
 arborum, Bouch., 1838.
 livonicus, Schr., 1848.
 a. *typus*, L. & P.
 b. *nemorosus*, Baud.
 altilis, Fisch.
 c. *roseus*, Breeck., 1870.
 d. *coloratus*, Breeck., 1870.
 e. *helveticus*, Bgt., 1862.
 reticulatus, D. & M., 1852.
 f. *dianæ*, Kim.
 g. *heyneimanni*, Bielz.
 h. *bettonii*, Sord.
 i. *alpestris*, L. & P., 1882.
 j. *pallens*, L. & P., 1882.
 k. *rupicola*, L. & P., 1882.
 l. *maculatus*, Roeb.
 m. *decipiens*, Ckll., 1886.
 n. *albomaculatus*, Kregl., sine
 descr.
 submaculatus, Ckll., 1890.
 carpaticus, Haz., 1885.
 tigrinus, Weidl.
 flavus, Weidl., 1876.
 obscurus, Esmark., 1886.
 42. *L. m. mongianensis*, Paul.
 43. *L. eubalius*, Bgt., 1864.
 Sect. LIMACUS, Lehmn., 1864.
 Plepticolimax, Malm., 1868.
 Simrothia.
44. *L. flavus*, L.
 variegatus, Drp., 1801.
 ehrenbergi, Bgt.
 ? *unguiculus*, Brand., 1815.
 bicolor, Selenka.
 chilensis, Gay, 1854.
 megalodontes, Q. & G., 1824.
 concauus, Turt., ex err.
 b. *umbrosus*, Phil., 1844.
 c. *breckworthianus*, Lehm.
 d. *antiquorum*, Sby.
 e. *maculatus*, Kal., 1839.
 f. *campanyoni*, Bgt., 1863.
 companoyi (Bgt.), Loc.
 g. *baeticus*, Mab.
 h. *deshayesi*, Bgt.
 i. *flavescens*, Fer., Moq.
 j. *rufescens*, Moq.
 k. *nigromaculatus*, Ckll.,
 1893.
 maculatus, Moq., 1856. (nec
 Kal.)
 l. *tigrinus*, Pini
 m. *colubrinus*, Pini.
 n. *virescens*, Moq.
 o. *suffusus*, Roeb.
 p. *griseus*, Roeb.
 ? q. *lineolatus*, Clige.
 r. *canariensis*, D'Orb.
 antiquorum, Ledm., 1819.
 s. *calendynus*, Bgt.
 45. *L. f. ecarinatus*, Bttg., 1881.
 Subg. LIMACOPSIS, Simr., 1889.
 Frauenfeldia, Hazay (nec
 Egg.)
 46. *L. cœrulans*, Bielz.
 b. *incomptus*, Kim.
 c. *interruptus*, Kim., 1884.
 47. *L. c. schwabi*, Frauenf.
 48. *L. montenegrinus*, Bttg.
 49. *L. creticus*, Simr.
 LIMAX, Subg. incert.
 50. *L. versicolor*, Haz., 1885.
 51. *L. crispatus*, Baud., 1871.
 52. *L. bieltii*, Seib., 1873.
 53. *L. cinereo-inmaculatus*, Olafs.
 54. *L. gyrratus*, Wst.
 b. *bergensis*, Wst.
 55. *L. niger*, Malz.
 56. *L. taygetes*, Desh.
 57. *L. phaniciacus*, Bgt.
 58. *L. keyserlingi*, Mts.

59. *L. lincolatus*, Risso.
 60. *L. collinus*, Norm., 1852.
 761. *L. mamon*, Theob., sine descr., 1864.
 762. *L. bengalensis*, Theob., sine descr.
 63. *L. acquinortalis*, D'Orb.
 64. *L. validivannus*, Phil.
 765. *L. cobanensis*, Cr. & F., 1872.
 [66. *L. lingulatus*, Sandb.]
 [67. *L. modioliformis*, Sandb.]
 [68. *L. latus*, Edw.]
- LYTOPELTE**, Bitg., 1886.
Platyoxon, Simr., 1886.
 69. *L. maculatus*, Korb & Heyn., 1874.
 70. *L. longicollis*, Bitg.
- EUMILAX**, Bitg., 1881.
 71. *E. brandti*, Mts., 1880.
b. subunicolor, Ckll., 1893.
- Sect. **GIGANTOMILAX**, Bitg., 1883.
 72. *E. lederi*, Bitg., 1883.
- Sect. **PARALIMAX**, Bug., 1883.
 73. *E. varius*, Bitg., 1884.
 74. *E. multirugatus*, Bitg., 1888.
 75. *E. intermittens*, Bitg.
 76. *E. reibischi*, Simr., 1891.
 77. *E. armeniacus*, Simr., 1886.
- AMALIA**, Moq., 1855.
 ? *Aspidoporus*, Fitz., 1833.
Milax, Gray, 1855.
- Sect. **LALLEMANTIA**, Mab., 1868.
Clytropolta, Heyn., 1867.
Palizzolia, Bgt., 1876.
Pirainea, L. & P.
78. *A. gagates*, Drap., 1801.
carinata, D'Orb.
polyptyela, Egl.
drymonius, Bgt.
carinata, Gray, 1855, ex err.
cinerea, Ledm.
atrata, Mab., 1868.
a. typus, L. & P.
b. typica, Poll., 1891.
c. olivacea, Moq.
d. bedriagæ, L. & P.
e. benoiti, L. & P.
f. atlantica, Ckll., 1891.
g. maderensis, Ckll.
raymondiana, Simr., ex err., 1891.
h. ascensionis, Less.
i. helenæ, Ckll.
- ii. *tristansis*, Ckll.
i. pallidissima, Poll., 1891.
j. hewstoni, Cooper.
i. plumbea, Ckll.
79. *A. g. plumbea*, Moq.
u. rava, Wilms.
80. *A. g. ichnusæ*, L. & P., 1882.
81. *A. g. mediterranea*, Ckll.
b. similis, Ckll.
82. *A. g. insularis*, L. & P., 1882.
 ? *scaptobia*, Bgt., 1861.
a. typica, Poll., 1891.
b. algerica, Poll., 1891.
83. *A. g. doderleini*, L. & P., 1882.
84. *A. g. sicula*, L. & P., 1882.
 ? *monterosati*, Bgt.
85. *A. g. cabilliana*, Poll., 1891.
86. *A. g. eremiophila*, Egl., 1861.
87. *A. g. nigricans*, Schultz in Phil.
88. *A. g. maura*, Q. & G.
pectinata, Selenka, 1865.
olivacea, Gld.
89. *A. g. nigricolus*, Tate, 1881.
nigricollus, Tate em Tryon
90. *A. g. tasmanica*, Tate, 1881.
91. *A. g. antipodarum*, Gray.
b. pallida, Ckll., 1891.
c. emarginata, Hutt.
92. *A. g. fuliginosa*, Gld.
93. *A. g. sandwichei*, Eyd.
94. *A. capensis*, Krauss, 1848.
kraussii, Ads.
- ? 95. *A. mouensis*, Gass.
- Sect. **TANDONIA**, L. & P.
 96. *A. marginata*, Drap.
marginalis, Schnur.
 ? *cristata*, Leibl., 1829, sine descr.
a. typus, L. & P.
b. rustica, Mill.
affinis, Mill.
c. pyrrichus, Mab., 1870.
d. rufula, Moq.
97. *A. sowerbii*, Fér., 1823.
carinata, Leach, 1820, ed. Gray, 1852.
argillacea, Gass., 1856.
unguicula, Turb., ex err.
b. rustica, Roeb., ex err.
c. nigrescens, Roeb. MS., Ckll., 1886.
d. fuscocarinata, Ckll., 1886.

- e. bicolor*, Ckll.
f. pallida, B. Mus. MS., Ckll.
 (sine descr.)
98. **A. s. carinata**, Risso, 1826.
fulva, Faul.
a. typus, L. & P.
b. pallidissima, L. & P.
c. insolita, L. & P.
d. oretea, L. & P.
e. casertana, L. & P.
99. *A. s. eichwaldi*, Kal.
100. *A. s. pacomei*, Flor., 1889(? 1890).
101. **A. s. tyrrena**, L. & P., 1882.
102. **A. s. etrusca**, Issel., 1868.
103. **A. s. hessei**, Brig.
104. **A. s. kobelti**, Hesse, 1882
105. **A. gracilis**, Leyd., 1876.
marginata, Kim.
gagates, Meneg.
cibiensis, Kim.
b. budapestensis, Haz., 1881.
106. **A. cristata**, Kal., 1851.
 ? *Pallidula*, Ckll.
107. **A. reuleauxi**, Cless., 1887.
b. punctata, Cless., 1887.
108. **A. barypus**, Bgt.
- SECT. SUBAMALIA, Fell.
- Malinastrum**, Simr., ex err.
109. **A. hellenica**, Simr., 1886.
110. **A. cretica**, Simr., 1884.
111. **A. kaleniczenkoi**, Cless.
112. **A. robici**, Simr., 1884.
Amalia, sect. incert.
- ? 113. *A. limax*, Fitz., 1833.
- [114. **A. eocenica**, Sacc.]
- [115. **A. gracilior**, Sandb.]
 [SANSANIA, Bgt.]
- [116. **S. larteti**, Dupuy, 1850.]
- [117. **S. crassitesta**, Reuss.]
- MESSOLIMAX**, Poll., 1888.
118. **M. brauni**, Poll., 1888.
119. **M. reibischi**, Simr., 1891.
- AGRIOLIMAX**, Mörch in Malm., 1868.
Limacellus, "Fén., 1821," Kregl.
Krynickia, (pars) Kal., 1839.
Krynickillus, (pars) Kal., 1851.
Megapelta, Mörch, 1857.
Megaspis, Kryn. MS., Gray.
- Malino**, Gray, 1855.
 ? **Deroceras**, Raf., 1820.
Hydrolimax, Malm., 1868.
120. **A. agrestis**, L.
hyalinus, L.
obliquus, Brard, 1815.
tunicatus, Gould, 1841.
niciensis, Bgt. MS., Nev., 1820.
canariensis, E. A. Sm., ex err.
- a. typus*, L. & P.
albidus, Pini.
b. flavicypeus, D. & M., 1857.
flans, Gray ex Leach err.
- ? *c. auratus*, Less.
- d. tristis*, Moq.
e. lilacinus, Moq.
f. succineus, "Müll.," Wst.
g. typicus, Ckll., ex Roeb. err.
h. niger, Morel.
i. albidus, Pic.
j. albus, Ckll.
albidus, Roeb., ex err.
h. rufescens, L. & P.
l. rufescens, D. & M.
- m. griseus*, Ckll., 1889.
- n. cineraceus*, Moq.
o. melanocephalus, Moq.
p. xanthosoma, Fisch.
q. ornatus, Paul (nec Moq.)
rufescens, Pini.
r. bilobatus, Fér.
s. reticulatus, Müll.
legrandi, Tate, 1881.
t. veranyanus, Bgt., 1861.
u. florentinus, L. & P.
v. submaculatus, Wilms.
w. obscurus, Moq.
x. punctatus, Picard.
y. nigricans, Wst.
z. nigrescens, J. Colb.
a'. varians, Wst.
b'. sylvaticus, Moq. (nec Drap.)
c'. etruscus, Issel.
d'. meinlandi, Heyn.
e'. molestus, Hutton.
f'. atbitentaculatus, D. & M.
g'. atritentaculatus, D. & M.
 ? *h'. fasciatus*, D. & M.
i'. nemorosus, Mab., 1870.

- f. saxorum*, Raud., 1862.
121. *A. a. panormitanus*, L. & P., 1882.
f. virescens, Schultz in Phil.
122. *A. varians*, A. Ad.
123. *A. setchuanensis*, Heude, 1885.
124. *A. minutus*, Kryn. MS., Kal., 1851.
125. *A. pallidus*, Schr.
norvegicus, Wst.
agrestis, Lindstr., ex err.
filans, Sord., ex err.
b. immaculatus, L. & P.
c. fusconotatus, L. & P.
126. *A. melanocephalus*, Kal., 1839.
127. *A. dymezeviczii*, Kal., 1839.
128. *A. immaculatus*, Simr., 1891.
129. *A. sardus*, Simr., 1886.
130. *A. lombricoides*, Marel.
131. *A. simrothi*, Ckll.
drymonius, Simr., ex. err.
132. *A. subagrestis*, Simr., 1891.
133. *A. agresticulus*, Simr., 1891.
134. *A. maltzani*, Simr., 1884.
ponsonbyi, Hesse, 1885.
135. *A. phœniciaicus*, Bgt., 1853.
136. *A. berytensis*, Bgt., 1853.
137. *A. fedtschenkoni*, Koch & Heyn., 1874.
138. *A. thersites*, Heyn. & Koch, 1886.
139. *A. hottgeri*, Simr.
140. *A. oertzeni*, Simr.
141. *A. camanæ*, Poll., 1891.
142. *A. polloneræ*, Simr., 1889.
143. *A. majoricensis*, Heyn.
144. *A. pycnoblennius*, Bgt., 1861.
145. *A. iberus*, Fischw.
146. *A. altaicus*, Simr., 1886.
147. *A. andrios*, Simr. (sine descr.).
148. *A. hanryanus*, Flor., 1889
 (? 1890).
149. *A. cyniciacus*, Mab.
150. *A. pallens*, Simr. (sine descr.).
151. *A. fickelti*, Heyn.
152. *A. nitidus*, Simr.
153. *A. lævis*, Müll., 1774.
brinneus, Drp., 1801.
arenarius, Cass., 1867.
parvulus, Norm., 1852.
b. mucronatus, Wst.
c. maculatus, Ckll.
d. intentaculatus, Baud.
154. *A. l. mentonicus*, Nev., 1880.
155. *A. l. lacustris*, Bonelli in L. & P., 1882.
156. *A. l. heydani*, Heyn., 1863.
157. *A. l. bourguignati*, Mab., 1870.
158. *A. l. rarotonganus*, Heyn.
159. *A. l. braziliensis*, Semper.
160. *A. l. andernus*, D'Orb.
161. *A. l. berendfi*, S. & Pf.
b. hemphilli, W. G. Binn.
c. pictus, Ckll. in W. G. Binn.
162. *A. l. semitectus*, Morch, 1857.
163. *A. l. guatemalensis*, Ckll. & Fisch., 1870.

THE MALACOLOGICAL SOCIETY OF LONDON.

June 9th, 1893.—Dr. Hy. Woodward, F.R.S., &c., in the chair.

The following were elected members of the Society:—
 Ph. Dautzenberg, Dr. Paul Fischer, Lt.-Col. G. S. Parry and
 Homer Squyer.

The following papers were read:—“On Nautilus, Recent and Fossil” by Mr. G. F. Harris, F.G.S.; “On the Distribution of *Geomalacus* in Ireland” by Dr. K. F. Scharff; “On the Habitat of the Genus *Ephippodonta*, Tate,” by Mr. E. H. Matthews (communicated by the Secretary); “On the Occurrence of *Cylostrema millepunctatum*, Friele, in British Seas” by Mr. G. W. Chaster, M.R.C.S.

There were a large series of exhibits.

July 14th.—Dr. Hy. Woodward, F.R.S., &c., in the chair.

The following were elected members of the Society :—Gustave Dollfus, Charles Hedley, Dr. Jousseau, Dr. Kendig, J. J. MacAndrew, and Richard Rimmer.

The following papers were read :—“On the Occurrence of *Crepidula fornicata* in Essex” by Mr. W. Crouch, F.Z.S.; “On the Anatomy of *Ephippodonta Macdougalli*, Tate” by Mr. M. F. Woodward; “Description of a New Species of *Cancellaria*” by Mr. G. B. Sowerby, F.L.S., F.Z.S.; “On the *Clausilla* of Sumatra, with descriptions of two New Species” by Mr. E. R. Sykes, B.A., F.Z.S.; “On the Habit of Oviposition in the Umbilicus of some Helices of the Section *Libera*” by Mr. G. K. Gude.

CURRENT LITERATURE.

In order to make the following Bibliography as complete as possible, the Editor invites the co-operation of British and foreign authors. All communications should be addressed to the Editor, the “Conchologist,” Mason College, Birmingham, England.

MALACOLOGY IN GENERAL.

Pilsbry, H. A.—Tryon's Manual of Conchology, ser. i., pts. 53a and 56; ser. ii., p. 32. Philadelphia. Academy of Natural Sciences.

In the part dealing with the Helices, the following are new:—*Helicella headlei* (near *H. erkelii*, Kob.; the reference to figures of this species should be 47–49 and not 49–51, and on the next page *H. erkelii*, Kob., is referred to figs. 58 and 59 which should be 50 and 51), *Iberus culminicola*, Kob., MSS. (near *Iberus sultana*), *Pomatia mazzuliopsis*, Ancey (already described by Ancey as *H. subaperta*), *Hemitrochus caymanensis*, Maynard (near *H. streator*, Pils.), *Cochlostyla versicolor*, Mlldf., *Vallonia excentrica*, Sterki, *V. dectivis*, Sterki, *V. parvula*, Sterki, *V. perspectiva*, Sterki, *V. cyclopharella*, Ancey, *Camena pachychila*, Smith MS., *Chloritis pseudoprimum*, Pils. (new name for *primum*, Rve. non Férussac).

In the Marine series, part 56 continues the monograph of the Polyplacophora; part 53a is, however, of much more general interest, as it contains the introduction, a review of the history of the group, and a new classification. This last is based on the “characters furnished by the articulating surfaces of the valves.” It is too lengthy to give in detail here. The main feature is the giving up of the groups of regular and irregular chitons. The Polyplacophora are divided into three “superfamilies.” In the first (Eoplacophora), “the valves lack insertion plates, or, if present, they are unslit.” In the second (Mesoplacophora) “all valves possess insertion plates. Valve i, i.—vii. or i.—viii., have slits; teeth are smooth, or but slightly roughened between the slits, never closely, finely pectinated; valves lack eyes.” In the third (Teleoplacophora) “all valves, or valves i.—vii., possess insertion plates cut into teeth by slits; the teeth are sharply sculptured, or ‘pectinated,’ outside by fine vertical grooves (Chitonidæ).” Mr. Pilsbry's new theory as to the origin of insertion-plates is interesting, namely, that their presence (and corrugation) are due mainly to the buffeting of the surf, &c.; and he instances the fact that chitons from great depths either lack

these plates or have them weakly represented, while those living on the shore have them strongly developed, and often corrugated. He also believes sutural tufts "to be the direct result of over-nutrition of the girdle at the sutures, caused by its greater mobility at those points." An interesting seven-valved specimen of *Mopalia ciliata*, Sow., is figured, in which there is no trace of the missing valve, and there is no striking change in the general appearance of the animal. A little more care might be used with the plates; in one copy, plate 52 has had some paper placed on it before it was dry, while plate 46 literally has a hole in it, and other marks due to a wet plate having been laid on its back.—E. R. S.

Tomlin, Brockton.—The Genus *Rissoa* (contd.). Brit. Nat., 1893, pp. 122-3.

Küster, H. C.—Systematisches Conchylien-Cabinet, fortgesetzt von Kobelt. 40 pp., 6 pls. Lief. 396. (Contains part of *Cerithium*).

Woodward, B. B.—Recent Progress in Conchology. Nat. Sci., 1893, iii., pp. 33-9.

STRUCTURE AND DEVELOPMENT.

Barrois, J.—Anat. dei *Cryptoseca monodonta*. Rev. d. Sci. Nat. de l'Ouest, Tom. ii, No. 3, pp. 320-1.

Collinge, Walter E.—The Morphology of the Generative System in the Genus *Tetacella*. Ann. & Mag. N. H., 1893, pp. 21-5, pl. 1.

Fischer, H.—Sur quelques travaux récents relatifs à la Morphologie des Mollusques univalves. Journ. de Conchyl., 1893, pp. 5-15.

Heymons, R.—Zur Entwicklungsgeschichte von *Umbrella mediterranea*, Lam., Zeit. f. wiss. Zool., 1893, lvi., pp. 245-98, pls. xiv-xvi.

Dr. Heymons gives a careful and clearly illustrated account of the development of the egg of *Umbrella* up to the veliger stage. Segmentation is total, and after two divisions (transverse and sagittal), the embryo consists of four macromeres lying in one plane, exhibiting an animal pole above and a vegetative pole below. Three generations of micromeres are produced by successive equatorial divisions of the four macromeres at their animal poles. The micromeres multiply and form a cap of cells (primitive epiblast) over the dorsal side (=animal pole) of the embryo: this gradually extends over the ventral surface as well. The mesoblast arises by separation of a cell from the left posterior macromere; it then divides into a right and left half, and these by sub-division give rise to two solid paired mesoblastic hands lying one on each side of the hypoblast posteriorly. The hypoblast is formed by further sub-division of the primitive macromeres. Gastrulation is effected by a sinking inwards of the hypoblast at the vegetative (=ventral) pole, accompanied by epibolic growth of the epiblast up to the lips of the blastopore so formed. The blastopore is at first elongated, wider in front than behind, and extending from the middle to the posterior extremity of the embryo: eventually it completely closes from behind forwards. Mouth and anus arise by epiblastic involutions on the sites of the former extremities of the blastopore.

