ISLAND LIFE

OR

THE PHENOMENA AND CAUSES OF

INSULAR FAUNAS AND FLORAS

INCLUDING A REVISION AND ATTEMPTED SOLUTION OF THE PROBLEM OF

GEOLOGICAL CLIMATES

BY

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CORRECTIONS IN PRESENT ISSUE.

The first issue of this Edition being exhausted, the opportunity is taken of making a few corrections, the most important of which are here stated :—

Page 163. Statement modified as to supposed glaciation of South Africa.

Pages 174 and 338. Many geologists now hold that there was no great submergence during the glacial epoch. The passages referring to it have therefore been re-written.

Page 182. Colonel Fielden's explanation of the occurrence of large trees on shores and in recent drift in high latitudes, is now added.

,, 272. A species of Carex peculiar to Bermuda is now given.

,, 356. *Geomalacus maculosus*, as a peculiar British species, is now omitted.

Verbal alterations have also been made at pages 41, 105, 356, and 360.

only accumulate where precipitation is greater than melting and evaporation, and this is never the case except in areas exposed to the full influence of the vapour-bearing winds. The outer rim of the ice-sheet would inevitably exhaust the air of so much of its moisture that what reached the inner parts would produce far less snow than would be melted by the long hot days of summer.[1] The accumulations of ice were therefore probably confined, in the northern hemisphere, to the coasts exposed to moist winds, and where elevated land and mountain ranges afforded condensers to initiate the process of glaciation; and we have already seen that the evidence strongly supports this view. Even with this limitation, however, the mass of accumulated ice would be enormous, as indeed we have positive evidence that it was, and might have caused a sufficient shifting of the centre of gravity of the earth to produce a submergence of about 150 or 200 feet.

But this would only be the case if the accumulation of ice on one pole was accompanied by a diminution on the other, and this may have occurred to a limited extent during the earlier stages of the glacial epoch, when alternations of warmer and colder periods would be caused by winter occurring in *perihelion* or *aphelion*. If, however, as is here maintained, no such alternations occurred when the excentricity was near its maximum, then the ice would accumulate in the southern hemisphere at the same time as in the northern, unless changed geographical conditions, of which we have no evidence whatever, prevented such accumulations. That there was such a greater accumulation of ice is shown by the traces of ancient glaciers in the Southern Andes and in New Zealand, and also, according to several writers, in South Africa; and the indications in all these localities point to a period so recent that it must almost certainly have been contemporaneous with the glacial period of the northern hemisphere.[2]

[1] Dr. Croll objects to this argument, and adduces the case of Greenland as showing that ice may accumulate far from sea. But the width of Greenland is small compared with that of the supposed Antarctic ice-cap. (*Climate and Cosmology*, p. 78.)

[2] The recent extensive glaciation of New Zealand is generally imputed by the local geologists to a greater elevation of the land; but I cannot help

This greater accumulation of ice in both hemispheres would lower the whole ocean by the quantity of water

believing that the high phase of excentricity which caused our own glacial epoch was at all events an assisting cause. This is rendered more probable if taken in connection with the following very definite statement of glacial markings in South Africa. Captain Aylward in his *Transvaal of To-day* (p. 171) says :—"It will be interesting to geologists and others to learn that the entire country, from the summits of the Quathlamba to the junction of the Vaal and Orange rivers, shows marks of having been swept over, and that at no very distant period, by vast masses of ice from east to west. The striations are plainly visible, scarring the older rocks, and marking the hill-sides—getting lower and lower and less visible as, descending from the mountains, the kopjies (small hills) stand wider apart ; but wherever the hills narrow towards each other, again showing how the vast ice-fields were checked, thrown up, and raised against their Eastern extremities."

This passage is evidently written by a person familiar with the phenomena of glaciation, and as Captain Aylward's preface is dated from Edinburgh, he has probably seen similar markings in Scotland. The country described consists of the most extensive and lofty plateau in South Africa, rising to a mountain knot with peaks more than 10,000 feet high, thus offering an appropriate area for the condensation of vapour and the accumulation of snow. At present, however, the mountains do not reach the snow-line, and there is no proof that they have been much higher in recent times, since the coast of Natal is now said to be rising. It is evident that no slight elevation would now lead to the accumulation of snow and ice in these mountains, situated as they are between 27° and 30° S. Lat. ; since the Andes, which in 32° S. Lat. reach 23,300 feet high, and in 28° S. Lat. 20,000, with far more extensive plateaus, produce no ice-fields. We cannot, therefore, believe that a few thousand feet of additional elevation, even if it occurred so recently as indicated by the presence of striations, would have produced the remarkable amount of glaciation above described ; while from the analogy of the northern hemisphere, we may well believe that it was mainly due to the same high excentricity that led to the glaciation of Western and Central Europe, and Eastern North America.