The author discusses the significance of his results, which in many points curiously resemble the developmental processes recently described by Wilson in *Nereis*. The mesoblastic bands enclose no coelomic cavities, such as Erlanger has observed in several Gastropods: they are, nevertheless, of distinctly hypoblastic origin. Heymons concludes his valuable paper with an account of the excretory organs of the larva.

Moss, W., and Paulden, F.—Reproductive organs of *Bulimus acutus* (*Helix acuta*). Trans. and Ann. Rpt. Manchester Micro. Soc., 1892, pp. 75-9; pl. ii.

Simroth, H.—Some remarks with respect to Mr. Wotton's paper on the Life-History of *A. ater*. Journ. Conch., 1893, pp. 208-9.

VARIATION.

- Cockerell, T. D. A.—Climate and Variation of Slugs. *Science*, 1893, xxi., pp. 338-9.
- Melville, J. C.—On a variety of *Cypræa cruenta*, Gmel. *Journ. Conch.*, 1893, p. 194.
- Nelson, Wm.—A variety of *Limnaea palustris*. *Naturalist*, 1893, p. 251.
- Sterki, V.—*Conulus fulvus*, Müll., var. nov. *dentatus*. *Naut.*, 1893, vii., pp. 4-5.
- Taylor, J. W.—*Vertigo pusilla*, var. *albina*. *Journ. Conch.*, 1893, p. 194.
- Taylor, J. W.—*Planorbis albus*, v. *sulcata*. *Ibid.*, 1893, p. 209.

CLASSIFICATION, NOMENCLATURE, NEW GENERA,
AND SPECIES.

- Ancey, C. F.—Description d'une nouvelle Helice de Kabylie. *Bull. Soc. Zool. d. France*, 1893, xviii., p. 136. *H. subaperta*. (= *H. mazzulioptis*, Ancey, MSS.).
- Ancey, C. F.—Descr. d'une espece nouvelle de *Pupa* de l'Algerie. *Ibid.*, p. 138.
- Bush, Katherine J.—Rpt. on the Moll. dredged by the "Blake" in 1880, including descrs. of several new species. *Bull. Mus. Comp. Zool.*, 1893, pp. 199-244, pl. i-ii.
- Cockerell, T. D. A.—Notes on the North American species of *Succinea*. *Naut.*, 1893, vii., pp. 43-46.
- Crosse, H., and Fischer, P.—Descr. d'un *Bulinulus* et d'un *Anodonta* nouveaux provenant du Mexique. *Journ. de Conchyl.*, 1893, pp. 31-2, pl. 1.
- Dall, W. H.—New species of *Yoldia* from California. *Naut.*, 1893, vii., p. 29.
- Dautzenberg, Ph.—Descr. d'un *Perideris* nouveau, provenant du Dahomey. *Journ. de Conchyl.*, 1893, pp. 33-4, pl. 1.
- Dautzenberg, Ph.—Descr. d'un nouvelle espèce du genre *Littorina*, provenant, des côtes de la Tunisie. *Ibid.*, pp. 35-6, pl. 1.
- Dautzenberg, Ph.—Descr. d'un Mollusque nouveau, provenant du Congo français. *Ibid.*, pp. 50-1.
- Drouet, H.—*Unionide* nouveaux ou peu connus. *Ibid.*, pp. 36-50.
- Fischer, H.—Note sur l'animal du *Bulinulus chaperti*. *Ibid.*, pp. 32-3, pl. 1.
- Ford, John.—Descr. of a new species of *Cypræa*. *Naut.*, 1893, vii., pp. 39-41.
- Godwin-Austen, H. H.—On a supposed new species of *Rhiostoma* from Borneo, and notices of Two other species of shells from Palawan. *Ann. and Mag. N.H.*, 1893, pp. 32-3; 3 woodcuts.
R. boxalli, sp. n.; *Lagocheilus similis*, E. A. Smith, var. sp.; and *Cassidula bicolor*, sp. n.
- Goldfuss, O.—Eine Neue *Pomatia*. *Nachr. Deutsch. Malak. Gesell.*, 1893, p. 86.
- Hedley, C., and Suter, H.—Reference List of the Land and Freshwater Mollusca of New Zealand. *Proc. Linn. Soc., N.S.W.*, 1892, (2), vii., pp. 613-65.
- It is now ten years since Professor Hutton's "Revision of the Land Mollusca of New Zealand" was published. That conchologists have not been idle since that time is evidenced by the present reference list, in which Mr. Hedley and Mr. Suter enumerate 43 additional species and 13 varieties unknown at that time. We regret to note that the names of seven species here published for the first

time are unaccompanied by descriptions or figures. This practice of publishing mere names serves no useful purpose, and only encumbers bibliography, which, as working conchologists know to their cost, is sufficiently complicated already.

It will, doubtless, be a surprise to many to find *Helix* included in the foreign genera "which have one by one been eliminated from our list," and this surprise will not be lessened when, on scanning this list, they learn that instead of *Helix* no less than 18 "genera," with 5 sub-genera have been adopted. Of the former, *Otocoencha*, *Pyrrha*, and *Suteria* each contains but one species, and *Rhenea* and *Geroulia* two species each. It may well be asked, whither will this lead us, and where is this to end? Hitherto the chief source of trouble has been the undue splitting up of species, but this is of slight importance as compared to this latest innovation in systematic conchology. It is to be earnestly hoped that other revisors of faunas will refrain from emulating this needless multiplication of genera. Another reprehensible feature in the present list is the adoption of Reeve's names in preference to those given by Pfeiffer. The authors argue that Reeve published his names in 1852, and that "Pfeiffer's descriptions probably did not appear till the following year," but as Reeve in his "Conchologia Iconica" quotes Pfeiffer's names, there can be no doubt as to their priority. These changes were made by Reeve because Pfeiffer used the names of letters of the Greek alphabet, which the former considered only applicable to varietal names. but such changes, as Mr. Pilsbry states, "being wholly unwarranted, the propriety of returning to the original Pfeifferian names is now conceded by most students."

Having made our adverse remarks on these points, we will now turn to the favourable features of the paper. For the general systematic arrangement we have nothing but praise, while the copious references and the complete synonymy, together with the exhaustive and reliable list of habitats, will prove a great boon to collectors, as well as to faunistic compilers. The only clerical error or misprint we have found appears, under *Laoma pacilosticta*, on p. 646, where *Conch. Icon.*, pl. cxxii., should be cxxxi. With the exceptions above indicated, the work appears to have been admirably done, and we congratulate the authors on having made an important contribution to conchological literature, and having so satisfactorily performed their difficult task.—G. K. G.

The Zoological Society informs me that the part in which Pfeiffer's original description appeared was issued in March or April, 1854, though bearing the date 1852. There is, therefore, no question as to priority, and Pfeiffer's names must be given up for Reeve's. Varieties "Beta, Pfr." are mentioned of *Rhytida dunnea*, &c., Pfeiffer, however, never described such varieties; what he did was to insert after the type "β" and then a description: the usual process by which a variety is indicated but not named.—E. R. S.

Hedley, C.—Note on *Endodonta infundibulum*, II. & J. Naut., 1893, vii., p. 35.

E. infundibulum is a var. of *gradata*, Gould, not a synonym of *crebristammis*, Pfr.—E. R. S.

Jousseume, ——Descr. d'un Mollusque nouveau. Le Nat., 1893, p. 171.
Arabica gillei.

Kobelt, W.—Die Verbreitung von *Helix arbustorum*, I. Nachr. Deutsch. Malak. Gesell., 1893, pp. 87-92.

Pelseener, P.—La Classification Générale des Mollusques. Bull. Sci. France et Belg., 1892, xxiv., pp. 346-72.

Prof. Pelseener discusses the classification of Mollusca, and defends the scheme which he has adopted for his forthcoming "Introduction à l'Etude des Mollusques." He again controverts Von Jhering's views upon the polyphyletic nature of the group, and opposes the idea of any direct affinity of the Mollusca with the Turbellaria. On the other hand he argues in favour of a direct phylogenetic relationship of the Mollusca with the errant Polychæta, especially with the family Eunicidæ. Pelseener recognises five great classes,—Amphineura, Gastropoda, Scaphopoda, Lamellibranchia, and Cephalopoda. The arrangement of the Scaphopoda and

Cephalopoda is unchanged, and the author's views upon the classification of the Lamellibranchia are already known. There remain the classes Amphineura and Gastropoda, the author's sub-division of which is here appended:—

AMPHINEURA	{ Polyplacophora.	
	{ Aplacophora.	
GASTROPODA.	{ Streptoneura.	{ Aspidobranchia. { Rhipidoglossa.
		{ (= Diotocardia). { Docoglossa
		{ (= Patellidæ).
	{ Ctenobranchia. { Platypoda.	
		{ (= Monotocardia) { Heteropoda.
	{ Euthyneura.	{ Opisthobranchia. { Tectibranchia.
		{ Nudibranchia.
	{ Pulmonata.	{ Stylommatophora.
		{ Basommatophora.

The separation of the Amphineura from the Gastropoda is amply warranted, we think, by recent morphological research. We must also admit that in regarding the Chitonidæ as less modified than the Neomeniidæ, and in emphasising the resemblances between the former and a generalised Euniceid type, Prof. Pelsener has not exaggerated the evidence at his command. Indeed, were there any embryological evidence of an ancestral metamerism of the mesoblast in Mollusca, we should regard the Annelidan origin of the phylum as well established. At present, however, *Nautilus* alone among Mollusca exhibits a reduplication of the nephridia; and it is extremely doubtful whether the metamerism of *Nautilus* has not been secondarily acquired.—W. G.

Pilsbry, H. A.—Notes on the Genera of *Unionide* and *Mutelide*. Naut., 1893, vii., p. 30. (See Simpson, C. T.)

Pilsbry, H. A.—Notes on the *Acanthochitidæ*, with descriptions of new American species. Naut., 1893, vii., p. 31.

Pilsbry, H. A.—*Polygyra sub-palliata*, n. sp. Naut., 1893, vii., pp. 5-7.

Rolle, Hermann.—Eine Neue *Pseudoglossula*. Nachr. Deutsch. Malak. Gesell., 1893, pp. 86-7.

Simpson, C. T.—A Review of von Jhering's Classification of the *Unionide* and *Mutelide*. Naut., 1893, vii., pp. 17-21.

Simpson, C. T.—A Reply to Professor Wheeler. Naut., 1893, vii., p. 22. (See Wheeler, C. Le Roy.)

Simroth, H.—Kritische Bemerkungen über die Systematik der Neomeniiden. Zeit. f. Wiss. Zool., 1893, lvi., pp. 310-327.

In editing the mollusca for Bronn's "Klassen und Ordnungen," Dr. Simroth has had occasion to review the morphological and systematic work of the Norwegian and Mediterranean naturalists who, at considerable intervals, have investigated the species between twenty and thirty in number, which compose this family. In this paper he criticises the only existing classification (that of Pruvot) and attempts a new one, not based, as was Pruvot's, on the variation of a single organ (the gill) but on the combination of a larger number of anatomical features. Accordingly, the author gives an interesting *résumé* of the variations of the form of the body, of the foot, and of the various systems of organs. Coming to Dr. Simroth's classification, we have a division into (a) Northern and (b) Mediterranean forms, a mode of expressing the interesting fact that, as far as our present knowledge goes, the genera under section (a) are in every case distinct from those under (b). This, however, can only be regarded as a temporary mode of classification. Under (a) the genera *Neomenia*, *Proneomenia*, and *Solenopus* are re-defined, and are now, as indeed is the case with the genera right through this classification, of very limited extent. Among the Mediterranean forms a number of new provisional genera have been defined—*Rhopalomenia*, *Macellomenia*, *Nematomenia*, *Myzomenia*, *Echinomenia*. These, together with *Paramenia*,

Pruvot, *Ismenia*, Pruvot, *Lepidomenia*, Kowalevsky et Marion, form the twelve genera in which the twenty-six species are arranged. The very tentative nature of this method is fully realised by Dr. Simroth, but it can hardly be said to give satisfaction, or to render much clearer the mutual relations of these interesting forms. That they form "the tips of a large number of widely divergent branches" is a conclusion warranted by the character of the genera, in which we agree with Dr. Simroth. The nature of the connections of these branches is the work of the future.

The last two pages are devoted to a discussion of the habitat and mode of life of the Neomeniidae, and the bearing of these considerations on the relationship with the Chitonidae. Dr. Simroth concludes that the Neomeniidae are derived from littoral Chitonidae which have descended beyond the influence of wave-motion. The absence of dorsal plates in the adult, the form of the foot, of the radula, and the straight short intestine, are explicable on this hypothesis.—F. W. G.

Stearns, R. E. C.—New species of *Nassa* from the Gulf of California. *Naut.*, vii., 1893, p. 10.

Sterki, V. Some Notes on *Zonitide*. *Naut.*, 1893, vii., pp. 13-17.

Thiele, J.—Ueber das Kriechen der Schnecken. Sitz und Ab. der Nat. Ges., Isis in Dresden, 1892, pp. 72-75.

Wheeler, C. Le Roy.—The Unio Muddle. *Naut.*, 1893, vii., p. 9.

Williams, J. W.—Conchological Cracknels. *Sci. Goss.*, 1893, pp. 182-3.

PHYSIOLOGY, HABITS, AND CONDITIONS OF LIFE.

Herdman, W. A.—Oyster Culture and Temperature. *Nature*, July 20th, 1893, p. 269.

Prouho, H.—Observations sur les Mœurs de *Idalina elegans* (Leuckart). *Arch. Zool. Exp.*, 1893 (3), 1, pp. 105-111, figs. 1-4.

M. Prouho continues his admirable observations on the habits of marine animals, and has given a full and graphically illustrated description of the way in which the Nudibranch *Idalina elegans* [On the name *Idalina* see Notman, *Ann. Mag. Nat. Hist.*, vi., 1890, p. 74] buries itself in certain Ascidians of the family *Cynthidae*. The Nudibranch does not simply bore into the test of the Ascidian in quest of imbedded *Muscula*, as Alder and Hancock surmised, but makes a way with its radula right through the test in order to devour the Ascidian itself. It is able to distinguish between different Ascidians, its favourite prey being *Polycarpa varians* and *Ctenicella*: a single individual kept in an aquarium with a clump of the former devoured six of the Ascidians in succession within 47 days.

M. Prouho's observations thus fully confirm my own prior interpretation (*Jour. Mar. Biol. Ass.*, 1892, ii., 4, p. 326).—W. G.

Williamson, Mrs. M. B.—Beach Shell Collecting in connection with a study of Oceanic Phenomena. *Naut.*, 1893, vii., pp. 41-3.

SPECIAL FAUNA AND DISTRIBUTION.

Adcock, D. J.—A Hand List of the Aquatic Mollusca inhabiting South Australia. Adelaide, 1893.

As far as it goes it is fairly complete; but it is only a partial fauna, for as its author states, "the freshwater pulmonates are not included, and a few cephalopods, several of the minute shelled gasteropods, the nudibranchs, and some additional species of *Kellia* and allied genera are yet to be determined."

- Bednall, W. T.**—L. and F. W. Moll. of Elder Exploring Expedition. Trans. Roy. Soc., S. Australia, xvi., pt. 1, pp. 62-7, pl. 1.
- Belt, A.**—Conchological Notes, Sci. Goss., 1893, pp. 171-2.
- Boettger, D.**—Die Verhältniszahle der paläarktischen *Najaden*. Nachr. Deutsch. Malak. Gesel., 1893, pp. 65-79.
- Brusina, S.**—Drei *Eulima microstoma*. Ibid., pp. 79-83.
- Cockerell, T. D. A.**—*Arion celticus*. Sci. Goss., 1893, p. 141.
- Cockerell, T. D. A.**—The small grey slug in Jamaica. Naut., 1893, vii., p. 21.
- Dall, W. H.**—*Bulimulus proteus*, Brod., and its distribution. Naut., 1893, vii., p. 26. *B. montezuma*, Dall., n. sp. (= *B. proteus*, Binney I. and F. W. Shells N. Amer., i., p. 107, non Broderip).
- Dautzenberg, Ph.**—Liste d. Moll. marins recueillis à Granville et à St. Pair. Journ. de Conchyl., 1893, pp. 16-30.
- Dautzenberg, Ph.**—Additions à la liste des Coquilles de St. Lunaire. Feu. d. Jeune Nat., 1893, p. 141.
- Dautzenberg, Ph.**—Contribution à la Faune Malacologique des Sechelles. Bull. Soc. Zool. d. France, 1893, xviii., pp. 78-84.
- Folin, de**—Les Moll. speciaux à la Région extrême sud-ouest d. la France et l'Atlantide. Rev. d. Sci. Nat. d. l'Ouest, T. ii., pp. 324-29.
- Gain, W. A.**—The Mollusca of Nottinghamshire. Brit. Nat., 1893, p. 137.
- Guppy, R. J. L.**—The L. & F. M. of Trinidad. Journ. Conch., 1893, p. 210-24.
- Yet another list of Trinidad Mollusca by Mr. Guppy! Those curious in such matters may be informed that he has already listed them as follows: Ann. & Mag. N. H., 1866; Proc. Scient. Assn. Trinidad, 1869, and in 1872; Proc. Zool. Soc., 1875, and Journ. Conch., 1875.
- What good purpose another list can serve, Mr. Guppy and the editor best know. There is an excellent list by Crosse in Journ. de Conchyl., 1890.
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- Roebuck, W. D.**—Six-banded *H. nemoralis* at Adel nr. Leeds. Naturalist, 1893, p. 176.
- Roebuck, W. D.**—Additions to the Authent. Comital Census of the L. & F. M. of Scotland. Ann. Scot. N. H., 1893, pp. 164-70.
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- Scott, Thomas.**—On *Neæra cuspidata* and *Odostomia rufa*, v. *fulvocincta*, in the Firth of Forth. Ann. Scol. N. H., 1893, i., p. 184.
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- Williamson, Mrs. M. Burton.**—Edible Mollusks of S. California. Naut. 1893, vii., p. 27.

PALÆONTOLOGY.

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The paper is smartly criticised by an anonymous writer in "Natural Science" (Aug.), iii., pp. 140-5.
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- Hallg, E.**—Études sui les Ammonites des étages moyens du système jurassique. Genre *Sonninia*—Genre *Witchellia*. Bull. Soc. Géol. France, xx., pp. 277-333, 3 pls.
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- Siemiradzki, J. von.**—Der obere Jura in Polen und seine Fauna II. Gastropoden, Bivalven, &c. Zeit. Deutsch. Geol. Gesell., xlv., pp. 103-130.
A few new species.
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Volutederma moodmari and *Cerithium pilsbryi*, n. spp.

EDITOR'S NOTES.

From a proof circular we learn that the Council of the Conchological Society (at Leeds) proposed to nominate Mr. B. B. Woodward as President for the forthcoming year. Mr. Woodward, we understand, was not consulted in the matter at all, and has taken the first opportunity of declining the post.

Since Mr. Woodward withdrew, a circular has been sent out with Dr. Scharff's name on, but we understand that this also was without his knowledge, and that he has likewise withdrawn his name.

The present method of conducting the business of the Society leaves much to be desired. A point we strongly object to is the election of Conrillors who cannot attend the meetings, and who are never consulted, the business being practically settled by two or three members.

Now that the Malacological Society has made such a magnificent start, we venture to prophecy an early departure of this "learned Leeds body," and until then the obscurity it deserves; a fate enjoyed by its proceedings for many years.

THE
CONCHOLOGIST

A Journal of Malacology.

EDITED BY

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THE CONCHOLOGIST is published every quarter day, and issued to Subscribers only.

The pre-paid Annual Subscription is 4s. 4d.

Messrs. FRIEDLÄNDER & SOHN, BERLIN, receive Subscriptions for the Continent.

All Communications should be addressed

W E COLLINGE, MASON COLLEGE, BIRMINGHAM.

THE CONCHOLOGIST:

A Journal of Malacology.

Vol. II.

DECEMBER 21st, 1893.

No. 8.

A CHECK-LIST OF THE SLUGS.

By T. D. A. COCKERELL, F.Z.S., F.E.S.,

Professor of Entomology and Zoology, New Mexico Agricultural College.

WITH APPENDIX AND NOTES

By WALTER E. COLLINGE,

Demonstrator of Biology, Mason College, Birmingham.

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164. *A. l. americanus*, Tate, 1869.
165. *A. l. stenurus*, Streb., 1880.
166. *A. l. campestris*, Binn., 1841.
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 ? *gracilis*, Raf.
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 c. hyperboreus, Wst.
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168. *A. l. sanwichiensis*, "Soul.,
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169. *A. l. jalapensis*, Str. & Pfr.
170. *A. l. queenlandicus*, Hedley,
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[**PACHYMILAX**, Btlg.].
[171. *P. sandbergeri*, Btlg., 1884.]
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- DEFLEVELEUSIA*, Hag., 1885.
 172. *D. bourguignati*, Hag., 1885.
 173. *D. letourneuxi*, Hag., 1885.
 174. *D. prisca*, Hag., 1885.
 175. *D. eximia*, Hag., 1885.
 176. *D. elongata*, Hag., 1885.
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 177. *F. letourneuxi*, Hag., 1885.
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 178. *C. letourneuxi*, Hag., 1885.
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 179. *P. olivieri*, Cuv., 1805.
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 180. *P. alexandrina*, Ehr., 1831.
 181. *P. dorsalis*, Mouss., 1874.
 182. *P. deshayesii*, Moq.
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 183. *P. valencienni*, W. & Van B.
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 184. *P. v. maculata*, Ckll., 1887.
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 h. olivacea, Ckll., 1887.
 185. *P. gervaisi*, Moq., 1850.
 186. *P. calyculata*, Sowb.
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 187. *P. callosa*, Mouss.
 188. *P. rutellum*, Hutton, 1849.
 189. *P. sayni*, Font.]
 [190. *P. unguiformis*, Germ.]
 [191. *P. vitrinæformis*, Sandb.]
 [192. *P. succini*, Klebs.]
 [193. *P. paladilhiana*, Fench.]
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 194. *T. imitatrix*, Bttg.
 195. *T. retowski*, Bttg.
 196. *T. semiplumbeus*, Bttg., 1886.
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 197. *P. lederi*, Bttg.
 198. *P. bicolor*, Bttg.
 199. *P. velitaris*, V. Mts., 1880.
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 200. *S. pallida*, Bttg.
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 Viquesnelia, Morel. ex cr.
 201. *P. atlantica*, Morel & Drouet.
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 202. *C. petterdi*, Tate, 1881.
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 203. *V. gabbi*, W. G. Binn.
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 204. *A. chaperi*, Morel., 1883.
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 205. *E. allaudi*, Poirier, 1887.
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 206. *D. dilecta*, Issel.
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 207. *M. dussumieri*, Val. MS.,
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 208. *M. d. thwaitesii*, Humb.
 209. *M. d. beddomei*, G.-A.
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 c. maculosa, G.-A.
 210. *M. infumata*, Fér.
 211. *M. nordenskioldi*, Wst.
 212. *M. philippinensis*, Semp.
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 213. *I. gracilis*, Gray, 1855.
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 h. mainwaringi, Nev. MS.,
 G.-A.
 214. *I. problematicus*, Fér.
 215. *I. cacharicus*, G.-A., 1888.
 216. *I. pupillaris*, Humb.
 punctatus, Hass.
 h. punctata, V. Mts.
 c. marmorata, V. Mts.

- d. vittata*, V. Mts.
 217. *l. siamensis*, Ckll.
 218. *l. beccaria*, Issel, 1874.
 δ. doriæ, Issel, 1874.
 SUBG. CRYPTIBYBI, Ckll., 1891.
 219. *l. magnificus*, Nev. & G.-A.
 SUBG. PSEUDAUSTENIA, Ckll., 1891.
 220. *l. ater*, G.-A.
 δ. aterrimus, G.-A.
 α. cinerus, G.-A.
 δ. castaneus, G.-A.
 221. *l. auriformis*, Blf., 1866.
PARMACOCHLEA, E. A. Sm.
 222. *P. fischeri*, E. A. Sm.
AFRICARION, G.-A.
 223. *A. pallens*, "Morel," G.-A.
 224. *A. lymphaseus*, Morel.
AUSTENIA, Nev., 1878, sine descr.,
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 ? *Laconia*, Gray.
 225. *A. gigas*, Bs.
 226. *A. hyalea*, Bock.
 227. *A. peguensis*, Theob.
 228. *A. unguicula*, Morel.
 229. *A. aperta*, Beck. MS., Pfr., 1848.
 230. *A. verrucosa*, G.-A.
 231. *A. erratica*, G.-A., 1888.
 232. *A. khyoungensis*, G.-A., 1888.
 233. *A. ferussaci*, Gray.
 234. *A. venusta*, Theob.
 235. *A. feæ*, Canefri, 1890.
 236. *A. salius*, Bens.
 δ. ovata, G.-A.
 237. *A. papillaspira*, G.-A.
 238. *A. globosa*, G.-A.
 239. *A. panchetensis*, G.-A.
 240. *A. bensoni*, Pfr.
 δ. sylhetensis, G.-A.
 241. *A. monticola*, Bens.
 242. *A. stoliczkanus*, Nev.
 243. *A. serahanensis*, G.-A.
 244. *A. theobaldi*, G.-A.
 SUBG. EUAUSTENIÆ, Ckll., 1891.
 245. *A. scutella*, Bs.
 SUBG. CRYPTAUSTENIÆ, Ckll., 1891.
 246. *A. planospira*, Bs., 1859.
 succinea, Reeve.
GIRASIA, Gray, 1855.
 Hoplites, Theob., sine descr.
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 Parmarion, Fischer, 1856.
 Rigasia, Gray.
 247. **G. extranea**, Fér.
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 α. hookeri, Gray.
 β. brunnea, G.-A.
 γ. shillongensis, G.-A.
 δ. maculosa, G.-A.
 248. **G. crocea**, G.-A., 1872.
 β. depressa, Ckll., 1891.
 249. **G. burtii**, G.-A.
 ? *β. radha*, G.-A.
 250. **G. nagaensis**, G.-A.
 251. **G. cinerea**, G.-A.
 252. **G. dalhousiæ**, G.-A.
 253. **G. pankabariensis**, G.-A.,
 1888.
 254. **G. serahanensis**, G.-A., 1888.
 255. **G. butleri**, G.-A.
 minor, G.-A.
 ? *resplendens*, Nev.
 256. **G. solida**, G.-A.
 257. **G. affinis**, Ckll., 1891.
 258. **G. setchuanensis**, Heude, 1885.
 259. **G. kersteini**, V. Mts.
 260. **G. tæniata**, Hass.
 261. *G. reticulata*, Hass.
 262. *G. lutea*, Mouss. in V. Mts.
 263. *G. plana*, Mouss. in V. Mts.
PARMELLA, H. Ad.
 264. **P. planata**, H. Ad.
 265. **P. etheridgei**, Brazier.
ELISOLIMAX, Ckll.
 Elisa, Heyn., procc.
 266. **E. longicauda**, Fisch., 1882.
 β. maculata, Fisch.
 bella, Heyn, 1883.
 γ. permaculata, Ckll., 1891.
UROCYCLUS, Gray, 1864.
 267. **U. kirkii**, Gray.
 268. **U. flavescens**, Kef., 1866.
 269. **U. pallescens**, Ckll., 1891.
 270. **U. comarensis**, Fisch.
 271. **U. vittatus**, Fisch.
 272. **U. buchholzi**, V. Mts.
 273. **U. fasciatus**, V. Mts., 1879.
 flavescens, Gibbons ex err.
 β. pallidus, Gibbons.
 274. **U. acuminatus**, Poirier, 1887.
 275. **U. kraussianus**, Heyn, 1862.
 276. **U. madagascariensis**, Poirier,
 1887.
DENDROLIMAX, Dohrn.
 277. **D. heynemanni**, Dohrn.

278. *D. graeffei*, Simr., 1890.
TRICHOTOXON, Simr., 1888.
 279. *T. heyneimanni*, Simr., 1890.
 280. *T. tarenti*, Heyn.
ATOXON, Simr., 1890.
 281. *A. hildebrandi*, Simr., 1890.
 282. *A. schulzei*, Simr., 1890.
BUETTNERIA, Simr., 1890.
 283. *B. leuckarti*, Simr., 1890.
PHANCROPORUS, Simr., 1888.
 284. *P. reinhardti*, Simr., 1890.
 Subf. **OTOCONCHINÆ**, Ckll.
OTOCONCHA, Hutton.
 285. *O. dimidiata*, Pfr., 1851.
 286. *O. zebra*, Legmill., 1842.
TESTACELLIDÆ, Gray,
 1833.
TESTACELLA, Cuv., 1800.
Testacellus, F.-Big., 1802.
Helicolimax, Fér.
 287. *T. maugei*, Fér., 1819.
haliotidea (pars), Lam., ex
 err., 1801.
burdigalensis, Gass. in Grat.,
 1855.
vagans, Hutton.
oceanica, Grat., 1855.
canariensis, Grat., 1855.
b. viridans, Morel.
 [288. *T. m. deshayesi*, Mich., 1855.
alta-ripoe, Grat.]
 289. *T. catalonica*, Poll., 1888.
 290. *T. scutulorum*, Sby., 1823.
anglica, Grat.
scutata, Less., 1838.
a. typica, Ckll.
b. pallida, Ckll.
c. aurea, Ckll.
d. medii-templi, Tapping.
 291. *T. s. pecchiolii*, Bgt.
 292. *T. s. bisulcata*, Risso, 1826.
galloprovinciales, Grat.,
 1855.
b. major, Wst.
 293. *T. albida*, Ckll., 1885.
 294. *T. episcia*, Bgt., 1861.
bisulcata (pars), Risso, 1826.
 295. *T. campanyonii*, Dup., 1847.
campanyoi, Dup. em. P.
 Massot, 1870.
canigonensis, Grat., 1855.
 296. *T. pascali*, Bgt., Massot, 1870.
 297. *T. hourguignati*, Massot, 1870.
 298. *T. brondeli*, Bgt.
 299. *T. subtrigona*, Poll., 1888.
 300. *T. haliotidea*, Drp., 1801.
europæa, Roissy in Buffon,
 1805.
haliotides, Cantr., 1840.
gallicæ, Oken, 1815.
subterranea, Laf., 1806.
b. major, Pfr.
c. albinos, Moq.
 ? *albina*, Pfr.
d. elongata, Pfr.
e. ovalis, Moq.
f. trigona, Gass. & Fisch.
g. flavescens, Moq.
h. dilatata, Poll., 1889.
 301. *T. h. barcinonensis*, Poll.,
 1888.
 302. *T. h. dubia*, Poll., 1888.
 303. *T. fischeriana* Bgt.
major, Gass. & Fisch.
 304. *T. gestroi*, Issl.
 305. *T. williamsiana*, Nevill.
 306. *T. servaini*, Massot, 1870.
 307. *T. drymonia*, Bgt., 1861.
haliotidea, Costa ex err. 1840.
 308. *T. berrarii*, Issl.
 309. *T. stabillei*, Pinf.
 310. *T. pelatti*, Massot, 1872.
 [311. *T. asinina*, Serres.]
 [312. *T. bruntoniana*, Serres.]
 [313. *T. lartetii*, Dup., 1850.]
 [314. *T. nouleti*, Bgt., 1881.]
 [315. *T. pedemontana*, Sacco, 1885.]
 [316. *T. zelli*, Klein.]
 ?317. *T. dibrangensis*, G.-A.
 ?318. *T. aurigaster*, Layard.
DAUDEBARDIA, Htm. in Sturm.
 1821.
Helicolimax, Gray.
 Subg. **LIBANIA**, Bgt., 1867.
Moussonia, Bgt., 1866 (nec.
 Semp., 1865).
Pseudolibania, Stef.
Sieversia, Rossm.
Rufina, Cless.
Eudaudebardia, Wst.
 319. *D. rufa*, Drp., 1805.
b. cycladum, V. Mts., 1889.
c. viridis, Reul., 1889.

320. *D. r. heldii*, Cless., 1872.
nivalis, Cless. ex err.
321. *D. r. nivalis*, Benoit.
322. *D. r. monticola*, Benoit.
323. *D. hassiaca*, Cless., 1868.
324. *D. leourneuxi*, Bgt.
325. *D. nubigena*, Bgt.
326. *D. grandis*, Benoit.
327. *D. haliciensis*, Wst., 1881.
328. *D. isseliana*, Nevill.
329. *D. brevipes*, Drp., 1805.
longipes, Zgl.
δ. maravignæ, Pirajno, 1840.
330. *D. atlantica*, Bgt.
331. *D. platystoma*, Let., 1870.
332. *D. charopia*, Let., 1870.
333. *D. elata*, Mühlf., sine descr.
334. *D. lederi*, Btg., 1881.
δ. albinus, Wst., sine descr. 1886.
335. *D. sicula*, Bivona, 1839.
rufa, Benoit, ex err.
elongata, Calcara.
336. *D. heydeni*, Btg., 1879.
pawlenkoi, Btg., 1880.
337. *D. sieversi*, Btg., 1880.
338. *D. fischeri*, Bgt., 1864.
sicula, Fisch., ex err. 1856.
339. *D. bættgeri*, Cless.
340. *D. tarantina*, De Stef., 1879.
341. *D. calophana*, Wst., 1881.
342. *D. langi*, Pfr., 1846.
transsilvanica, Blz., 1859.
bielzi, Parr.
343. *D. saulcyi*, Bgt.
berytensis, Grat.
syriaca, Roth.
344. *D. s. gaillardoti*, Bgt.
- Subg. ISSELIA, Dgt.
345. *D. sardoa*, Issel.
- SCHIZOGLOSSA**, Hedley, 1893.
346. *S. novoseelandica*, Pfr., 1862.
 (1861?)
- CHLAMYDEPHORUS**, W. G. Binn., 1879.
Apera, Heyn.
347. *C. gibbonsi*, W. G. Binn., 1879.
348. *C. burnupi*, E. A. Smith, 1892.
- PHOSPHORAX**, Webb & Berth.
349. *P. noctilucus*, D'Orb., in Fér.
- ELECTROPHORUS**, Fér., 1819.
350. *P. orbignii*, Fér.
351. *P. castatus*, Bosc.

352. *P. cornutus*, Bosc.
- ARIONIDÆ**, Gray.
- OOPELTINÆ**, Ckll., 1891.
- OOPELTA**, Morch in Heyn., 1867.
 353. *O. nigropunctata*, Morch in Heyn.
354. *O. aterrimia*, Gray, 1855.
- BINNEYINÆ**, Ckll., 1891.
- BINNEYA**, J. G. Cooper, 1863.
Xanthyx, Cr. & Fisch., 1867.
355. *B. notabilis*, J. G. Coop.
356. *B. sumichrasti*, Brot., 1867.
357. *B. salleana*, Pfr., 1856.
358. *B. cordovana*, Pfr., 1859.
359. *B. chiapensis*, Pfr.
- HEMPHILLIA**, Bld. & Binn., 1872.
360. *H. glandulosa*, Bld. & Binn.
- CRYPTOSTRACON**, W. G. Binn., 1879.
361. *C. gabbi*, W. G. Binn.
- PELTELLA**, Webb & Van. B.
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Peltellina, Gray.
362. *P. palliolum*, Fér.
 ? *americana*.
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363. *G. albopunctata*, Shudl.
364. *G. flavolineata*, Shudl.
365. *G. nigrolineata*, Shudl.
- ARIONINÆ**, W. G. Binn., 1864.
- ARION**, Fér., 1819 (1817?).
Baudonia, Mab.
Eugeomalacus, Mab., 1870.
Kobeltia, Seib.
Prolepis, Moq.
Lochea, Moq.
Carinella, Mab.
366. *A. ater*, L. 1758.
δ. albus, L.
 i. *simplex*, Moq.
 ii. *marginatus*, Moq.
 iii. *elegans*, Moq.
 iv. *oculatus*, Moq.
c. medius, Jencs.
d. cinereonebulatus, Jencs.
e. cinereus, Wst.
f. marginatus (Moq.?) Esm.
367. *A. a. rufus*, L. 1758.
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subflavus, Johns.
empiricorum, Fér.

- glaucus**, Colb.
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vulgaris, Moq.
i. draparnaudii, Kal.
ii. brunneus, Rösch.
b. lamarckii, Kal.
ruber, Moq.
c. nigrescens, Raz.
razoumowskii, Kal.
 ? **fuscatus**, Fér.
i. seminiger, Ckll.
ii. cinerascens, Ckll.
cinereus, Roeb. (nec. Wst.)
iii. plumbeus, Roeb.
iv. aldrovandii, Kal.
ater, Moq.
niger, D. & M.
v. griseomarginatus, D. & M.
d. aterrimus, D. & M.
e. marginellus, Schr.
swammerdamii, Kal.
marginatus, Moq.
f. luteus, Raz. 1789.
succineus (pars), Müll.
flavescens, Fér.
schrunkii, Kal., 1851.
i. lividus, Colb., 1866.
ii. ferussakii, Kal., 1851.
virescens, Mill., 1850 (?1854).
subdeletus, Ckll., 1886.
g. pallescens, Moq.
i. luteopallescens, Roeb. MS., Ckll.
ii. brunneopallescens, Roeb.
iii. fuscolutescens, Ckll.
iv. introvibesens, L. E. Ad., sine descr.
h. albus, Fér.
albidus, Roeb.
i. reticulatus, Roeb.
f. bicolor, Moq.
h. scharffi, Ckll.
i. subreticulatus, Ckll., 1886.
ii. elineolatus, Ckll., 1886.
l. albolateralis, Roeb.
m. bocagei, Simr., sens. Clige.
n. fasciatus, Ckll.
 ? *o. fasciatus*, Seib.
p. mulleri, Kal.
q. maculatus, D. & M.
r. virescens, Clige.
 ? *s. bicolor*, V. d. Brueck, 1870.
 ? *t. rupicola*, Mab.
 ? *u. olivaceus*, Lehm., 1856.
 ? *v. servainianus*, Mab., 1870.
 368. **A. a. hibernus**, Mab., 1868.
rufulus, Baudon, 1884.
 369. **A. a. brevierei**, Poll., 1887.
b. niger, Brev. in Poll.
 370. **A. a. aggericola**, Mab., 1870.
 371. **A. a. sulcatus**, Morel, 1845.
h. bocagei, Simr., s. str.
pallescens, Lisb. Mus. MS., sine descr.
 372. **A. lusitanicus**, Mab., 1868.
rufus, Morel, ex err.
 ? **fuliginus**, Morel, 1845.
h. rufescens, Clige., 1893.
c. olivaceus, Clige., 1893.
d. nigrescens, Clige., 1893.
e. griseus, Clige., 1893.
f. simrothi, Ckll.
 373. **A. l. hispanicus**, Simr., 1886.
 374. **A. l. dasilvæ**, Poll., 1887.
 375. **A. l. nobrei**, Poll., 1889.
ater (pars), Morel, ex err. 1845.
 375a. **A. flagellus**, Clige., 1893. +
a. phillipsi, Clige., 1893.
 376. **A. subfuscus**, Drp., 1805.
cinctus, D. & M., 1852.
fasciatus (pars), Nilss.
a. cinereofuscus, Drp.
incommodus, Hutt.
i. typus, Poll., 1890.
ii. krynickii, Kal., 1851.
h. cinereus, Loc. sine descr.
c. griseus, Clige.
 ? *fasciis-ohsoletus*, Clige. sine descr.
d. albus, Esch.
e. rufofuscus, Drp.
 ? **rufescens**, Loc. sine descr.
i. mabillianus, Bgl.
ii. aurantifascus, Loc. sine descr., Ckll.
iii. rufescens, Clige., 1892.
iv. ardosiarum, Colb.
f. succineus, Bouil., 1836.
flavescens, Clige.
i. gaudefroyi, Mab., 1870.
 ? **olivaceus**, Schm., 1856.