These observations confirm those of Mr. G. W. Stow, who, in a paper published in the *Quarterly Journal of the Geological Society* (Vol. XXVII. p. 539), describes similar phenomena in the same mountains, and also mounds and ridges of unstratified clay packed with angular boulders ; while further south the Stormberg mountains are said to be similarly glaciated, with immense accumulations of morainic matter in all the valleys. We have here most of the surface phenomena characteristic of a glaciated country, only a few degrees south of the tropic ; and taken in connection with the indications of recent glaciation in New Zealand, and those discovered by Dr. R. von Lendenfeld in the Australian Alps between 6,000 and 7,000 feet elevation (*Nature*, Vol. XXXII. p. 69), we can hardly doubt the occurrence of some general and wide-spread cause of glaciation in the southern hemisphere at a period so recent that the superficial phenomena are almost as well preserved as in Europe. Other geologists however deny that there are any distinct indications of glacial action in South Africa ; but the recent discovery by Dr. J. W. Gregory, F.G.S., of the former extension of glaciers on Mount Kenya 5,000 feet below their present limits, renders probable the former glaciation of the South African Highlands.

abstracted from it, while any want of perfect synchronism between the decrease of the ice at the two poles would cause a movement of the centre of gravity of the earth, and a slight rise of the sea-level at one pole and depression at the other. It is also generally believed that a great accumulation of ice would cause subsidence by its pressure on the flexible crust of the earth, and we thus have a very complex series of agents leading to elevations and subsidences of limited amount, such as seem always to have accompanied glaciation. This complexity of the causes at work may explain the somewhat contradictory evidence as to rise and fall of land, some authors maintaining that it stood higher, and others lower, during the glacial period.

The State of the Planet Mars, as Bearing on the Theory of Excentricity as a Cause of Glacial Periods.—It is well known that the polar regions of the planet Mars are covered with white patches or discs, which undergo considerable alterations of size according as they are more or less exposed to the sun's rays. They have therefore been generally considered to be snow or ice-caps, and to prove that Mars is now undergoing something like a glacial period. It must always be remembered, however, that we are very ignorant of the exact physical conditions of the surface of Mars. It appears to have a cloudy atmosphere like our own, but the gaseous composition of that atmosphere may be different, and the clouds may be formed of other matter besides aqueous vapour. Its much smaller mass and attractive power must have an effect on the nature and extent of these clouds, and the heat of the sun may consequently be modified in a way quite different from anything that obtains upon our earth. Bearing these difficulties and uncertainties in mind, let us see what are the actual facts connected with the supposed polar snows of Mars.[1]

[1] The astronomical facts connected with the motions and appearance of the planet are taken from a paper by Mr. Edward Carpenter, M.A., in the *Geological Magazine* of March, 1877, entitled, "Evidence Afforded by Mars on the Subject of Glacial Periods," but I arrive at somewhat different conclusions from those of the writer of the paper.

Now Dr. Croll gives us the following account of the present aspect of the surface of a large part of the country:—

"Go where one will in the lowlands of Scotland and he shall hardly find a single acre whose upper surface bears the marks of being formed by the denuding agents now in operation. He will observe everywhere mounds and hollows which cannot be accounted for by the present agencies at work. . . . In regard to the general surface of the country the present agencies may be said to be just beginning to carve a new line of features out of the old glacially-formed surface. But so little progress has yet been made, that the kames, gravel-mounds, knolls of boulder clay, &c., still retain in most cases their original form." [1]

The facts here seem a little inconsistent, and we must suppose that Dr. Croll has somewhat exaggerated the universality and complete preservation of the glaciated surface. The amount of average denudation, however, is not a matter of opinion but of measurement; and its consequences can in no way be evaded. They are, moreover, strictly proportionate to the time elapsed; and if so much of the old surface of the country has certainly been remodelled or carried into the sea since the last glacial epoch, it becomes evident that any surface-phenomena produced by still earlier glacial epochs *must* have long since entirely disappeared.