- g. lateritius*, Clige., 1892.
h. alpestris, Poll., 1890.
 ? *fuscescens*, Loc. sine descr.
i. nigricans, Poll., 1887.
j. vormanni, Loens., 1890.
k. nivalis, Kock, 1878.
l. brunneus, Lehm.
m. atripunctatus, D. & M., 1852.
n. medius, Jens., 1872.
o. quadrifasciatus, Jens., 1872.
p. polloneræ, Pini, 1884.
 ? *g. limacopus*, Wst., 1871.
 ? *r. euthymeanus*, Flor., 1886.
 377. *A. s. fuscus*, "Müll.," Poll.
b. boettgeri, Poll.
c. stabilei, Poll.
 ? *d. citrinus*, Wst.
 378. *A. s. bavayi*, Poll., 1887.
 379. *A. s. pegorarii*, L. & P., 1882.
 380. *A. flavus*, Nilss., 1882. (? Müll.)
campestris, Mab., 1868.
melanocephalus, Wst., ex err.
 381. *A. rubiginosus*, Baud.
b. nigricans, Baud.
 382. *A. rupicola*, Mab.
 383. *A. tenellus*, Millet, 1854 (? 1850).
b. albidus Baud., 1871.
c. oresiacus, Mab., 1870.
 ? *d. sourhieuvi*, Fagot., 1884.
 384. *A. occidentalis*, Ckll., 1893.
 385. *A. hortensis*, Fér., 1819.
 ? *concauus*, Brard, 1815.
fuscus, (pars) Moq., ex err.
 ? *fallax*, Sterki, 1882.
a. fasciatus, Moq., 1855.
i. typus, Poll.
ii. niger, Moq.
iii. alpestris, D. & M.
iv. pyrenaicus, Moq.
v. atbipes, Ckll.
vi. dorsalis, Moq.
vii. pelophilus, Mab., 1870.
 ? *limbatus*, Moq., 1855.
fasciatus, Kick., 1830.
b. griseus, Moq.
c. cæruleus, Clige.
d. distinctus, Mab.
e. virescens, Moq.
f. nemoralis, D. & M.
g. pallidus, Roeb. sine descr.
h. luteus, Baud.
i. subfuscus, C. Pfr., 1821.
i. rufescens, Moq.
 ? *ii. fallax*, Ckll.
 386. *A. h. celticus*, Poll., 1887.
 387. *A. h. anthracinus*, Bgt., 1866.
 388. *A. cottianus*, Poll., 1887.
 389. *A. nilssoni*, Poll., 1887.
hortensis, Malm. ex err.
 390. *A. alpinus*, Poll., 1887.
 ? *alpicola*, Fér., 1823.
b. aureus, Less., 1881.
 391. *A. intermedius*, Norm., 1852.
 ? *flavus*, Müll., 1774.
 ? *aureus*, Gmel., 1778.
 ? *melanocephalus*, F. Big. in
 Fér., 1822.
tenellus, Heyn. ex err., 1861.
bourguignati, Mab., 1867
 (*Geomal.*).
hiemalis, Drouet, 1867.
mabilei, Baud., 1868.
mabillianus, Baud., 1864.
minimus, Simr., 1885.
vendeanus, Let., 1869.
a. normalis, Moq.
b. pallidus, Moq.
c. albidus, Moq.
d. plumbeus, Clige., 1892.
e. apenninus, Poll., 1889.
 392. *A. i. paladthianus*, Mab.,
 1867.
verrucosus, Brev., 1881.
 ? *moitessicrianus*, Mab., 1867.
 393. *A. i. mollerii*, Poll.
 394. *A. pascalianus*, Mab., 1868.
fuscatus, Morel., ex err.,
 1845.
 395. *A. lineatus*, Risso, 1826.
 396. *A. austenianus*, Nev. sine descr.
 397. *A. fasciatus* (pars), Nilss. 1822.
 ? *alpicola* (pars), Fér.
marginatus, Kickx., 1837.
circumscripatus, Johns., 1828.
leucophæus, Norm., 1852.
griseus, Bgt. ex err., 1864.
dupuyanus, Bgt., 1864.
bourguignati, Mab., 1868.
 ? *bayani*, (pars) Jous., 1876.
b. miser, Poll., 1887.
i. griseus, Clige., 1892.
c. neustriacus, Mab., 1868.
i. flavescens, Clige., 1892.

- ff. **subfuscus**, Roeb., 1892.
d. atripunctatus, Ckll., 1891.
 398. **A. f. subcarinatus**, Poll., 1885.
 399. **A. f. ambiguus**, Poll., 1889.
b. armoricanus, Poll., 1889.
c. subalbidus, Ckll., 1891.
 400. *A. paladillianus*, Mab., 1870.
 401. **A. limidus**, Morel.
 ? *montanus*, Mab.
 401a. **A. elongatus**, Clge., 1893.
ARIUNCULUS, Lessona, 1881
 402. **A. speziæ**, Less.
 403. **A. mortileti**, Less.
a. flavus, Less.
typus, L. & P.
b. aurantiacus, Less.
c. monachus, Less.
d. pullatus, Less.
 404. **A. camerani**, Less.
 Sect. **ICHNUSARION**, Poll., 1890.
 405. **A. isselii**, Bgt.
GEOMALACUS, Allm.
 406. **G. maculosus**, Allm., 1846.
lusitanus, Da Silva, 1873.
maculatus, Gray ex err., 1855.
andrewsi, Mab.
a. typicus, Heyn.
b. allmani, Heyn., 1873.
c. verkruzeni, Heyn., 1873.
d. fasciatus, Ckll., 1890.
 Sect. **ARRUDIA**, Poll., 1890.
 407. **G. oliveiræ**, Simr.
 408. **G. anguiformis**, Morel, 1845.
anguiformis, Gray ex err., 1855.
viridus, Morel.
b. squammatinus, Morel., 1845.
LETOURNEUXIA, Egt.
 409. **L. numidica**, Bgt.
 410. **L. moreletti**, Hesse.
 411. **L. atlantica**, Bgt.
 412. **L. tournieri**, Poll., 1890.
 [413. **L. pliocenica**, Sacco, 1885.]
TETRASPIS, Hag., 1885.
 414. **T. leturneuxi**, Hag., 1885.
ANADENUS, Heyn.
 Sect. **ALTIVAGI**, Ckll.
 415. **A. altivagus**, Theob.
gigantens, Heyn.
 ? *modestus*, Theob.
 416. **A. schlagintweiti**, Heyn.
 Sect. **SULCATI**, Ckll.
 417. **A. jerdoni**, G.-A., 1882.
 Sect. *incert.*
 418. **A. blandfordi**, G.-A., 1882.
 419. **A. insignis**, G.-A., 1882.
ANADENULUS, Ckll., 1890.
 420. **A. cockerelli**, Hemph., 1890.
PROPHYSAON, Bld. & Binn.
Limacaron, Cooper.
 Sect. **TYPICI**, Ckll.
 421. **P. andersoni**, Coop., 1872.
b. hemphilli, B. & B.
c. pallidum, Ckll., 1891.
d. marmoratum, Ckll., 1892.
e. suffusum, Ckll., 1893.
 422. **P. pacificum**, Ckll.
flavum, Ckll.
 Sect. **CÆRULEI**, Ckll.
 423. **P. cæruleum**, Ckll.
b. dubium, Ckll.
 Sect. **FASCIATI**, Ckll.
 424. **P. fasciatum**, Ckll. in W. G. Binn., 1890.
andersoni, W. G. Binn., ex err.
b. obscurum, Ckll., 1893.
 425. **P. f. humile**, Ckll.
 Sect. **PHENACARION**, Ckll.
 426. **P. foliolatum**, Gould.
 427. **P. hemphilli**, W. G. Binn.
ARIOLIMAX, Moreh.
 428. **A. columbianus**, Gould, 1851.
a. typicus, Ckll., 1891.
b. stramineus, Hemph., 1891.
c. maculatus, Ckll. in W. G. Binn., 1890.
d. niger, Ckll., 1891.
 429. **A. c. californicus**, Coop., 1872.
b. maculatus, Ckll., 1891.
 430. **A. c. costaricensis**, Ckll., 1890.
 431. *A. c. hexoxi*, Weth., sine descr.
HESPERARION, Simroth., 1892.
 432. **H. niger**, Coop., 1892.
b. maculatus, Ckll., 1892.
 ? *c. andersoni*, W. G. Binn.
 433. **H. hemPELLI**, W. G. Binn.
b. maculatus, Ckll. in W. G. Binn., 1890.
PHILOMYCINÆ, Ckll., 1891.

LIMACELLA, Blainv., 1817. (nec Brard.)

- Limacellus**, Fér., 1821.
- Philomycus**, Raf., 1820.
- Tebennophorus**, Binn., 1842.
- Pallifera**, Morse., 1864.
- Meghimatium**, V. Hass., 1824.
- Incillaria**, Bens., 1842.
- Eumelus**, Raf., 1820.
- 434. **L. carolinensis**, Booc.
- carolinianus**, De Roissy.
- togata**, Gould.
- marmorata**, De Kay., sine descr.
- quadrius**, Raf.
- 435. **L. nebulosa**, Ckll., 1890.
- ? **nebulosa**, Raf., 1820.
- ? **flexuolaris**, Raf., 1820.
- 436. **L. pennsylvanica**, Pilsb.
- 437. **L. dorsalis**, Binn., 1842.
- ? **oxurus**, Raf.
- ? **oxyurus**, Gray ex err.
- ? **fuscus**, Raf.
- ? **lividus**, Raf.
- 438. **L. wetherbyi**, W. G. Binn.
- 439. **L. hemphilli**, W. G. Binn.
- 440. **L. crosseana**, Streb.
- 441. **L. sallei**, Cr. & Fisch.
- 442. **L. aurata**, Tate.
- 443. **L. costaricensis**, Mörch.
- 444. **L. lactiformis**, Blainv., 1817.
- lactescens**, Fér. ex err.
- elfortiana**, Blainv., 1825.
- 445. **L. bilineata**, Bens., 1842.
- 446. **L. confusa**, Ckll., 1890.
- bilineata**, Kef. ex err.
- 447. **L. chinensis**, Ckll., 1890.
- bilineata**, Heude ex err., 1882.
- 448. **L. formosensis**, Ckll., 1890.
- 449. **L. campestris**, G.-A., 1876.
- 450. **L. striata**, Hass., 1824.
- 451. **L. picta**, Stol.
- 452. **L. monticola**, G.-A., 1876.
- 453. **L. reticulata**, v. Hass.
- 454. **L. cylindracea**, Fér.
- 455. **L. australis**, Bergh.

VERONICELLIDÆ, Gray, 1840.

VERONICELLINÆ, Ckll., 1891.

VERONICELLA, Blainv.

Vaginula, Fér., 1821.
Vaginulus.

- (i.) Species of the Indian Region.
- 456. **V. alte**, Fér.
- 457. **V. frauenfeldi**, Semper.
- 458. **V. maculata**, Temp.
- 459. **V. reticulata**, Wst., 1885.
- 460. **V. sarasinorum**, Simr., 1892.
- (ii.) Species of the Indo-Chinese Peninsula.
- 461. **V. birmanica**, Theob.
- h. pallidula**, Fea., sine descr.
- 462. **V. siamensis**, Mart.
- 463. **V. hasselti**, Mart., 1867.
- 464. **V. proxima**, Tap.-Can.
- 465. **V. andersoniana**, Tap.-Can.
- 466. **V. bocourti**, Roch., 1885.
- 467. **V. chandoensis**, Roch., 1888.
- 468. **V. titanotona**, Roch., 1888.
- 469. **V. hennigi**, Simr.
- (iii.) Species of Malay Peninsula.
- 470. **V. carusi**, Simr.
- (iv.) Species of Chinese Region.
- 471. **V. crosseana**, Mab. & Le M.
- 472. **V. chinensis**, Moll., 1881.
- 473. **V. fargesiana**, Heude.
- 474. **V. patriatiana**, Heude.
- 475. **V. carbonaria**, Heude, 1890.
- 476. **V. pictor**, Heude, 1890.
- 477. **V. lemonieriana**, Heude, 1890.
- 478. **V. reinhardti**, Semp., 1885 (1886?).
- (v.) Species of Philippine Is.
- 479. **V. luzonica**, Gray.
- 480. **V. zamboangensis**, Semp.
- (vi.) Species of Borneo.
- 481. **V. wallacei**, Issel, 1874.
- 482. **V. stuxbergi**, Wst., 1885.
- sternbergi**, Ed. Mal. Bl., err. typ.
- 483. **V. flava**, Heyn.
- 484. **V. idæ**, Semp.
- (vii.) Species of Sumatra.
- 485. **V. schneideri**, Simr., 1892.
- 486. **V. sumatrensis**, Simr., 1892.
- 487. **V. weberi**, Simr., 1892.
- (viii.) Species of Java.
- 488. **V. lævigata**, Cuv.
- 489. **V. bleekeri**, Kef., 1865.
- 490. **V. strubelli**, Simr., 1892.
- 491. **V. cockerelli**, Simr., 1892.
- 492. **V. marshalli**, Simr., 1892.

493. *V. platei*, Simr., 1892.
 494. *V. newtoni*, Simr., 1892.
 495. *V. maculosa*, V. Hass.
 496. *V. mollis*, V. Hass.
 497. *V. portilosa*, V. Hass.
 498. *V. punctata*, V. Hass.
 499. *V. viridialba*, V. Hass.
 (ix.) Species of Moluccas, Celebes, &c.
 500. *V. chavesi*, Simr., 1892.
 501. *V. bocagei*, Simr., 1892.
 502. *V. graffi*, Simr., 1892.
 503. *V. vivipara*, Simr., 1892.
 (x.) Species of New Caledonia.
 504. *V. plebeia*, Fisch., 1868.
 (xi.) Species of Queensland.
 505. *V. leydigi*, Simr.
 506. *V. hedleyi*, Simr.
 (xii.) Species of the Seychelles.
 507. *V. seychellensis*, Fisch., 1872.
 508. *V. bicolor*, Heyn., 1885.
 509. *V. elegans*, Heyn., 1885.
 510. *V. tristis*, Heyn., 1885.
 511. *V. parva*, Heyn., 1885.
 (xiii.) Species of Rodriguez.
 512. *V. rodericensis*, E. A. Sm.
 (xiv.) Species of Mauritius.
 513. *V. punctulata*, Fisch.
 514. *V. trilineata*, Semp.
 515. *V. andreaea*, Semp.
 (xv.) Species of Bourbon.
 516. *V. maillardii*, Fisch., 1872.
 (xvi.) Species of Madagascar.
 517. *V. subaspera*, Fisch.
 518. *V. verrucosa*, Heyn., 1885.
 519. *V. margaritifera*, Heyn., 1885.
 520. *V. sulfurea*, Heyn., 1885.
 (xvii.) Species of Comoro Is.
 521. *V. picla*, Heyn.
 522. *V. grossa*, Heyn.
 523. *V. comorensis*, Fisch., 1883.
 (xviii.) Species of East Africa.
 524. *V. petersi*, V. Mts.
 525. *V. koellikeri*, Semp.
 526. *V. brevis*, Fisch., 1872.
 (xix.) Species of South Africa.
 527. *V. natalensis*, Rapp.
 528. *V. maura*, Heyn.
 529. *V. saxicola*, Ckll.
 (xx.) Species of West Africa.
 530. *V. liberiana*, Cld.
 531. *V. pleuroprocta*, V. Mts.
 (xxi.) Species of Princes Is.
 532. *V. myrmecophila*, Heyn., 1868.
 (xxii.) Species of Bermuda.
 533. *V. schivelyæ*, Pilsbry, 1890.
 (xxiii.) Species of Florida.
 534. *V. floridana*, Binn.
 (xxiv.) Species of Cuba.
 535. *V. cubensis*, Pfr., 1840.
occidentalis, Arango, ex err.
 (xxv.) Species of Jamaica.
 536. *V. sloanii*, Cav.
laevis, Blainv.
♂ coffeæ, Ckll., 1893.
 537. *V. virgata*, Ckll., 1892.
 538. *V. jamaicensis*, Ckll., 1892.
 539. *V. dissimilis*, Ckll., 1892.
 (xxvi.) Species of Porto Rico.
 540. *V. portoricensis*, Semp.
 (xxvii.) Species of Lesser Antilles.
 541. *V. occidentalis*, Guild.
 542. *V. punctatissima*, Semp.
 543. *V. dubia*, Semp.
 544. *V. morchii*, Semp.
 545. *V. luciae*, Ckll.
 (xxviii.) Species of Central America.
 546. *V. moreleti*, C. & F., 1872.
 547. *V. mexicana*, S. & P.
 548. *V. olivacea*, Stearns, 1871.
 549. *V. strebelii*, Semp.,
mexicana, Semp. (nec S. & P.).
 (xxvix.) Species of Eastern S. America.
 550. *V. solea*, D'Orb.
A. bonariensis, Strob.
 551. *V. tuberculosa*, V. Mts., 1868.
 552. *V. paranensis*, Burm.
 553. *V. multicolor*, Semp.
 554. *V. taunaysii*, Fern.
 555. *V. fusca*, Heyn.
 556. *V. langsdorfi*, Fér.
 557. *V. aberrans*, Heyn., 1885.
 558. *V. angustipes*, Heyn., 1885.
 559. *V. reclusa*, Allemao, 1859.
 560. *V. jordani*, Simr., 1892.
 561. *V. paraguensis*, Simr., 1892.
 562. *V. taylori*, Simr., 1892.
 563. *V. cærulescens*, Semp.
 564. *V. bielenbergii*, Semp.
 565. *V. immaculata*, Semp.
 566. *V. galatheæ*, Semp.
 567. *V. boettgeri*, Semp.
 568. *V. variegata*, Semp.
 569. *V. behnii*, Semp.

570. *V. lamellata*, Semp.
 571. *V. marginata*, Semp.
 572. *V. kjellerupii*, Semp.
 573. *V. kroyeri*, Semp.
 574. *V. martensii*, Semp.
 (xxx.) Species of Western South America.
575. *V. limayana*, Less.
 576. *V. andensis*, Mill.
 δ. cephalophora, Mill., 1879.
 α. quadricularis, Mill., 1879
 577. *V. boetzkesi*, Mill., 1879.
 δ. complanata, Mill., 1879.
 578. *V. arcuata*, Mill., 1879.
 δ. teres, Mill., 1879.
 579. *V. atropunctata*, Mill., 1879.
 580. *V. linguæformis*, Semp.
 581. *V. marianita*, Const., 1887.
 582. *V. adpersa*, Heyn, 1885.
 583. *V. gayi*, Fisch., 1872.
 584. *V. nigra*, Heyn.
 585. *V. chilensis*, Leiprig Mts. MS., Simr., 1891.
 586. *V. decipiens*, Semp.
 (xxxi.) Species of uncertain locality.
 587. *V. kraussii*, Fér.
 588. *V. kreidellii*, Semp.
 589. *V. telescopium*, Semp.
 590. *V. voigtii*, Semp.
 Subg. **IMERINIA**, Ckll., 1891.
 591. *V. grandidieri*, C. & F., 1871.
 LEONARDIA, T.-Can.
 592. *L. nevilliana*, T.-Can.
 ? *OTHELOSOMA*, Gray, 1869.
 593. *O. symondsii*, Gray.
 Subf. **VAGINULINÆ**, Ckll., 1891.
RATHOUSIA, Heude.
 594. *R. sinensis*, Heude, 1882.
 leonina, Heude.
 595. *R. tigrina*, Heude.
 596. *R. pantherina*, Heude.
ATOPOS, Simr., 1891.
 Vaginulus, W. C. Binn., 1879
 597. *A. semperi*, Simr., 1891.
 598. *A. strubelli*, Simr., 1891.
 599. *A. leuckarti*, Simr., 1891.
 600. *A. trigonus*, Semp.
 601. *A. pulverulentus*, Beus.
 sanguineus, "Stel."
PRISMA, Simr., 1891.
 602. *P. tourannense*, Fyd. & Souf.
 603. *P. prismaticum*, T.-Can., 1883.
 604. *P. heynemanni*, Simr., 1891.
 605. *P. australe*, Heyn.
JANELLIDÆ, Gray, 1853.
JANELLINÆ, Ckll., 1891.
JANELLA, Gray in M. E. Gray (nec Gral.).
 Athoracophorus, Gould, 1852.
 606. *J. bitentaculata*, Q. & G., 1832.
 δ. antipodarum, Gray, 1853.
 Sect. **KONOPHORA**, Hutton.
 Conophera, Tryon ex err.
 607. *J. marmorea*, Hutt., 1879.
 608. *J. marmorata*, V. Mts. MS., Simr.
 Sect. **PSEUDANEITEA**, Ckll., 1891.
 609. *J. papillata*, Hutt., 1879.
 610. *J. verrucosa*, V. Mts. MS., Simr.
 δ. nigricans, V. Mts. MS., Simr.
 α. fuscata, V. Mts. MS., Simr.
 fasciata, V. Mts. MS., Suter.
NEOJANELLA, Ckll., 1891.
 611. *N. dubia*, Ckll., 1891.
ANEITELLA, Ckll., 1891.
 612. *A. virgata*, F. A. Sm., 1884.
ANEITEA, Gray, 1860.
 Aneiteum, W. G. Bion, ex err.
 Triboniophorus, Humb., 1863.
 613. *A. graffei*, Humb., 1863.
 schutei, Kef.
 δ. krefftii, Kef., 1865.
 α. rosea, Hedley, 1892.
 614. *A. macdonaldi*, Gray, 1860.
 615. *A. hirudo*, Fisch., 1868.
 616. *A. modesta*, C. & F., 1870.
HYALIMACINÆ, G.-A., 1882.
HYALIMAX, H. & A., Ad., 1855.
 617. *H. maillardi*, Fisch., 1867.
 618. *H. mauritianus*, Kaug., 1827.
 mauritus, Fér., 1827.
 murtitii, Woodw., ex err.
 619. *H. perlucidus*, Q. & G., 1832.
 pellucidus, Tryon, ex err.
 Sect. **JARAVA**, G.-A., 1882.
 620. *H. andamanicus*, G.-A., 1882.
 δ. punctulatus, Ckll., 1890.
 621. *H. reinhardti*, Mörch., 1872.
 622. *H. viridis*, Theob., 1864.

SUCCINEIDÆ, W. G. Binn.

em Fischer.

OMALONYX, D'Orb.**Homalonyx**, Agass., 1847.**Amphibulima**, (pars) Beck,
1837.**Helisiga**, (pars) Ffr., 1855.623. **O. unguis**, Fér.**matheronii**, Pot. & Mich.? *b. felina*, Guppy.624. **O. guadeloupensis**, Less.? **antillarum**, Grat.625. **O. patera**, Döving.626. **O. gayana**, D'Orb.627. **O. convexa**, Mart., 1868.? Subg. **PELTA**, Beck.628. **O. cumingi**, Beck.**NOTES.**

- 1 c. It is a matter of opinion whether *maculatus* (Leach) or *krynickii* should take priority.
- 1 e. The form *maculatus*, Pic., is hardly distinct from *punctatus*, Esm.; of course, Picard's name has priority, but it is not the same as *maculatus*, Leach.
- 1 f. Moquin-Tandon is the author of this variety, strictly speaking.
- 1 g. I have seen the type of *megaspidus* in the British Museum. The external mouth-parts are those of *maximus*, not of *flavus*; so also the reticulation, &c.
- 1 r. *strobili*, as I have identified it, is only a pale or semialbino form of *maximus*.
- 1 g'. *subunicolor*, Simroth. I have seen no description of this.
- 2-8. Subspecies or races not studied by me, and of quite minor rank.
9. *cinereo-niger*. After all the discussion that has taken place, I feel somewhat diffident about adding more. For my own part, I have never been at a loss to identify *cinereo-niger* by external marks, even when the sole has been unicolorous. Yet it is only fair to state that an example from Wales, which I was strongly persuaded was *cinereo-niger*, though the sole was not banded, was at Leeds referred to *maximus*.⁶ Probably the specimens are still preserved there, and if it is really *maximus*, I must retract the above statement about the identification of *cinereo-niger*. This slug was recorded by Mr. Fenn as *cinereo-niger* var. in *Journ. of Conch.*, 1887, p. 198 (see also p. 137). In the British Museum there is a large *cinereo-niger*, entirely white (var. *albus*, Paasch.).⁷

⁶In all probability this was *cinereo-niger*.—W. F. C.⁷It would be interesting to know in what manner the var. *albus*, Am Stein, of *L. maximus*, L., differs from the var. *albus* of Paasch.—W. F. C.

As it seems to me, the real question of the specific or subspecific validity of *cinereo-niger* is not solved by the statements made by Messrs. Roebuck and Collinge, and it still remains to be asked, can both *maximus* and *cinereo-niger* be obtained from eggs laid by a single slug of either kind? If not—and I do not believe myself that they could—*cinereo-niger* is a valid subspecies or species. Then, if it be found (as seems to be the case) that *cinereo-niger*, thus distinct, intergrades with *maximus* in certain localities, it is not a species but a subspecies, and that, I believe, is its proper rank.

Of course it follows from this way of looking at the matter, that some of the older and more distinct varieties of horses, dogs, &c., known to have developed under domestication, are subspecifically distinct, and this, I think, is a just conclusion.

10. I have restored the name *geographicus*, as it no doubt belongs to *dacampi*, and is older and also appropriate.
13. *L. fungivorus* is placed by its author in *Malacolimax*, but Simroth says it is a young *cinereo-niger* form!
21. Böttger described it as a variety of *maximus*, his name takes priority.
31. To *tenellus* have been referred *aureus*, Gmel., and *squamatinus*, Morel., but it appears that the first is an *Arion*, the second a *Geomalacus*.
- 31 *b*. I have seen no description of *griseus*.
34. *L. raymondianus*. Simroth has referred this name to a variety of *Amalia gagates*, but I can hardly believe he is right. Pollonera has recognised a true *Malacolimax* as *raymondianus*.
36. *L. nyctelius*. Mr. Pollonera has sent me this from Algeria. A species formerly called *nyctelius* by Simroth seems to be *subsaxanus*.
37. *L. valentianus*. According to Simroth, this is a race of *arborum* (*marginatus*). Mr. Pollonera sent me a specimen from Barcelona, and it seemed to me quite distinct from *marginatus*. However, so far as external marks went, I could see no specific difference between *valentianus* and *nyctelius*.
38. *L. fulvus*. Simroth suggests that this may be a yellow form of *tenellus*.
41. *L. marginatus*. I believe *sylvestris* is the same, but it is too poorly described to be certainly recognisable.

- 44b. Var. *umbrosus*, Phil. This name may be taken to represent a slight mutation like *maculatus*, Kal., but with the dark colouring more brown.
- 44 g. Var. *lineolatus*. Mr. Collinge must forgive me for saying that I am still quite puzzled about this form, owing to the yellowish tentacles. Will not its author give some further details about it?⁸
- 44 r. *canariensis*. This probably does not differ from the type. *L. canariensis* of Mr. E. A. Smith (P. Z. S., 1849, pp. 276-78) is another thing altogether, being *Agriolimax agrestis*, v. *sylvaticus*, Moq., as I have satisfied myself by an examination of the original specimens. Dr. Simroth in his beautiful work on the slugs of Portugal and the Azores, has drawn some erroneous conclusions from the misidentification of *canariensis*.
44. *L. ehrenbergi*. Heynemann states that this is *flavus*. It was supposed to have no shell.
44. *L. megalodontes*, Q. and G. Found near Port Jackson, Australia. The Australian malacologists seem agreed that this is *flavus*.
57. Heynemann remarks of *phaeniciacus* that Böttger thought it was *Agriolimax agrestis*, but from the figure it might be *variegatus (flavus)*.
59. *L. lineolatus*. The description reads like the young of a dark form of *flavus*.
65. *L. cobanensis*. Probably an *Agriolimax*.
68. *L. latus*. Fossil in the I. of Wight. *L. modioliformis* is also English.
- 71-77. *Eumilax*, having priority over *Paralimax*, must be used for the genus.
- Amalia*.—*Aspidoporus* is older than *Amalia*, and *Clytropelta* than *Lallemantia*; yet it would seem absurd to adopt these names, both founded on fictitious characters.
- 78 b. *typica*, Poll. This is in the British Museum from Bath. It is like *heavstoni*.
79. *A. plumbea* may appear either as a variety or sub-species, according to the locality; that is to say, in England it represents a geographical race or subspecies, but plumbeous specimens may occur where the type prevails, just as black

⁸It seems foolish to puzzle one's self over such a very minor colour variation as yellow tentacles. I have no further details to add to my original description. As its name indicates, it has a line on the sides of its body, and as such a form was not known, I thought it of sufficient importance to name it.—W.E.C.

ones are occasionally found in England. All the species of the *gagates* group are very closely allied, and the validity of some is doubtful; but they can hardly be studied in a satisfactory manner without much larger collections than are at present available in museums. Meanwhile, it seems best to keep them distinct, and to treat somewhat cautiously assertions of identity which are not backed by adequate comparison of specimens.⁹

97 f. *pallida*. I merely include this name as it has been published; it does not represent any distinct variety.

106. *A. pallidula*, Ckll., is a small form, distinguished from the young of *sowerbii* by its colour, its transparency, its high acute keel, and its non-attenuate tail. *A. cristata*, Kal., as figured by its author, is pale reddish-ochre, head and neck blackish, no sulcus visible on mantle thus unlike *pallidula*. But Dr. Simroth has lately figured as *cristata* a slug which seems so like *pallidula* that they may well be the same thing. Hence, assuming that Dr. Simroth has correctly identified his slug, and that Kaleniczenko's figure was somewhat misleading, I place *pallidula* as a doubtful synonym of *cristata*.

113. = *Aspidoporus limax*, Fitz.

Agriolimax, 1868. This is a good test case for the law of priority, all the following names being prior to it.

- (1.) *Deroceras*, 1820. There can be little doubt that *D. gracilis*, Raf., was *A. campestris*, Binn., but the description was inaccurate.
- (2.) *Limacellus*, 1821, as quoted by Kreglinger, may be a mistake. *Limacellus*, as known to me in Perussac's writings, is Blainville's genus—a totally different thing.
- (3.) *Krynichia*, 1839 (afterwards called *Krynichillus*, and also *Megaspis*), has been used for the *laevis* group of *Agriolimax*, but I do not see how this restriction can be justified. However, it included some species of *Agriolimax*.
- (4.) *Malino*, 1855, was founded on *A. lombricoides*—a true *Agriolimax*—yet its author was under a mis-

⁹ I have elsewhere (Conch. 1892, ii, p. 92) pointed out that in my opinion *A. pumilio* is but a colour variation of *A. gagates*. I fail to see any reason whatever why it should be regarded as specifically distinct from *A. gagates* any more than any of the other colour varieties. The zoological evidence for the specific identity of a number of the *gagates* group is practically nil, and malacologists will do well to recognise only such whose anatomy has been fully described and figured. The constant splitting up of a species into subspecies, varieties, &c., is a practice I have little patience with, and in a difficult genus like *Lanaba* it is only adding confusion to an already complicated study, and heaping up difficulties in the way of future workers.—W. W. C.

apprehension as to the generic characters, and placed the species of *Agriolimax* with which he was himself acquainted in *Limax*!

- (5.) *Megapelta*, 1857. Also founded on a misconception of the generic characters; the species being known to the author by a drawing only. It certainly was an *Agriolimax* of the *lævis* group.

Of the above, not one was correctly defined, nor were the true generic characters mentioned, but it will be hard for those who believe in strict priority to overlook them all in favour of *Agriolimax*. *Limacellus*, as quoted by Kreglinger, may be safely put aside as a mistake, but I cannot now refer to the place cited. The correct synonymy of *Limacellus* seems to be:—

- (1.) *Limacellus*, Fér., 1821 = *Limacella*, Blainv., 1817 = *Philomycus*.
 (2.) *Limacellus*, Turt., 1831 = *Limacella*, Brard., 1815 = *Limax*.

There now remain four names, three of which were founded solely on slugs which were doubtless species of *Agriolimax*. In the case of *Deroceas* and *Megapelta* it is true the identity is not actually proven; but with *Malina* there can be no shadow of doubt. *Hydroilimax* (or *Deroceas* or *Megapelta*) is available for the *lævis* group, if that can be separated from the *agrestis* group in any satisfactory manner, which I doubt.¹⁰

120. *A. agrestis*. The mutations of the species are extremely numerous, and according to one's opinion, have been named too much—or too little. At all events, it is not difficult to find several mutations not yet named, which are as distinct as several of those named. Thus at Parkstone, Dorset, I found four mutations, none exactly agreeing with any described. Again, at Acton, Middlesex, D. B. Cockerell found five specimens representing three undescribed mutations, one of which was identical with one from Parkstone. Of course, these mutations are but slight—about equivalent in value to the band-variations of some *Helices*.

¹⁰ There can be little doubt, I think, but that *Agriolimax* should remain, seeing not one of the prior genera mentioned was correctly defined. Future investigations upon the anatomy of the slugs will undoubtedly necessitate the re-describing of many genera, and I would venture to suggest that, instead of adopting a new term, the old one should be retained, and simply alter the name of the author—e.g., I could the genus *Neojanella*, Coll., 1861, be found upon anatomical examination to be distinct from any other genus of *Janellidae*, I should retain the name *Neojanella*, adding to it the name of the author who first adequately described and figured the same.—W. E. C.

- 120 *d. tristis*. Moquin-Tandon describes his slug as banded, which seems to indicate that it may not be *agrestis*. If so, the form recognised as *tristis* in England will want a new name.
- 120 *g. typicus*. I have used the name for the ordinary immaculate forms, not necessarily within the strict definition of *typus*, L. and P. I did not originate the name, and believe it was first used by Roebuck as an amended form of *typus*, or by error for Lessona and Pollonera's term. Thus, Roebuck cites it as "*typica*" of Less. and Pell. in *J. of Conch.*, 1884, p. 252.¹¹
- 120 *h. niger*, Morelet. I have not seen Morelet's description; Mr. Butterell described it under the same name.
- 120 *i. albidus*, Pic., *typus*, L. & P., and *cineraceus*, Moq., are but slight modifications of the grey immaculate form. So also *albitentaculatus*.
- 120 *k. l. rufescens*, L. & P., is obscurely spotted, but *rufescens*, D. & M., is immaculate; *q. ornatus*, Paul., is probably to be united with *rufescens* as given by Less. & Poll., and *ornatus*, Moq., seems only a further modification of the same type.
- 120 *f. w. s.* In the same way, the reddish *succineus*, Wst., taking brownish spots, becomes *obscurus*, Moq., and when the spots become darker and more distinct with the interstices of the rugæ usually darkened, we have *reticulatus*, Müll.
- 120 *l. x. veranyanus* and *punctatus* are practically equivalent it would seem.
- 120 *a. b. varians* and *sylvaticus*, Moq., are almost precisely the same. Draparnaud's *sylvaticus* is something altogether different.
- 120 *o. g. melanocephalus*, Moq. (not *A. melanocephalus*, Kal.), is practically identical with *atritentaculatus*.
- 120 *e. molestus*, Hutton. A form of the species found in New Zealand, descended from introduced examples. A specimen in the British Museum, which I examined, from Dunedin (Otago Univ. Mus.), seemed peculiar in its rather smooth body, its white ground-colour, and its blackish-brown tint above. Hutton (*Man. N.Z. Moll.*) states that the slug is quite variable, so that it will hardly be possible to identify *molestus* with any particular mutation.

¹¹ This is only another case of the careless manner in which Mr. Roebuck uses the nomenclature of foreign authors. I have always regarded the "*typica*" of Mr. Roebuck as an error. The above form in such a case should read *typicus*, Gyll. How can the type be a variety?—
W. F. C.

- 120 *p. xanthosoma*. This is stated to be yellowish-amber, so it might be identified with *rufescens*, D. & M. There is a more extreme form, bright orange above, of which Mr. Wilcock sent me a drawing, with the following description:—
- “Body and mantle bright orange red, shading to greyish down the sides: tentacles and head fuscous.” This might better be referred to *succineus*, of which Westerlund writes “*supra subrufus, subtus albus*.” It was found in Yorkshire.
- 120 *r. bilobatus*. A curious malformation; the only specimen I have seen came from Philadelphia, U.S.A., sent by Mr. Pilsbry.
121. *virescens*, if the same, takes priority.
123. *Limax setchuanensis* is evidently an *Agriolimax*; the figure looks like *agrestis*.
131. *A. simrothi*. This name is proposed for the species indicated by Simroth in his work on the slugs of Portugal and the Azores as *drymonius*, Bgt., the true *drymonius* being an *Amalia*.
148. *A. hanryanus*. May not this be a form of *agrestis*?
150. *pallens*; see *Port.-Azor.-Faun.*, p. 313. Is it a slip for *pallidus*?
152. *A. nitidus*. According to Simroth, Bourguignat's *brondetianus* is a species similar to *nitidus*, but Pollonera thinks differently.
154. *A. mentonicus*. Tryon refers this to *agrestis*, but it seems rather to be some form of *lævis*, or allied thereto.
- 158-170. Simroth is disposed to refer all these to *lævis*, but nevertheless they show some distinctions among themselves. Certainly when one examines many specimens it becomes exceedingly difficult to draw specific lines; and from any point of view, no doubt to have six names for the Central American forms, and three for those of South America, is quite unnecessary. In North America there were three nominal species in the books for some time, but as soon as they could be sufficiently compared, it was seen that they were at best only varietally distinct. A more recently discovered species from the Pacific coast of North America (*hemphilli*) seems adequately distinct from *campestris*, but is, in my opinion, a variety of *A. berendti* of Central America.
158. *A. rarotonganus*. In the British Museum are specimens from Rarotonga (coll. Rev. Wyatt Gill; pres. by Sir J. Lubbock)

and New Caledonia, which appear to be veritable *rarotonganus** but are not, so far as I can judge, the same as *lævis*. The Rarotonga slug looks like *agrestis*, but one of the New Caledonia ones has the ground-colour dark, as in *campestris*. Without dissection it would be very difficult to make any positive assertion about their identity, but it seems possible that they may represent a distinct species.

170. *A. queenslandicus*. According to Dr. Simroth this is *lævis*.
 166 f. *nigrescens*. Merely a mutation; dark, blackish or brownish-grey, mantle mottled with darker, back obscurely mottled, tentacles blackish, central area of sole darker than lateral areas. Washington, D.C., several examples (Dr. R. E. C. Stearns).
 179-188. The species of *Parmacella* doubtless ought to be reduced, but it seems best to consider them distinct until they are definitely proved otherwise. Simroth in his work on the slugs of Portugal and the Azores, gives an interesting discussion of the matter, and concludes that *valeniennii*, *deshayesi*, *calyculata*, *callosa*, and *dorsalis* are all races of *olivieri*; which is, in fact, the only valid species of *Parmacella*!

The curious thing is, as Simroth points out, that whereas there is considerable difference of colour among the so-called species, those from the extreme east most resemble in this respect those of the extreme south-west.

I made a comparison of certain specimens in the British Museum, and found therein structural differences which may help to distinguish the species. The reticulation is not equally fine in all, and in order to test this point, I counted the transverse lines or grooves extending from mantle to foot in 10 millim. of the length of the slug.

- P. olivieri* from the Caucasus showed 5 lines in 10 mm.
P. v. maculata from Gibraltar showed 7 lines in 10 mm.
P. gervaisii from Gibraltar showed 7 lines in 10 mm.
P. deshayesi from Oran showed 11 lines in 10 mm.

Of course these measurements are from specimens in alcohol.

* I made the following descriptive notes from these:

- (1). Rarotonga slug. 10 mm. long (in alc.); ochreous, body almost unicolourous, mantle dark. Respiratory orifice pale-margined. Medium area of sole very little wider than either lateral area. Hardly any keel. Structure like *agrestis*.
 (2). New Caledonia slug. 16 mm. long (in alc.); mantle 24 mm. long blackish or black, paler at sides, margin of respiratory orifice pale. Body rather well but obscurely keeled, very dark blackish above, the reticulations marked black, more or less. Sole yellowish-grey, unicolourous, med. an area a little wider than either lateral. Ground colour dark, but structure like *agrestis*.
 (3). New Caledonia slug. Differs from 2, in having ground-colour lighter.

P. deshayesii is like *maculata* externally, except for the finer reticulation and the absence of the black spots and streaks.

The Caucasus *olivieri* presents an extraordinary resemblance to *maculata* var. *olivacea*, but the reticulation is not so fine. In the specimens seen by me, the jaw of *maculata* was broad and rounded at the ends, whereas the jaw of *olivieri* had the ends tapering. Whether the above distinctions are constant can only be learned from the examination of a larger series than I have had access to.¹⁹

Selenochlamys. This genus is referred to *Trigonochlamine* in consequence of the statements made by Simroth in his work on the slugs of Portugal, &c.

Plutoniina n. subfam. The information given by Simroth (l.c.) shows the affinities of *Plutonia* to be with *Vitrininae*; and consequently, according to my views, the genus must be placed in a new sub-family, which I call *Plutoniinae*.

Plutonia. It appears that this name has also been used for a genus of trilobites.¹⁹

201 b. *simrothi*. This is the pale variety from Fayal; Simroth, l.c., taf. 1, f. 4.

207-211. My impression is that these five names represent but one species of *Mariaella*, but, as usual, I give them the benefit of the doubt. The oldest name is *infumata*.

218 b. *doriae*. I do not know any good reason for considering this a species distinct from *beccarii*.

Austenia. I have removed from this genus various species wrongly included in it by authors (e.g., *dimidiata*, *minuta*, *australis*), but the present list includes several which do not seem to be congeneric with *A. gigas*. I must leave it to those who are familiar with these species to finally settle where they should be placed.

249 b. *radha*. This may be a distinct species.

Farmella. I follow Mr. Hedley in placing this in the *Helicarioninae*.

¹⁹The separation of species upon the form of reticulation or number of rugae is the very latest from the school of systematists. Some years ago I made some similar observations upon *Larica empiricorum*. I have not the figures by me, but I remember that there was a great variability shown. Simroth is in all probability correct in assuming *olivacea* to be the only valid species, but, at the same time a careful inquiry upon the structure of the other so-called species is very desirable.—W. E. C.

²⁰If any change is necessary, the generic name had better be altered, seeing that it is pre-occupied. I would therefore suggest that the subfamily, &c., read:

Vitrinocerinae, Collg.
—Plutoniina, Ckll.
Vitrinocerina, Collg.
—Plutoniina, Stat.

Elisoimax, new name for *Elisa*, Heyn., not *Elisa*, Reichenbach, 1854 (a genus of birds). *Elisia* has also been used twice (*Elisia*, Cantr., 1835, in Mollusca: *Elisia*, Big., 1857, in Diptera), but I should not myself consider this the same name as *Elisa*. I have elsewhere stated that I consider *Elisoimax* (*Eliso*) a valid genus.