Rise of the Sea-level Connected with Glacial Epochs, a Cause of Further Denudation.—There is also another powerful agent that must have assisted in the destruction of any such surface deposits or markings. During the last glacial epoch itself there were several minor oscillations of the land, without counting the great submergence of over 1,300 feet, supposed to be indicated by patches of shelly clays and gravels in Wales and Ireland, and also in a few localities in England and Scotland, since these are otherwise explained by many geologists. Other subsidences have no doubt occurred in the same areas during the Tertiary epoch, and some writers connect these subsidences with the glacial

[1] *Climate and Time in their Geological Relations*, p. 341.

period itself, the unequal amount of ice at the two poles causing the centre of gravity of the earth to be displaced when, of course, the surface of the ocean will conform to it and appear to rise in the one hemisphere and sink in the other. If this is the case, subsidences of the land are natural concomitants of a glacial period, and will powerfully aid in removing all evidence of its occurrence. We have seen reason to believe, however, that during the height of the glacial epoch the extreme cold persisted through the successive phases of precession, and if so, both polar areas would probably be glaciated at once. This would cause the abstraction of a large quantity of water from the ocean, and a proportionate elevation of the land, which would react on the accumulation of snow and ice, and thus add another to that wonderful series of physical agents which act and react on each other so as to intensify glacial epochs.

But whether or not these causes would produce any important fluctuations of the sea-level is of comparatively little importance to our present inquiry, because the wide extent of marine Tertiary deposits in the northern hemisphere and their occurrence at considerable elevations above the present sea-level, afford the most conclusive proofs that great changes of sea and land have occurred throughout the entire Tertiary period; and these repeated submergences and emergences of the land combined with sub-aërial and marine denudation, would undoubtedly destroy all those superficial evidences of ice-action on which we mainly depend for proofs of the occurrence of the last glacial epoch.

What Evidence of Early Glacial Epochs may be Expected.—Although we may admit the force of the preceding argument as to the extreme improbability of our finding any clear evidence of the superficial action of ice during remote glacial epochs, there is nevertheless one kind of evidence that we ought to find, because it is both wide-spread and practically indestructible.

One of the most constant of all the phenomena of a glaciated country is the abundance of icebergs produced by the breaking off of the ends of glaciers which terminate

epochs of glaciation far exceeding what now prevails; and it is therefore necessary to examine the evidence pretty closely in order to see if this view is more tenable in the case of the north polar regions than we have found it to be in that of the north temperate zone.

The most recent of these milder climates is perhaps indicated by the abundant remains of large mammalia—such as the mammoth, woolly rhinoceros, bison and horse, in the icy alluvial plains of Northern Siberia, and especially in the Liakhov Islands in the same latitude as the North Cape of Asia. These remains occur not in one or two spots only, as if collected by eddies at the mouth of a river, but along the whole borders of the Arctic Ocean; and it is generally admitted that the animals must have lived upon the adjacent plains, and that a considerably milder climate than now prevails could alone have enabled them to do so. How long ago this occurred we do not know, but one of the last intercalated mild periods of the glacial epoch itself seems to offer all the necessary conditions. Again, Sir Edward Belcher discovered on the dreary shores of Wellington Channel in 75½° N. Lat. the trunk and root of a fir tree which had evidently grown where it was found. It appeared to belong to the species *Abies alba*, or white fir, which now reaches 68° N. Lat. and is the most northerly conifer known. Similar trees, one four feet in circumference and thirty feet long, were found by Lieut. Mecham in Prince Patrick's Island in Lat. 76° 12′ N., and other Arctic explorers have found remains of trees in high latitudes.[1]

Similar indications of a recent milder climate are found in Spitzbergen. Professor Nordenskjöld says: "At various places on Spitzbergen, at the bottom of Lomme Bay, at Cape Thordsen, in Blomstrand's strata in Advent Bay, there are found large and well-developed shells of a bivalve, *Mytilus edulis*, which is not now found living on the coast of Spitzbergen, though on the west coast of Scandinavia it everywhere covers the rocks near the sea-shore. These shells occur most plentifully in the bed of a river which runs through Reindeer Valley at Cape Thordsen. They

[1] Colonel Fielden thinks that these trees have all been brought down by rivers, and have been stranded on shores which have been recently elevated. See *Trans. of Norfolk Nat. Hist. Soc., Vol. III.*, 1880.

are probably washed out of a thin bed of sand at a height of about twenty or thirty feet above the present sea-level, which is intersected by the river. The geological age of this bed cannot be very great, and it has clearly been formed since the present basin of the Ice Sound, or at least the greater part of it, has been hollowed out by glacial action."[1]

The Miocene Arctic Flora.—One of the most startling and important of the scientific discoveries of the last forty years has been that of the relics of a luxuriant Miocene flora in various parts of the Arctic regions. It is a discovery that was totally unexpected, and is even now considered by many men of science to be completely unintelligible; but it is so thoroughly established, and it has such a direct and important bearing on the subjects we are discussing in the present volume, that it is necessary to lay a tolerably complete outline of the facts before our readers.