Otoconchinae. Mr. Hedley classes *Otoconcha* with the *Helicarioninae*, further research having shown that its affinity with the *Binneyinae* was illusory. According to the scheme of classification I have adopted, it forms a new sub-family. In Messrs. Hedley and Suter's recent list of New Zealand Mollusca, *Otoconcha* and *Helicarion* appear as genera of *Zonitidae*, and Mr. Suter in a footnote expresses the opinion that *Otoconcha* is the same as the Philippine genus *Vitrinoidea*, Semper. As to this latter proposition I am not competent to form an opinion, but the reference is unlooked-for, and appears improbable on general grounds. However, Hutton remarks that *Otoconcha* seems allied to *Peltella*, and so far as superficial appearances go, *Peltella* is a good deal like *Vitrinoidea albajensis*, Semp. (see Semper's figure); judging therefore from external characters one might just as well say that *Otoconcha* is allied to *Vitrinoidea*—the more so, because we are led to believe from recent researches that it has at least some real affinity with it.

This question of *Otoconcha* and *Vitrinoidea* shows how entirely arbitrary is the line supposed to be drawn between the snails and the slugs.

- 300 *b.-h.* Possibly these varieties do not all pertain to *haliotidea* s. str. as now understood.
303. This is what was formerly called *T. bisulcata* var. *major*, and it may be a question whether it should not be called *T. major*, Cass. and Fisch. Similarly *Grasia butleri* is a name given to what was *Austenia gigas* var. *minor*, and strict priority would oblige us to write *G. minor*, G.-A. instead of *butleri*.
318. *T. aurigaster*. I know nothing of this beyond what has appeared in an advertisement on the cover of *Journ. of Conch.*
- Daudebardia*. It seems now to be generally recognised that *Libania* and the five names I have placed under it, as synonyms represent only one valid sub-genus. Westerlund proposed *Eudaudebardia* because none of the other names

were originally given to the group it represents as a whole, but all to separate parts of it. Believing that the rules of nomenclature demand the use of *Libania* (which seems to be the oldest name), I have sunk Westerlund's name as a synonym. Westerlund recognises nineteen species in the group; my list contains more, but probably a thorough revision, with ample material, might reduce the species by half.

Chlamydephorus. This differs by one letter from the similarly-named genus of mammals, and, from their derivation, the two names should be spelled alike. *Apera* is occupied in botany, but that is not generally considered to prevent the use of a zoological generic name. On the whole I prefer Mr. Binney's term with the original spelling, but those who use the list can follow whichever course they consider best. It is one of those cases which illustrate the difficulty of strictly applying the laws of nomenclature.

Phosphorax and *Plectrophorus*. One feels inclined to write Bosh, instead of Bosc, after some of these names! I merely insert them because they have been published; the generic and specific characters are purely imaginary. Gray suggested that *P. corninus* was founded on *A. ater*, some hardened mucus being taken for a shell.

366. *Arion ater*. It seems open to question whether the species or sub-species called *empiricorum* can be separated from the Linnean *ater*. Dr. Scharff (*Slugs of Ireland*, p. 539) states that he has examined specimens from Norway, and finds less difference between East Irish and Norwegian examples than there is between the West and East Irish.¹⁴ Again, if these forms are to be sub-specifically separated, can we call either of them *empiricorum*? Linné (*Syst. Nat.* Ed. x. 1758, p. 652) includes under his *ater* the Scandinavian form, but he also refers to Lister's *Limax ater* as identical—and this is our English black "*empiricorum*." Admitting, however, that *ater* can be used only for the Scandinavian race, we next come to *rufus*. *A. rufus*, L., is the *sub-rufus* of the *Fauna Suecica*, which Pollonera gives as a doubtful synonym of *empiricorum*, but it is also Lister's *L. sub-rufus montanus*, which is the British form, and there is a reference to Aldrovandi's *Limax magna, colore rufo*, which is surely also the so-called *empiricorum*.*

¹⁴ Was this not from an external examination only?—W. F. C.

* I regret that I cannot now examine Aldrovandi's work, to see whether this is so, but there can hardly be a doubt. For an interesting notice of this piece in the study of slugs (to which see Jardine's *Naturalists' Library*, vol. xvii, p. 11, A. C.

Therefore, since we *know* that *rufus* was meant to include the red *empiricorum*, and only doubt whether it may not have included something different in "*sub-rufus*," it seems but reasonable to use *rufus*, L., in preference to Férussac's title.

Furthermore, even if we set aside the Linnean name as unavailable, *empiricorum* falls before *L. luteus*, Raz., 1879, and *L. succineus*, Müll., 1774—which represents its yellow variety.

366 *b. albus*. First described by Müller as *L. albus margine lutes* in 1763, but first named *albus* in accordance with the modern system of nomenclature, by Linné, *Syst. Nat.* ed. xii. (1767). I follow Pollonera in referring this to *ater* proper.

366 *b. i-iv*. These four forms named by Moquin-Tandon ought to be such as are found in France, and therefore belonging to *rufus* (*empiricorum*). But they exactly correspond both in character and the order in which they are given with Müller's four varieties (*Verm. Hist.*, 1774, p. 4) of his *albus*, so they may be taken as based on the Müllerian descriptions, and not on specimens examined by Moquin-Tandon.

366 *f. marginatus*. Miss Esmark (*J. of Conch.*, 1812, p. 102) records var. *marginatus*, Moq., from Norway. If the Scandinavian slug is held distinct from the French one, this will be a variety of it, coloured like *marginatus*. It is to be observed, however, that Pollonero admits that some Scandinavian examples are veritable *empiricorum*, as distinct from *ater*. (*Arionidæ*, p. 5.)

367 *a. johnstonii*. So spelled by its author.

367 *b.* Gray (*Cat. Pulm. B. M.*, 1885, p. 54) quotes *Limax ruber*, Drap. I cannot now consult Draparnaud's work, but if the present variety was named *ruber*, of course *tamarckii* must fall.

367 *f. luteus*. I prefer this name, because Müller says of *succineus*, "*Rufo-fuscus vel succini coloris*"—thus including red-brown forms. I have been doubtful whether to cite the synonym *flavescens*, as it is by chance that Férussac uses a single term for the variety—as may be seen by comparison with his other citations of varieties, which are evidently intended as descriptive. The figure of *flavescens* is too red for *luteus* as strictly defined.

367 *f. ii. ferussackii*. So spelled by its author. This name and the two placed as synonyms of it belong to a greenish

subfasciate form, supposed to be the young of the yellow variety. Mr. Gain (*Sci. Goss.*, 1890, p. 45) remarks that the young of light-coloured varieties of this species show stripes a week or two after leaving the egg.

- 367 *k. scharffi*. Back black, sides yellow. Dr. Scharff records this from Ireland, and from what he states it appears to be quite common at Raheny, near Dublin. Although I am quite unable to understand Dr. Scharff's views about classification, and believe he equally fails to understand mine, or Dr. Simroth's (or did so when he last wrote on the subject), I may perhaps venture to give this form his name in recognition of the value of his work on Irish slugs. It happens that the forms I named *subreticulatus* and *elincolatus*, years ago, are but sub-varieties of this *scharffi*, but inasmuch as their names express peculiarities not necessarily inherent in the variety, I have disregarded what might seem the strict requirements of priority.
- 367 *m. bocagei*. Dr. Scharff figures a sub-variety of this, which he found in Ireland; and Mr. Collinge has written on the British representatives of *bocagei*. I think our forms should be separated as one or two sub-varieties, as the citation of the name *bocagei* simply may give rise to misunderstandings. (See *sulcatus*.)
- 367 *o. faciatus*, Seib. This is older than the *faciatus*, Ckll., having been published in *Mal. Bl.*, 1873, p. 190. I have no note of its peculiarities, and do not know whether it has any standing. Pollonera, in his revision of the genus, does not recognise it.
- 367 *p. mulleri*. This is Müller's variety, "*ater, carina dorsi pallide virenti*." The word "*carina*" can hardly be supposed to refer to any distinct keel, and so far as one may judge, the slug must be very similar to Dr. Scharff's Irish form of var. *bocagei*. Therefore, by strict priority, we should perhaps place *bocagei* as a sub-variety of *mulleri*—or it may be more correct to say that *bocagei* is the *mulleri*-like form of *sulcatus*.
- 367 *r. violescens*. This may well be the same as *hibernus*, but as the latter is claimed to be a distinct race or species, instead of a colour-variety, I give it the benefit of the doubt.
- 367 *s. bicolor*. This is not Moquin-Tandon's *bicolor*, but is based on a little slug 30 mm. long, supposed by some to be a form of *A. rufus*.

367 *t. ruficola*. Pollonera cites this as a doubtful species; it has been thought to be a form of *A. rufus*.

Very likely both this and *bicolor*, Broeck, really belong not to *A. rufus* but *A. subfuscus*, especially as Pollonera says he had some young *subfuscus* from France agreeing with *bicolor*.

371. *sulcatus*. I give this sub-specific value, as it differs somewhat from *rufus* of Central Europe. Simroth's *empiricorum* var. *bocagei* should probably be placed under *sulcatus*, in which case the *bocagei*-like forms (*mulleri*, &c.) of *rufus* must be separated from it. The question is whether we are to regard the name *bocagei* as applying merely to the peculiar colour of that slug, or to colour plus such slight structural differences as pertain to the Portuguese race. So far as observed the pale-backed forms of *sulcatus* (*bocagei*) and *rufus* (*mulleri*, &c.) are not strictly identical, as may very well be seen by comparing the figures of Simroth and Scharff; and it seems very possible that *rufus* proper does not produce a colour-variety exactly like *bocagei*, nor *sulcatus* one like *mulleri*.

I have examined several examples of *sulcatus* in the British Museum, which were obtained by Mr. E. A. Allen. They are dark brown in colour.

372. *fuliginus*. If it could be proved that this was *lusitanicus*, of course it has priority. Pollonera suggests its affinity with *subfuscus*—but that species appears not to be found in Portugal. Simroth thinks it may be an immature form of *lusitanicus*, or a closely allied species.

372 *e. simrothi*. A small race from the Azores, which should probably be regarded as a sub-species. See Simroth, *Archiv. f. Nat.*, 1888, p. 227, and *Port. Azor. Faun.*, Taf. 4., figs. 12-13.

375. *nobrei*. Five specimens from Portugal in the British Museum (E. A. Allen) appear to belong to *nobrei*, but they vary among themselves. One seems like *sulcatus*, only black with a plumbeous sole; the other four have the rugæ divided more transversely, after the manner of *ater*. The exact particulars are as follows:—

1. Black, mouth pale, sole plumbeus, unicolorous, length 61½ mm.
2. Black, mouth pale, sole plumbeus, unicolorous, length 61½ mm.
3. Black, mouth hardly pale, sole olivaceous, length 51 mm.

4. Black, mouth not pale, sole olivaceous, unicolorous, length 46 mm.
5. Black, mouth hardly pale, sole with central zone pale olivaceous, lateral zones black, and each broader than central, length 37 mm.

So far as external characters go, specimens 1 and 2 should be *nobrei*, and 5 *dasilvae*, while 3 and 4 seem somewhat intermediate. It is hard to believe they are not all mutations of one species.

376 a-c. The grey forms of *subfuscus* may be distinguished as follows:—

1. Banded—(a) bands distinct, sole yellowish = *cinereofuscus*.
sole whitish = *typus*.
(b) bands indistinct ... = *krynickyi*.
2. Bands wanting = *griseus*.

"*fasciis-obsolutis*" (*Conch.*, 1893, p. 115) is perhaps only a descriptive term from a label written by Mr. Pollonera. There is an unnamed form, found by Mr. Wilcock, which is like *cinereofuscus*, but has an orange foot-fringe.

376 e.g. The reddish forms may be separated thus:

1. Banded:
 - (a.) reddish, bands black = *rufofuscus*.
 - (b.) yellowish, bands brown = *mabillianus*.
 - (c.) orange = *aurantiacus*.
 - (d.) brick-red = *rufescens*.
 - (e.) greyish red, bands blackish = *ardosiarum*.
2. Bands wanting:
 - (a.) yellowish, margin greyish = *gaudefroyi*.
 - (b.) yellowish, margin yellow = *succineus*.
 - (c.) brick-red, margin grey = *lateritius*.

Of course these forms run into one another. The form *aurantiacus*, as described by me, is bright orange, with the bands ill-marked (*Sci. Goss.*, 1886, p. 187). It may not be the same as Locard's undescribed form, but in all probability it is. The form *vornanni*, Loens, 1890, is almost precisely the same thing, perhaps tending rather to *succineus*. Var. *ardosiarum* seems very close to Pollonera's later described v. *alpestris*, but the latter is sometimes with four bands.

According to Pollonera, *Arion olivaceus*, Schmidt, is the same as var. *gaudefroyi*. I have not had the opportunity of consulting Schmidt's description, but if the names are synonymous, *olivaceus* has many years priority.

Var. *flavescens*, Collge., given as a synonym of *succineus*, is yellowish, with bluish sulci (*vide*, Collinge in litt.). The latter feature might possibly separate it as a sub-variety.¹⁵

377. *A. fuscus*. Müller's description is hardly sufficient to fix the exact race, as given by Pollonera. It seems that *fuscus*, sens. Poll., cannot be separated as a species from *subfuscus*; and if it is clear what Müller intended, the name *fuscus* must stand for the species, having priority.¹⁶
- It may here be remarked that *A. fuscatus*, Fér., which has been thought to be a form of juvenile *A. ater*, is placed by Pollonera in the *subfuscus* group, though with a query.
378. *A. bavayi*. This, *nivalis* and *euthymeanus*, differ from *subfuscus* proper in the colour of the slime; but although this character has value in many cases, I do not think it can be held to indicate distinct species in this group, as it is known to be variable.¹⁷
385. *A. hortensis*. The name *concauus*, applied to the shell only, is earlier; but I do not see how it can be satisfactorily identified. Turton (1831) makes *Limacellus concaua*, Brard., identical with *Limacellus variegatus*. The name *fallax*, Sterki, is also very uncertain in its application; its identity with *A. bourguignati* has been suggested.

- 385 a. vii. There is some difficulty here. I have not seen the description of *fasciatus*, 1830, but very probably it was merely a wrong identification of *fasciatus*, Nilss., 1822, in which case it has no standing. Pollonera cites *limbatus* as equivalent to *A. anthracinus*, Bgt., but I do not know why, as Moquin's description precisely agrees with *A. hortensis*, v. *pelophilus*. In either case the name *limbatus*, Moq., cannot be given up, being earlier than *pelophilus* or *anthracinus*.

The various forms of var. *fasciatus* are very similar, differing in the degree of darkening, and the colour of the sole and sides of foot. Thus *dorsalis* has only the dorsal region black, *fasciatus* proper shows distinct black bands,

¹⁵ I have never described any such var. as *rufescens* or *flavescens* of *A. subfuscus*, and these names should certainly not appear. In a letter to Mr. Cockerell I mentioned that I purposed describing such, but he pointed out that Lecard had named a var. *rufescens* (since descr.), so I purposed grouping all red forms under *rufifuscus*. Dips. the new var. *lateritius*, however, turned up, and being a much better marked one than any previously described, I grouped all red forms under it. I was not aware of the var. *succineus*, Puz., when I used the term *flavescens*. As the yellow forms mentioned by Mr. Cockerell should be removed from the red ones.—W. E. C.

¹⁶ In all probability Müller's *A. fuscus* is *A. subfuscus*, Dips. Since Pollonera has very kindly favoured me with examples, and I agree with him that there is practically no difference in the anatomy from Draparnand's species. There is, however, a doubt about Müller's species, and so Draparnand's name should, in my opinion, be retained. *A. citrinus* West. is probably the same thing.—W. E. C.

¹⁷ The next step will probably be to separate species according to whether they are found on the north or the south side of the hedge.—W. E. C.

pyrenaicus is similar, but the ground-colour is dark grey, *niger* is so dark as only to leave the ground-colour appearing as pale bands. The form *albipes* has the sole white (slime colourless), *typus* has it yellow with the sides of the foot reddish, and in *pelophilus* the margin is decidedly red.

385 g. *pallida*. Roeb., *Naturalist*, Aug. 1887, p. 249, from Lincolnshire, was not described. Possibly it is the same as *v. nemoralis*, which is a very pale form, though more or less banded.

385 h. *luteus*. This seems to differ from *virescens* in being yellow, and having less pronounced bands.

390. *A. alpinus*, Poll., is doubtless a valid species, but the names *alpicola* and *aureus* are both older than Pollonera's designation. The figures of *alpicola* given by Pérussac (pl. 8 A. f. 2-3) look like *A. subfuscus*, and since there are several different species of similar appearance, it may be impossible to decide what Pérussac's slug really is. It might even be specifically identical with my *A. occidentalis*, which is certainly not *alpinus*.¹⁸

391. *A. intermedius*. It is doubtful which name should be preferred for this. I do not know *A. flavus*, Nilss., as distinguished by Pollonera, but if it has good structural characters, it seems almost hopeless to identify the names of older authors with it or *intermedius*. The oldest *flavus* is that of Müller, 1774, an inch and a half long, yellow, spotless, white beneath, found in Denmark and Norway. It has black tentacles. This is not *J. flavus*, Linn., of course, and all the slugs at that time being in *Limax*, Müller's name was altered to *aureus*, on account of pre-occupation, in 1778.

Now doubtless *flavus*, Müll., is an *Arion*, and if it is *flavus* sens Poll., or *intermedius*, the name must be used. Probably it will never be identified with certainty, and so it remains on the lists as a doubtful,—chiefly of importance because it prevents us from admitting a later *flavus* into the nomenclature. Consequently, although I leave *A. flavus*, Nilss., on the list, following Pollonera, it would be more correct to write:—

380. *A. campestris*, Mab
flavus, Nilss., Poll. (? Müll.)

The name *campestris* applies strictly to an orange form, and the yellow form might be distinguished as a variety.

¹⁸ Pérussac's figure, if not *subfuscus* is very closely allied to it, whereas the *A. occidentalis*, Coll., belongs to the *hortensis* group. In my opinion, it is *A. hortensis*.—W. F. C.

However, the slug is probably only subspecifically distinct from *A. subfuscus*, to which it may be allied through such forms as *vormanni*.

Simroth has shown that *intermedius* (*minimus*) is quite distinct from all *subfuscus* forms, and consequently whether *campestris* is a variety or sub-species of *subfuscus*, or an allied species, it ought not at the present day to be confounded with *intermedius*. But the outward similarity is such, that in dealing with the old descriptions we can hardly come to any certain judgment. Simroth has remarked, however, on the large size of Müller's *flavus*, which seems to distinguish it from *intermedius*.

Müller's *Arions* have always been a source of perplexity, and it may not be amiss to give some account of them for the benefit of those who cannot consult the original work.

O. F. Müller. — *Verm. Terr. et Fluv. Hist.*, vol. 2 (1774).

- p. 2. *Limax ater*. The first variety is the Linnæan *ater*. The fourth variety "*fusco-castaneus, ora lutescente: subtus albis*," is said to be *L. subrufus*, Linn.
- p. 4. *Limax albus*. With four varieties.
- p. 7. *Limax succineus*. "*L. supra subrufus, subtus albus*." "Long. $1\frac{1}{2}$ unc. *Rufo-fuscus vel succini coloris est absque maculis aut cingulo. Tentacula majori superne nigra; inter hæc linea obscura.*" With reference to *L. subrufus*, L., Syst. 3, and Hill, Anim. p. 87, l. c. Müller here makes some mistake, as *L. succineus* and *L. ater* var. (as above) either should not be separated, or are not both *subrufus*, L.
- p. 9. *Limax cinctus*. Two inches long, yellowish, amber above, white beneath, band and back with grey bands. What is this? A form of *subfuscus*? It is to be noted that this is the *first banded Arion ever named*, so whether it might be *subfuscus*, *intermedius*, *hortensis*, or what not, it has priority. Mörch has reported *A. cinctus* from Iceland.
- p. 10. *L. flavus*, see above.
- p. 11. *L. fuscus*. Reddish with black tentacles, white beneath. "*Linea laterali dorsoque nigricante.*" Length 8 lin.

p. II. *L. tenellus*. Genus uncertain; the name cannot be certainly applied to *Limax tenellus*, Auctt. It is greenish white, mantle yellowish, head and tentacles black.

391 a-c. Moquin-Tandon's *A. flavus*, with three varieties belongs to *intermedius*.

392. Priority demands the use of the earlier name *paludilhianns*, Simroth remarks on the close affinity of this with *intermedius*, and there seems nothing to separate it other than as a subspecies.