The Miocene flora of temperate Europe was very like that of Eastern Asia, Japan, and the warmer part of Eastern North America of the present day. It is very richly represented in Switzerland by well preserved fossil remains, and after a close comparison with the flora of other countries Professor Heer concludes that the Swiss Lower Miocene flora indicates a climate corresponding to that of Louisiana, North Africa, and South China, while the Upper Miocene climate of the same country would correspond to that of the south of Spain, Southern Japan, and Georgia (U.S. of America). Of this latter flora, found chiefly at Œninghen in the northern extremity of Switzerland, 465 species are known, of which 166 species are trees or shrubs, half of them being evergreens. They comprise sequoias like the Californian giant trees, camphor-trees, cinnamons, sassafras, bignonias, cassias, gleditschias, tulip-trees, and many other American genera, together with maples, ashes, planes, oaks, poplars, and other familiar European trees represented by a variety of extinct species. If we now go to the west coast of Greenland in 70° N. Lat. we find abundant remains of a flora of the same general

[1] *Geological Magazine*, 1876, "Geology of Spitzbergen," p. 267.

12. Helix pulchella. (Müll.) ...	... Europe; very close to *H. minuta* (Say) of the United States. Introduced into Bermuda (?)
13. ,, ventricosa. (Drap.) ...	... Azores, Canary Islands, and South Europe.
14. Bulimulus nitidulus. (Pfr.)	... Cuba, Haiti, &c.
15. Stenogyra octona. (Ch.) ...	... West Indies and South America.
16. Stenogyra decollata (Linn.)	... A South European species. Introduced.
17. Cœcilianella acicula. (Müll.)	... Florida, New Jersey, and Europe.
18. Pupa pellucida. (Pfr.) ..	... West Indies, and Yucatan.
19. ,, Barbadensis. (Pfr.) ...	... Barbadoes (?)
20. ,, Jamaicensis. (C. B. Ad.)	... Jamaica.
21. Helicina convexa. (Pfr.)	... Barbuda.[1]

Mr. Bland indicates only four species as certainly peculiar to Bermuda, and another sub-fossil species; while one or two of the remainder are indicated as doubtfully identical with those of other countries. We have thus about one-fifth of the land-shells peculiar, while almost all the other productions of the islands are identical with those of the adjacent continent and islands. This corresponds, however, with what occurs generally in islands at some distance from continents. In the Azores only one land-bird is peculiar out of eighteen resident species; the beetles show about one-eighth of the probably non-introduced species as peculiar; the plants about one-twentieth; while the land-shells have about half the species peculiar. This difference is well explained by the much greater difficulty of transmission over wide seas, in the case of land-shells, than of any other terrestrial organisms. It thus happens that when a species has once been conveyed it may remain isolated for unknown ages, and has time to become modified by local conditions unchecked by the introduction of other individuals of the original type.

Flora of Bermuda.—Unfortunately no good account of the plants of these islands has yet been published. Mr.

[1] Mr. Theo. D. A. Cockerell informs me that there are two slugs in Bermuda of which specimens exist in the British Museum.—*Amalia gagates* Drap. common in Europe, and *Agriolimax campestris* of the United States. Both may therefore have been introduced by human agency. Also *Vaginulus Morelete var. schivelyæ* which seems to be a variety of a Mexican species; perhaps imported.

Jones, in his paper "On the Vegetation of the Bermudas" gives a list of no less than 480 species of flowering plants; but this number includes all the culinary plants, fruit-trees, and garden flowers, as well as all the ornamental trees and shrubs from various parts of the world which have been introduced, mixed up with the European and American weeds that have come with agricultural or garden seeds, and the really indigenous plants, in one undistinguished series. It appears too, that the late Governor, Major-General Lefroy, "has sown and distributed throughout the islands packets of seeds from Kew, representing no less than 600 species, principally of trees and shrubs suited to sandy coast soils"—so that it will be more than ever difficult in future years to distinguish the indigenous from the introduced vegetation.

From the researches of Dr. Rein and Mr. Moseley there appear to be about 250 flowering plants in a wild state, and of these Mr. Moseley thinks less than half are indigenous. The majority are tropical and West Indian, while others are common to the Southern States of North America; the former class having been largely brought by means of the Gulf Stream, the latter by the agency of birds or by winds. Mr. Jones tells us that the currents bring numberless objects animate and inanimate from the Carribean Sea, including the seeds of trees, shrubs, and other plants, which are continually cast ashore and sometimes vegetate. The soap-berry tree (*Sapindus saponaria*) has been actually observed to originate in this way.