398-399. It is doubtful whether these two forms should take even sub-specific rank. In all probability, *circumscriptus*, placed as a synonym of *fasciatus*, is the same as *ambiguus*; and the forms named *subfuscus* (= the British representative of *neustriacus*) *flavescens* and *griseus* belong rather to *ambiguus* than to *fasciatus* proper, judging by the character of the keel, which in these is lost in the adult. For further observations see Mr. Collinge in *Conchologist*, 1892, vol. ii., pp. 77-80, where an alternative and possibly better arrangement of the varieties is given.¹⁹

402-403. Mr. Pollonera kindly sent me *A. mortilleti* from Rosazza, Piedmont, and *A. spezia* from Maccugnaga, Piedmont. I did not dissect them, but judging from their appearance, they might well be the same species. Mr. Pollonera states (in litt.) that *A. spezia* is smaller than *mortilleti*, and its mantle is also proportionately smaller.

Letourneuxia. Opinions differ about this. Heynemann in 1882 said it was scarcely distinct from *Arion*; Pollonera gives it as a sub-genus of *Geomalacus*; and now Simroth places it as a valid genus.

410. According to Simroth, *moreleti* may not be distinct from *numidica*.

413. *Geomalacus pliocenicus*, Sacco, from Piedmont (Upper Pliocene), should from its locality belong to the *Letourneuxia* group, which may formerly have inhabited Italy, and have been driven south during the glacial epoch. From the fossil it would be impossible to decide this one way or the other, and the generic reference merely rests on the balance of probability.

¹⁹ Having seen all the varieties (excepting *a* of this species 392), I do not agree with the arrangement adopted in the present list. *Miser*, Coll., is as distinct from *griseus*, Coll., as *neustriacus*, Mab., or *albipunctatus*, Coll., are; *flavescens*, Coll., is a variety in which the yellow predominates; *neustriacus* is quite a different thing. The two are possibly brought closer together by *subfuscus*, Roeb. I say possibly, for I never could distinguish wherein this latter differed from *neustriacus*.—W. P. C.

Limacella. I have found it most perplexing to decide what name to use for this genus, but after much consideration have come back to my original (1890) decision in favour of *Limacella*. There can be no manner of doubt what Blainville's slug was, all the evidence duly considered; and his type may be seen any day in the British Museum. The whole question seems to turn on the acceptance or otherwise of the rule, "once a synonym always a synonym"—a rule which is of doubtful value, as it gives an importance to *pure synonyms* they ought not to have, and prevents their being dropped out of the classification. At first sight, the rule appears to be a convenient one, but its logical outcome is absurdity. For example, if I were at the present moment, without conceivable reason, to propose a new name for the present genus, according to the rule, this name could never be used for another genus afterwards! That is to say, an absurd proposal of this sort would bind down zoologists ever after to keep the name in their notes or indices lest they should duplicate it. And if valid genus were given this name the nomenclator might lose its authorship, because he was not aware that I had proposed a useless name years before! Some present difficulty is got over by the "once a synonym" rule, certainly, but it only heaps up trouble for those coming after. One may imagine the scientific author of the year 2000 on his travels followed by a large van. Passer-by: "How is it you have so much luggage?" Scientific man: "Oh, my luggage is in this hand-bag; that van contains the volumes of the dictionary of synonyms."

436. *Philomycus pennsylvanicus*, Pilsbry in litt., July 5, 1893. A medium-sized species with ribbed jaw. Will shortly be published by its author.
448. *L. formosensis*. I expect this is only a race or variety of *bilineata*.
447. *L. chinensis*. Doubtless Heude's slug is the same, but he says it grows to 6 or 7 cm. long, so my type was immature.
457. *V. frauenfeldi*. Probably a synonym of *alte*.
461. *V. hirmanica*. Stoliczka in 1873 suggested that this and *V. hasselti* might both be synonyms of *V. mollis* (*Onchidium molle*, Hass.).
463. *V. hasselti*. Also in Borneo and Sumatra.
- 464-465. I find I have no note of the locality of these, but I think I have included them in the right series.

478. The date of publication of Semper's work (*Reisen in Arch. Phil.*, vii., Heft.), containing so many new names in *Veronicella*, is a matter of importance. It is dated 1885, but the British Museum copy is marked as received Jan. 15th, 1886. Probably, therefore, it was published early in January 1886.
483. *V. flava*. Also I. of Nias, off Sumatra.
514. *V. trilineata*. Perhaps a form of *maillardi*.
525. *V. koellikeri*. Probably a form of *petersi*.
526. *V. brevis*. In the British Museum is a coffee-brown species from Zanzibar (Dr. Kirk) which may not be specifically distinct from *brevis*.
527. *V. natalensis*. Gibbons (Q. J. C., 1879, p. 140) records a supposed variety of this from Mozambique, but surely it was a different species. It is said to be keeled.
529. *V. saxicola*. I have had this species in MS. for several years. It is 57 mm. long, 14 mm. broad, sole 6 mm. broad. ♀ orifice 2 mm. from sole and 32 from head. Sole not projecting posteriorly; mantle granulose, no raised warts, no sort of keel. Dark red-brown, unicolorous below, mottled-streaked with black or blackish above; a pale middle line slightly indicated posteriorly. When young paler, with a more obvious pale middle-line. Hab.; Port Elizabeth, under stones (A. E. Craven); in British Museum. Nearest, perhaps, to *V. petersi*. It is to be hoped that specimens which can be dissected will fall into the hands of some malacologist.

The following statistics of the position of the female orifice in African (and African-insular) species may be of service; but it must be remembered that the character is liable to some variation:—

<i>V. myrmecophila</i> ...	♀ orifice	'42	of total length from head.
<i>V. pleuroprocta</i> ...	"	'46	" "
<i>V. subaspera</i>	"	'47	" "
<i>V. tristis</i>	"	'47	" "
<i>V. grandidieri</i>	"	'50	" "
<i>V. margaritifera</i>	"	'50	" "
<i>V. grossa</i>	"	'52	" "
<i>V. verruosa</i>	"	'52	" "
<i>V. parva</i>	"	'53	" "
<i>V. petersi</i>	"	'55	" "
<i>V. saxicola</i>	"	'56	" "

<i>V. elegans</i>	} ♀ orifice	.57 of total length from head.	
<i>V. rodericensis</i>			
<i>V. sulfurea</i>			.. .. .58
<i>V. comorensis</i>			.. .. .59
<i>V. natalensis</i>			.. .. .60
<i>V. maura</i>	.. .. .61		

533. *V. schioelye*. Perhaps a variety of *V. moreleti* introduced.
535. *V. cubensis*. Mr. Ponsonby has kindly copied for me the description of *Onchidium cubense*, and I judge from it that the slug is not identical with *V. occidentalis*, to which it has been referred.

Semper has described a slug from Cuba and Jamaica, which he referred with doubt to *V. sloanii*: I do not think it can possibly be that species, but it may be a variety of my *V. dissimilis*, with which it agrees in possessing two retractores penis.

536. *V. sloanii*. I have been rather perplexed which name to use for this slug, but have concluded that *sloanii* is preferable. The facts, which are not apparently well-known to authors, are as follows:—

- (1.) Sir Hans Sloane found a *Veronicella* in Jamaica, which he figured very roughly in his work on the natural history of that island. We now know that there is more than one species of this genus in Jamaica; and there is nothing in Sloane's figure or very short descriptive notes, to prove that he saw one species only, or what species he observed. One might have made a guess, but no absolute certainty would have been possible, I imagine, from Sloane's record alone.
- (2.) Cuvier in 1817 proposed the name *Onchidium sloanii* for this slug, giving no description, but merely a reference to Sloane's work. (*Regne Animal*, ii., 410-11.)
- (3.) Férussac (*Hist. Nat. Moll.*, p. 82, pl. 7, figs. 8-9) gave an account of the creature, taken from Sloane, and placed it in *Veronicellus*.
- (4.) In the meantime (1817) Blainville described a slug in the British Museum collection as *Veronicella levis*. Afterwards (1825) he called it *Onchidium leve*, being apparently unaware that his genus *Veronicella* was distinct from *Onchidium*.

- (5.) Heynemann (*Jahrb.*, 1885, p. 15) refers to the existence of the type of *laevis* in the British Museum, and mentions the fact that it was from Jamaica, and out of the Sloane collection. I have examined the specimen and can confirm Heynemann's statement. Thus it becomes evident that *sloanii* and *laevis* are one and the same thing, and since we have access to the type of *laevis*, the species can be identified. There are two smaller examples in another bottle in the Museum, with no locality stated, but probably from the same source.

The original specimen of *laevis* may be described as follows:—Entirely yellowish-white (Sloane has it white or ashy, with some blackish marks). Length, 50 mm.; breadth, 17½ mm. Breadth of sole, 7 mm. End of sole rounded, not projecting beyond mantle. Female orifice, 29 mm. from head and 2 mm. from sole. Anal (?) orifice, 6 mm. from end of sole, and 13½ mm. from female orifice. Respiratory orifice somewhat rounded in outline, close to, and a little to the right of, the end of sole, much as in other species. Mantle granulose. Penis projecting from male orifice, stout, with end blunt and rounded.

The anal (?) orifice deserves note. I think it is abnormal, and not a peculiarity of the species, that there should be such an orifice away from the respiratory orifice. In Sloane's figure an orifice is drawn in the middle of the sole—an evident mistake; but in Blainville's figure what looks like a female orifice too far back is really this anal (?) orifice.³⁰

536 *b.* var. *coffea*. No adequate description of this has yet appeared, so I proceed to give one.

Slug when alive over 3¼ inches long, 31 mm. broad; when put into alcohol it exudes copious slime.

Adults not fuscate, young obscurely fuscate. Pale middle-line, usually very conspicuous. Colour above dark vandyke brown, obscurely marbled with darker. Skin minutely tuberculose. Beneath yellowish-white, spotless, sole more ochreous, end of sole blackish. Slime not milky in the living slug. Eye peduncles dark, inferior tentacles light. Sole narrow, not projecting beyond end of body.

³⁰ There can be no doubt but that this slug should be termed *sloanii*, as none of the later descriptions are any better than that given by Sloane. It yet remains for some one to describe and figure from better material the internal and external morphology. It is to be hoped, however, whoever does this will retain the term *sloanii*, and simply alter the authority.—W. R. C.

Measurements in alcohol: breadth of body 21 mm., of sole 8 mm. Female orifice 2 mm. from sole, 33 from head, and 32 from hind end. Filiform glands numerous (more than 15), about 6 mm. long. Penis-sac cylindrical, curved into the form of a U; retractor single, long; penis cylindrical with a rounded head and terminal orifice.

537. *V. virgata*. I am now somewhat uncertain whether this is distinct from *sloanii* other than in a varietal sense. I have descriptions of several other Jamaican *Veronicella*, which I refrain from naming publically, hoping by further study to arrive at some clear decision with regard to their standing. It is possible to distinguish these forms by characters which seem not altogether unimportant, but without obtaining further statistics as to variation, it seems hazardous to propose them all as species.

V. virgata, in five of the six specimens originally found, had the female orifice $\frac{1}{2}$ mm. from sole; in the sixth $\frac{3}{4}$ mm.; in *V. sloanii* (both type and var. *coffea*) it is 2 mm. from sole.

The female orifice is about the same distance from the middle in *virgata* as in *sloanii*, or perhaps rather more median. The six specimens of *virgata* had it respectively '52, '54, '55, '56, '56, and '57 of total length from head. In *levis* (*sloanii*) type it is '58.

As to breadth of body and sole, a *virgata* 50 mm. long had body 16 mm. broad and sole 6 broad—thus about 1 mm. narrower than the type of *levis*.

The anal orifice of *virgata* is not separate from the respiratory orifice. The filiform glands of *virgata* are 9 mm. long, whereas in *sloanii* v. *coffea* they are about 6 mm.

The types of *virgata* were from Port Henderson, but Mr. Peckham found (and kindly gave me) a single specimen at Moneague.

538. *V. jamaicensis*. This must be regarded as founded on Semper's figure and description. The specimens I had, which I believed identical with it, I now think to be distinct, and probably not specifically separable from *virgata*.
541. *V. occidentalis*, Guilding. This slug is reputed to occur in Cuba, Hayti, Porto Rico, Dominica, Venezuela, Guiana, Martinique, St. Vincent, Guadeloupe, Jamaica, Trinidad, and perhaps St. Thomas. These records, however, are mostly worthless, being based on a supposition that almost

any *Veronicella* found in the West Indies might safely be dubbed *occidentalis*. I do not for a moment suppose that true *occidentalis* is found in the Greater Antilles, or *lavisi* (*sloanii*),²¹ which has been confused with it, in the Lesser.

The type of *occidentalis* was from St. Vincent, and the description indicates it as brown above, with dark brown points; pale beneath, with a few brown points towards the sides. Length, 65 mm.; breadth, 15 mm.

The description, by itself, would not enable us to decide about the identity of the species, but whenever specimens agreeing with it are brought from St. Vincent, it will be possible to record the structural character which may serve to indicate the species wherever found.

It seems quite probable that *occidentalis* really does range southwards to the continent. In the British Museum there are specimens from British Guiana (I. Quelch) which above are dark brown with black peppering, below pale purplish-grey with some black spots; these might well be *occidentalis*. Another question arises, with regard to *punctatissima*, Semper. This species is recorded from Porto Rico, St. Thomas, and Trinidad, and very likely occurs in most of the Lesser Antilles. I have said above that I do not suppose *occidentalis* to be a native of the Greater Antilles, but it may extend as far as Porto Rico, and have just such a distribution as *punctatissima*. In fact, it seems highly probable that it and *punctatissima* are one species, as has already been suggested by Mr. Guppy (*J. of Conch.*, 1893, p. 222). Semper himself indicated this possibility. Mr. Guppy, in the article quoted, records only one *Veronicella* from Trinidad, namely *occidentalis*. While this record is probably correct, his earlier writings (*Proc. Sci. Assoc. Trin.*, 1866; *An. Mag. N. H.* (3 ser.), vol. xvii., p. 47) seem to indicate the existence of a second species, described as dark grey. It is for the Trinidad naturalists to inquire whether this is not Semper's *V. varulescens*, already known from Venezuela.

545. *V. lucia*, Ckll. Length about 67 mm.; breadth $23\frac{1}{3}$ mm.; sole, breadth 11 mm.; female orifice about 38 mm. from head, and $1\frac{1}{2}$ mm. from sole. Sole rounded posteriorly, not projecting beyond body. Mantle finely fitted. Sides produced, so that a transverse section of the slug would be

²¹ If Prof. Cockerell thinks the term *sloanii* preferable to *lavisi* he might at least set the example by using it, or adhere to either the one or the other. Note 537 is very confusing. — W. E. C.

somewhat fusiform in outline. Colour, above dull rather dark olivaceous, below (including sole) dull reddish-brown. Habitat: Fond St. Jacques, St. Lucia. In British Museum.

This appears to be a very well-marked species, so I venture to describe it, the anatomy being unknown.

Simper has doubtfully referred to *occidentalis* a slug from St. Thomas, which presents some resemblance to *luciae*. The position of the female orifice is almost precisely the same; and the whitish colour, without markings seems to ally it to *luciae*. However, in Simper's slug the breadth, as compared with the length—the breadth of the sole, and the total length—all differ from *luciae*. Thus:—*V. luciae* has the breadth .34 and the breadth of sole .16 of total length. In Semper's slug the measurements are .26 and .08 of total length.

In the British Museum there is a small species from Dominica, black with the head and sole brown. It seems to be a new species allied to *langsдорfi*, but I hold back the description in the hope of further specimens being collected, so that dissections can be made.

550. *V. solea*. It is doubtful whether this is a widely distributed and variable species, or whether there is a group of distinct species closely allied to it. Some such species have been separated, and must for the present be held valid, namely, *V. tuberculosa*, *V. marianita*, and *V. multicolor*. For figures of these slugs see Mrs. Gray, *Fig. Moll. Anim.*, 1859, pl. 278, f. 2 (or D'Orb., *Voy. Amer. Mer.*, t. 21, f. 3-4), *Bul. Soc. Zool.*, France, 1889; *Jahrbuch d. D. Mal. Ges.*, 1885, Taf. 2, 4. and Semper's work.
576. *V. andensis*. Perhaps identical with *limayana*.
584. *V. nigra*. May be identical with *gayi*.
- 588-589. *V. kreidelii* and *telescopium*. These are supposed to be American.

In the list I have given the species of *Veronicella* in groups according to locality, but a better classification of them is to be desired. Dr. Simroth has proposed three groups, thus:—

- (a) Acrocaulier. Penis perforate at the point; equatorial, e.g., *V. sloanii*.
- (b) Phyllocaulier. Group of *V. tuberculosa* and allies; neo-tropical.
- (c) Pleurocaulier. Penis laterally perforated; Asiatic and African, e.g., *V. maculata*.

Unfortunately, however, it is not yet possible to classify the whole series by the characters Simroth relies on, owing to our want of knowledge concerning the genital organs of many. If the groups are natural ones, very probably a sufficiently experienced person might be able to classify the species in them, even without reference to the anatomy; but I do not know of anyone, unless it is Dr. Simroth, who could at present attempt this with any chance of success.

V. taunaysi, as I pointed out in P. Z. S., 1891, p. 218, has characters which separate it somewhat widely from the type of *Veronicella*. We shall probably recognise it hereafter as the type of a distinct sub-genus, to which the name *Vaginula*, Fer., will apply. It does not fall properly under either of Dr. Simroth's divisions.

The group *Acrocaulier* is equivalent to typical *Veronicella*; *Phyllocaulier* and *Pleurocaulier* may hereafter have to be named as sub-genera.

Imerinia is a subgenus founded on a species from Madagascar, supposed to be *V. grandidieri*. The year before it was published, M. Ragonot applied the name *Imerina* to a genus of moths, and Mr. Gahan named a genus of beetles *Imerinus*. I mention this, as some may think this constitutes pre-occupation; but it seems to me that the difference of a letter sufficiently distinguishes the slug name.

The following description is taken from the specimens in the British Museum, on which the subgenus *Imerinia* is founded:—

Length 64 mm., breadth 16½ mm., breadth of sole 5½ mm. Female orifice 34 mm. from head, nearly 3 mm. from sole. Sole very narrow, narrowest posteriorly, rather rounded at end, not projecting. Mantle above and below thickly impressed-punctate; above with scattered raised warts, 1 or 2 mm. apart. Respiratory orifice practically median beneath end of sole. Some tufts of red-brown bristles about 1 mm. long, on anterior right-edge of mantle. A very slight impressed, hardly pale, middle-line of dorsum. Colour dark reddish-brown; no spots or bands. Two other specimens lack the bristles; one is darker, the other paler, brown.

Hab. *Imerina*, Madagascar (J. Wills).

Concerning *Leonardia*, I regret to say I possess no information beyond that published in *J. de Conch.*, 1890, p. 82. Might it possibly be the same as *Atopos*?

Vaginulinae. So named because Binney used the name *Vaginulus* for the group, but perhaps *Rathouisiinae* (*Rathouisiidae*, Heude) would be a preferable subfamily name.

I should have been disposed to consider *Atopos* a synonym of *Rathouisia*, but Dr. Simroth, who is best qualified to judge, does not unite them.

601. *Atopos pulverulentus* apparently includes a specimen in the British Museum from Pinang (Theobald), marked "*V. sanguinea*, Stol." It has the body beautifully marbled with black and grey, the sole pale orange tinted. Length about 54 mm. Bluntly keeled.

604. *P. heynemanni*. Simroth founds this name on Heynemann's account of the Huon Gulf specimen in the British Museum. I made a description of this same specimen as follows:—Length, 36 mm.; breadth, 8 mm.; breadth of sole, $4\frac{1}{2}$ mm.; distance of margin to keel, 6 mm. Strongly keeled dorsally; a deep groove between sole and mantle, mantle thickly and finely papillate, occasional papillæ black, thus producing sparse black points. General colour ochreous, clouded with grey. A doubtful orifice on right side of sole about $4\frac{1}{3}$ mm. from head. No slit or orifice in mantle above; mantle projects over head anteriorly; body tapers posteriorly. Hab.—Huon Gulf (Dr. Comrie).

It is much to be regretted that Dr. Heynemann, in his paper on the slugs in the British Museum, did not think it necessary to cite the names of the collectors, or the persons from whom the slugs were obtained. Dr. Comrie's name is now first mentioned, I believe, in connection with the above slug; *Veronicella fusca* and *V. flava* (Borneo specimen), described without any mention of their collectors, were obtained by the Museum from Dr. Cunningham and E. Gerrard, jun., respectively. The *V. taunaysi* in the British Museum, it may be mentioned, is also from Dr. Cunningham.

605. *P. australe*. I believe this is a *Prisma*, not an *Atopos*, but have no exact information.

Janellidae. Mr. Hedley has lately sent me a paper, "An Enumeration of the *Janellidae*," which appeared in *Trans. N.Z. Inst.*, 1892. In this article he uses language "more

forcible than polite" regarding some of my published writings. I have privately communicated to Mr. Hedley my opinion concerning his controversial writings, and we are now on the best of terms, so there is no occasion for further personalities by way of public reply!

Yet I desire to assure Mr. Hedley and others, in all sincerity, that I greatly value criticism of my published statements, so far as it helps towards the elucidation of the truth. This must be the attitude of every reasonable naturalist, and if it is proved in any case that an error has been made, the author of the mistake ought to feel obliged to its detector.

"*Humanum est errare*," however, and if one attacks a paper with the deliberate intention of making the most of its faults, and it is astonishing how much criticism may be written. To illustrate this, I will take Mr. Hedley's "Enumeration of the *Janellidae*," and point out the actual and probable mistakes and omissions it contains.

Page 156. Mr. Hedley refers to his paper in *Au. Mag. N. Hist.*, p. 169-71, as exposing my errors, and uses other similar language, entirely ignoring my reply, in which I showed that his criticisms were without reasonable foundation. The "Enumeration" was read June 2nd, and as my reply appeared in May, it obviously was not available in Australia when the paper was written. However, on p. 160, Mr. Hedley quotes from my reply on one point, showing that he had it before the "Enumeration" was published. Why then did he not omit his previously written remarks on p. 156, or insert some justification of them?

Notwithstanding the language he uses in the "Enumeration," Mr. Hedley does not bring forward a single new fact to prove that I was wrong. Indeed, the whole paper contains no new fact, except the description of the interesting variety on p. 161.

Pages 157-8. My *Pseudancitea* is sunk as a synonym (I called it a subgenus) of *Janella*, and its type species (*papillata*) is given as a variety of *J. bitentaculata*. One can only suppose from this that Mr. Hedley did not know *papillata*, the more so because the mistake of classing it as a variety is rectified in the recent list of N.Z. Mollusca, in which Mr. Hedley was assisted by Mr. Suter. With regard

to *Pseudaneitea*, it may be a section rather than a subgenus, and I have nothing to say against those who, with a full knowledge of the facts, prefer not to use the term.

Pages 158-159. *J. verrucosa* and *J. marmorata* are both credited simply to Von Martens, and stated to be from "New Zealand;" a glance at my "mischievous," P.Z.S. paper would have prevented these mistakes. They are from the Auckland Is., as Mr. Suter explains in a footnote, and they were described by Dr. Simroth, although Dr. V. Martens ticketed them with names. The authority, therefore, should be "V. Mts. in Simr.," or "V. Mts. MS., Simr." Another more doubtful point is the date of the publication of these two slugs. Mr. Hedley cites 1889, which is the date on Dr. Simroth's paper, but the *part* containing the paper is dated 1890. The paper was reviewed in the "*Nachrichtblatt*," Jan.-Feb. 1890, and must have appeared, I suppose, in January of that year. There is still, however, the possibility that separates were issued late in 1889.

Pages 159. *Neojanella dubia*. I said the *head* of this was shrivelled. Mr. Hedley perverts it into a statement that the specimen was shrunken, leaving the reader to infer that the whole slug was meant. He also says it "probably belongs to the preceding species" (*marmorata*). Now this must be simply a bad guess, for there is apparently no foundation for such a statement. In Messrs. Hedley and Suter's recent New Zealand list, *Neojanella* is referred, without comment or query, to *J. bitentaculata* as a pure synonym! On what grounds I have no idea, and I have been waiting anxiously for particulars, supposing that such a reference must be supported by some very plain and unexpected evidence. But now I get a letter from Mr. Hedley, dated July 20th, 1893, in which he says "you will perhaps continue to support *Pseudaneitea* and *Neojanella*, of which I must require more evidence before admission. . . . If you return to London it would strengthen your position if you published a good figure of *Neojanella*." Now, what does this mean, unless that he is still undecided about *Neojanella*, and thinks it possible that further evidence might prove its validity? If so, how can the reference to *bitentaculata*, as mentioned above, be justified?

Page 161. The species of *Hyalimax* have some synonymy, which is omitted. Also *H. maillardi* is given as from Mauritius,—should it not be Bourbon? I have no access to the original description, but have always been under the impression that it came from the latter island. I note, also, that Dr. Heynemann cites it as from Bourbon only.

Page 157. "*Athoracophus*" and "*Konophera*" are doubtless only misprints.

Now I leave it to be imagined what sort of a criticism Mr. Hedley might have written of "An Enumeration of the *Janellidae*," if it had not so happened that he, and not I, was its author.

Athoracophorus. For reasons stated under *Limacella*, I am not now disposed to reject *Janella* on account of preoccupation by a synonym. This was Mr. Hedley's view, but singularly enough, just as I decide in its favour I hear from him "I am now inclined to substitute *Athoracophorus* for *Janella*."⁵²

608. *J. marmorata*. Messrs. Hedley and Suter place this as a synonym of Hutton's *marmorea*. To me, they seemed amply distinct, but there may be reasons unknown to any but these authors, which make it necessary to unite them. I have only seen one example of *marmorea* and none of *marmorata*.

610. *J. verrucosa*. For the present I give this the benefit of the doubt, but probably Messrs. Hedley and Suter correctly refer it to *papillata*. Hutton cites *papillata* from the Auckland Islands.

611. *N. dubia*. As above mentioned, Messrs. Hedley and Suter have referred this to *Janella bitentaculata*. The back of the *Janella* presents a groove which is lacking in *Neojanella*, and the specimens I have of *J. bitentaculata* are much smaller than *Neojanella*. Thus, *Neojanella dubia* (in alcohol) is 53 mm. long, *J. bitentaculata* from Wellington, N.Z., is 16 mm. long. (Spr. fr. Otago Univ. Mus.) *J. bitentaculata* = *antipodarum*, Gray, type specimen, is 19 mm. long. In Gray's type of *antipodarum* (in Brit. Mus.) the genital organ protrudes, leading one to suppose that the slug is mature. If so, it cannot possibly be the

⁵² It is to be hoped that Mr. Hedley and other authors will retain the name *Janella*.—W.E.C.

same as *Neojanella*, but if Messrs. Hedley and Suter can affirm that individuals agreeing with *bilenticulata* (*antipodarum*) do grow to a length of 53 mm. (as measured in alcohol), and that when so grown they agree with my description of *Neojanella dubia*, of course I have nothing further to say. I very much hope that conclusive proof will soon be offered, one way or the other.

Hyalimacinae. Mr. Hedley refers to the anatomy of "*Parmarion*" *kersteni*, V. Mts., which appears to make it a member of this group. Its proper generic position is still undecided, and my information about it does not enable me to offer any opinion.

Another "*Parmarion*" which I do not understand is *rangianus*, Fér., from Bourbon and (it is said) Madagascar. Tryon gives it as a *Parmarion*, and Gray (*B. M. Cat.*, 1855) cites it as a doubtful *Drusia*. It has also been called *Parmatella rangii*. I had an idea it was a *Hyalimax*, but Mr. Hedley makes no mention of it in his "Enumeration," and I have not now access to the literature that might enable me to decide about it.

CONCLUSION.

In concluding the list, I wish to point out that it is necessarily very far from perfect, and that the progress of knowledge concerning slugs must inevitably require great changes to be made, even in respect to matters which now seem beyond dispute. The compiler of such a list knows its weak points better than most of its critics can know them—knows how often it has been impossible to decide with any certainty about the validity of a species; and how often one opinion has seemed about as good as another, and has been followed because some choice had to be made, rather than because it was probably correct.

Probably there are few things so prejudicial to the progress of science as the spirit of confident assertion which will not readily admit the possibility of error, or consider the views of one who thinks differently. To illustrate the dangers of such an attitude, I may instance the radical changes which have taken place of late years in our views respecting the species of *Arion*. Kobelt's catalogue (1887) may undoubtedly be taken as compiled from the best sources, and to represent the opinion of the time, yet when we turn to *Arion* in the index, we find as follows:—

A. bourguignate = *fuscus* var.

A. brunneus = *empiricorum* juv.

A. campestris = *empiricorum* var.

A. dupuyantis = *fuscus* var.

A. fasciatus - *hartensis* et *fuscus*.

A. intermedius = *empiricorum* juv.

A. nivalis - valid species

A. albaricus = valid species.

A. parcolianus - *fuscus*

and so forth. It is easy now to see how little the conclusions of the authors of 1881 were to be trusted, but does this not suggest possibilities concerning the opinions of authors of 1893?

Finally, I will venture to make a suggestion regarding the list. Let it be the basis of our classification until it can be improved; and let every slug-student send notes to the "Journal of Malacology": which may be published under the general heading of *Additions and Amendments to the Slug List*. Such notes, one might hope, would be fairly numerous, especially just at first, as every student on reading the list will be sure to think of several changes which seem to him necessary or desirable. The proposed changes might be discussed after publication by those who disagreed with them, and after a time, it might be announced that a second (revised) list was about to appear. Upon this announcement every student would write to the Editor of the Journal, giving his latest opinions, and in due time the list would appear, doubtless a vast improvement upon its predecessor. As in the present list, some notes would be appended, especially when it was necessary to explain the views of minorities who disagreed with the classification given. In cases of great difficulty, a post-card vote might be taken to decide a point. The revised list would not of course, be in any sense final, but would be followed by other editions as often as circumstances demanded or permitted.

If the funds could be obtained for printing, a new edition every year would be very useful, and would give a great impetus to the study.

APPENDIX.

By WALTER E. COLLINGE.

Professor Cockerell has placed all students of the slugs under a great obligation for so admirably and carefully compiled a check list. Only those who have worked at this group, and have extended their inquiries beyond the fauna of their own immediate country, are fully able to appreciate the value of such a list as the present, and whatever difference of opinion may prevail as to the validity of

this or that genus or the system of classification, all malacologists will, I think, appreciate the amount of patient labour involved in such an undertaking.

Professor Cockerell has invited me to append to his list some critical observations and notes of my own, but as the same has passed through my hands during the vacation, during which period I have had other work to complete, and often away from the sources of literature desired, I have only been able to express an opinion on a few general points.

I am not aware that the slugs have ever been so catalogued before, and therefore a very many points of difficulty must have arisen to the compiler as to classification, priority, generic and specific distinction, &c., in all of which cases a decision was a very perplexing matter. No one appreciates more than myself Professor Cockerell's work upon the slugs; in fact, for the last five years I have followed very closely his writings, and have been in constant correspondence with him, and which, I hope, may continue for very many years to come. We regard the slugs—in fact, the Mollusca altogether—from two entirely different standpoints; nevertheless, we are prepared to agree to differ, and not to permit objectional personalities to arise or stand in our way in elucidating the history of so interesting and important a group.

Hitherto the slugs have been studied purely from a systematical standpoint, but with the publication of the works of Simroth, Semper, Lessona, Pollonera, Godwin-Austen, Scharff, Hedley, and others, our views are rapidly changing, and a new and more rational system is supplanting the old. This new system—which I am pleased to observe is spreading in other departments of Zoology¹—demands a knowledge of internal as well as external morphology, and as I have previously stated,² *rightly refuses to recognise inadequate descriptions or descriptions of shells apart from the animal, or to acknowledge genera or species founded upon purely external features*; in short, it demands that they shall be classified and created “upon the aggregate characters,” and not upon single features.³

The slugs, as a group, are one which are subject to endless variation in colour, markings, form, size, &c., &c. Mr. Gairn has shown that in a lifetime an individual species passes through a number of distinct variations in colour, markings, and form, very different, in some cases, from the adult animal.⁴ The observations

¹ W. F. Kirby, “Nature,” 1853 (10th Aug.), p. 225.

² Conchologist, 1890, vol. 11, p. 64 (f. 61r. 12).

³ Hedley, Trans. New Zeal. Inst., 1892, xxv., p. 237.

⁴ Conchologist, 1890, vol. 11, p. 55.

of numerous malacologists on the changes effected by habitat, climate, food, &c., are known to all. Important as these various variations may be—I must confess I cannot attach the importance to them that some have done—they are, from the variability of their nature, unsuitable for generic or specific distinction, except as secondary characters. Recourse must, therefore, be made to the anatomy. In the form of the various organs we find a permanent and well-marked difference between one genera or species and another. It must be remembered that there are slight variations in the form, colour, &c., of the various organs according to age, season, &c., so that a reasonable limit must be allowed in which a species may vary. The anatomical differences which distinguish *Arion* from *Testacella*, or *Testacella* from *Veronicella*, are at once appreciable. Not only is this so, but, *generally speaking*, an acquaintance of any duration will enable the student in most cases to readily distinguish between one species and another from the morphology of the generative organs alone; where these are undeveloped or at all doubtful, the nervous and digestive systems are almost as serviceable. Seeing, then, that the external features are liable to such change, and that the internal are much more constant, I prefer to accept the latter, and upon these build up a rational basis for a system of classification. The old system of systematic zoology has had its day, and as a warning (and in evidence of its worthlessness) leaves us volumes of synonyms to almost every species, not to mention any of the graver errors it has been the source of. With the advance of morphological investigation, the student, instead of revelling in the multiplication of so-called species and varieties (to me Bourguignat and Westerlund are a terrible warning) endeavours to classify upon some scientific basis, and then to show the genetic or specific relationship between one genera or species and another. A study based on such lines rises to one of importance and value; on the old, resembles a schoolboy's attempt at a system of ethics—in short, becomes a farce.

Until Professor Cockerell describes and figures the anatomical differences in his species of slugs, I cannot accept them as valid. I do not say that they are not so, as many seem to be very distinct, judging from the external features, &c., but until I see structural differences—not mere variations in the breadth or colour of some single organ—differences which mark them off in the majority of individuals from their nearest known ally, I shall regard them as doubtful.

If we allow a species (or variety) to vary within a certain limit, there is no need for any such things as subspecies (or subvarieties)

which are so prominent in the present list. I will only mention a single example to show the utter absurdity of such a method of treatment. The genus *Amalia* has been thrown into the greatest confusion and chaos, so many are the species made out of the slight anatomical variations and the many colour variations of four or five species. Professor Cockerell warns malacologists *re confident assertions, the admission of errors and the consideration of others' views, all of which are very apt and opportune, but when a case is brought to the test, and anatomical evidence of the most convincing and undeniable character from the ablest malacological anatomist living, is advanced to disprove the specific identity of such a variety as cinereo-niger of L. maximus, he writes:—*"I have never been at a loss to identify *cinereo-niger* by external marks."

Coming to the *Arionidae*, a family I am particularly interested in, there is much that I cannot agree with, *re A. ater, rufus, and empiricorum*. Professor Cockerell seems to have overlooked the fact that because Linné thought that Lister's species was identical with his, or vice versa, it does not at all prove that either were right. My view—possibly I am quite wrong—is that Linné described an *Arion* which he termed *ater*—I am omitting any question as to genera—a species which seems to be limited to the Scandinavian region; he also described an *A. rufus*, which is probably but a variety of *A. ater*? Various other European authors later described a large black *Arion* or varieties of it. The best description, however, about which there can be no doubt as to the species, is that of Férussac's. He gave the name *empiricorum* to this slug. Moquin-Tandon named the red variety *ruber*, which, however, must give way to Kaleniczenko's var. *lamarckii* (if the description is good), which is the same thing, and there the matter ends.

What Professor Cockerell is trying to prove respecting the varieties *bocagei, sulcatus, and mulleri* I really fail to see. First he endeavours to prove that *sulcatus* is something for which there is no evidence whatever, and classes *bocagei* as a variety of it, whereas Simroth, its author, classed it as a variety of *empiricorum*. He next suggests to class *bocagei* as a subvariety of *mulleri* and finally concludes "that *bocagei* is the *mulleri*-like form of *sulcatus*." Simroth states that *sulcatus* is identical with *empiricorum*, and even Pollonera advances little or nothing in support of its identity as a species. If there is any evidence—I have not the original description by me—for supposing Müller's variety is identical with Simroth's, then the former must have priority, and *sulcatus* should remain as a distinct variety of *empiricorum*, unless we place the three unnamed minor forms I have described, all under one name. It seems to me that Moquin-

Tandon's var. *bicolor* is sufficiently well marked and described to include all those forms in which there is a dark dorsal surface and lighter sides; in such a case it would include, as well as the forms above mentioned, v. *albolateralis*, Roebuck, and v. *scharffi*, Ckll. (in 1891 Professor Cockerell classed this as v. *bicolor*, Moq. See *Conchologist*, 1891, i., p. 50).

Respecting the final suggestion, I will gladly do what I can, by placing the pages of the "Journal of Malacology" at the disposal of all malacologists for open and free discussion of the list.

I have a suggestion to make myself, which, if other malacologists will help, I will endeavour to carry out. It is very desirable, I think, that we should have a "Register of Original Descriptions," and, if possible, figures, where they exist, of all described slugs and their anatomy. I purpose to commence such a register, which will contain a copy of the original description of every known family, sub-family, section, genus, sub-genus, variety, &c., with reference to the original. These I will place at the disposal of any malacologist by sending copies of any description, on payment of some small fee to cover the cost of clerical expenses. The register, when complete, I may possibly print, and place in some public museum, with a collection of the slugs of the world, which I am bringing together. The descriptions desired at present are all in the foregoing list; after a time a notice will appear in the "Journal," stating by number and letter what are still wanted.

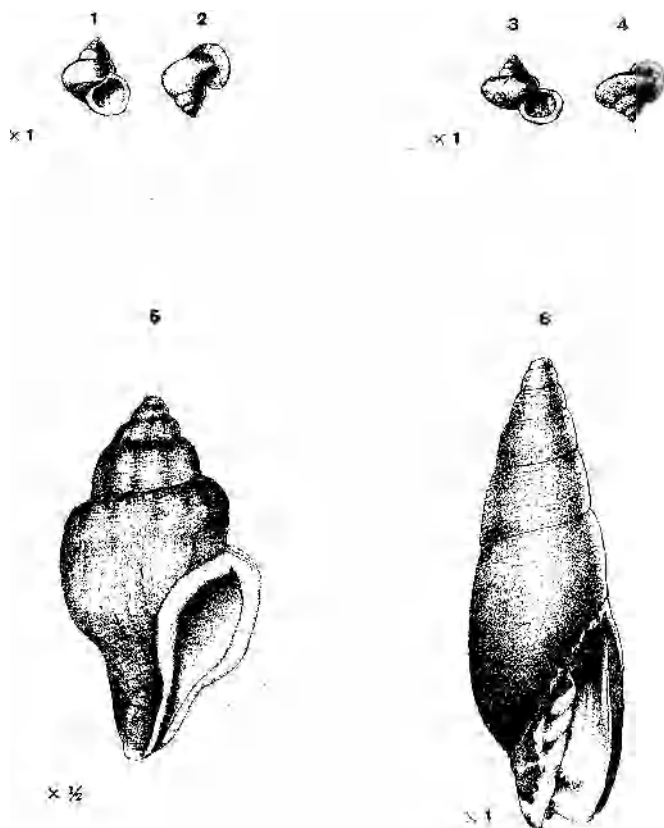
In conclusion, I feel sure the publication of this list well merits the grateful thanks of all malacologists, and that it will give a definite impetus to the study of the slugs in this and other countries. I trust the "spirit of confident assertion," &c., is not so rife as Prof. Cockerell thinks, but that we are all open to conviction, and pursuing our studies in a spirit of broad-mindedness, and with "that fanaticism of veracity which is a greater possession than much learning."

THE EDITORS

As a body are not to be considered responsible for any facts or opinions advanced in the several papers in this volume, which must rest entirely on the credit of their respective authors.

ERRATA.

- (b) p. 14, line 22, for "at last" *read* "and lastly."
- .. p. 19, line 1, for "Journ. Marine, etc.," *read* "Q.J.M.S."
- .. p. 29, line 25, for "My observations 'On'" *read* "my 'Observations on.'"
- .. p. 33, line 6 from bottom of page, for "Indegenous" *read* "Indigenous."
- .. p. 36, line 20, for "Reaumer" *read* "Reamur."
- .. p. 39 and 40, for "W. H. Dale" *read* "W. H. Dall."
- .. p. 72, line 4 from bottom of page, for "Cephalopoda" *read* "Cephalopoda."
- .. p. 84, line 10, for "Aronide" *read* "Arionide."
- .. p. 148, line 38, for "var. *griseus*, Moq." *read* "var. *griseus*, Clge." and add "*A. hortensis*, Fér." before the word "*cæruleus*."



1 and 2.—*Acroptychia albocincta*, E. A. SMITH.

3 and 4.—*Acroptychia notabilis*, E. A. SMITH.

5.—*Iatirus maximus*, SOWERBY.

6.—*Mitra ida*, MELVILL.



1



2



3



4



5

- Fig. 1. *Papyrotheca mirabilis*, Brus. 4.5 millim. high, 1.9 millim. broad.
 Fig. 2. do. do. do. 5.5 " " 2.2 " "
 Fig. 3. do. do. do. 3.2 " " 1.8 " "
 Fig. 4. do. *pseudogyra*, Brus. 2 millim. " 0.8 " "
 Fig. 5. do. *contraria*, Brus. 3.2 " " 1.9 " "