The only *species* of flowering plant peculiar to Bermuda is *Carex Bermudiana* (Hemsley), which is said to be allied to a species found only in St. Helena; but there are some local forms of continental species, among which are *Sisyrinchium Bermudianum* and a variety of *Rhus toxicodendron*. There are, however, two ferns—an Adiantum and a Nephrodium, which are unknown from any other locality. The juniper, which is so conspicuous a feature of the islands, is said to be a West Indian species (*Juniperus barbadensis*) found in Jamaica and the Bahamas, not the North American red

cedar; but there seems to be still some doubt about this common plant.

Mr. Moseley, who visited Bermuda in the *Challenger*, has well explained the probable origin of the vegetation. The large number of West Indian plants is no doubt due to the Gulf Stream and constant surface drift of warm water in this direction, while others have been brought by the annual cyclones which sweep over the intervening ocean. The great number of American migratory birds, including large flocks of the American golden plover, with ducks and other aquatic species, no doubt occasionally bring seeds, either in the mud attached to their feet or in their stomachs.[1] As these causes are either constantly in action or recur annually, it is not surprising that almost all the species should be unchanged owing to the frequent intercrossing of freshly-arrived specimens. If a competent botanist were thoroughly to explore Bermuda, eliminate the species introduced by human agency, and investigate the source from whence the others were derived and the mode by which they had reached so remote an island, we should obtain important information as to the dispersal of plants, which might afford us a clue to the solution of many difficult problems in their geographical distribution.

Concluding Remarks.—The two groups of islands we have now been considering furnish us with some most instructive facts as to the power of many groups of organisms to pass over from 700 to 900 miles of open sea. There is no doubt whatever that all the indigenous species have thus reached these islands, and in many cases the process may be seen going on from year to year. We find that, as regards birds, migratory habits and the liability to be caught by violent storms are the conditions which determine the island-population. In both islands the land-birds are almost exclusively migrants; and in both, the non-migratory groups—wrens, tits, creepers, and nuthatches—are absent; while the number of annual visitors is greater in proportion as the migratory habits and prevalence of storms afford more efficient means for their introduction.

[1] "Notes on the Vegetation of Bermuda," by H. N. Moseley. (*Journal of the Linnean Society*, Vol. XIV., *Botany*, p. 317.)

mouth the old channel is 260 feet below the sea-level The watershed at Kilsith is now 160 feet above the sea, the old valley bottom being 120 feet deep or forty feet above the sea. In some places the old valley was a ravine with precipitous rocky walls, which have been found in mining excavations. Sir A. Geikie, who has himself discovered many similar buried valleys, is of opinion that "they unquestionably belong to the period of the boulder clay."

We have here a clear proof that, when these rivers were formed, the land must have stood in relation to the sea *at least* 260 feet higher than it does now, and probably much more; and this is sufficient to join England to the continent. Supporting this evidence, we have freshwater or littoral shells found at great depths off our coasts. Mr. Godwin Austen records the dredging up of a freshwater shell (*Unio pictorum*) off the mouth of the English Channel between the fifty fathom and 100 fathom lines, while in the same locality gravel banks with littoral shells now lie under sixty or seventy fathoms water.[1] More recently Mr. Gwyn Jeffreys has recorded the discovery of eight species of fossil arctic shells off the Shetland Isles in about ninety fathoms water, all being characteristic shallow water species, so that their association at this great depth is a distinct indication of considerable subsidence.[2]

Time of Last Union with the Continent.—The period when this last union with the continent took place was comparatively recent, as shown by the identity of the shells with living species, and the fact that the buried river channels are all covered with clays and gravels of the glacial period, of such a character as to indicate that most of them were deposited above the sea-level. From these and various other indications geologists are all agreed that the last continental period, as it is called, was subsequent to the greatest development of the ice, but probably before the cold epoch had wholly passed away. But if so recent, we should naturally expect our land still

[1] *Quarterly Journal of Geological Society*, 1850, p. 96.
[2] *British Association Report*, Dundee, 1867, p. 431.

Land and Freshwater Shells.—In the first edition of this work four species were noted as being, so far as was then known, exclusively British. Two of these, *Cyclas pisidioides* (now called *Sphærium pisidioides*) and *Geomalacus maculosus*, have been discovered on the continent, but the other two remain still apparently confined to these islands; and to these another has been added by the discovery of a new species of Hydrobia in the estuary of the Thames. The peculiar species now stands as follows:—

1. Limnea involuta.—A pond snail with a small polished amber-coloured shell found only in a small alpine lake and its inflowing stream on Cromagloun mountain near the lakes of Killarney. It was discovered in 1838, and has frequently been obtained since in the same locality. It is sometimes classed as a variety of *Limnea peregra*, and is at all events closely allied to that species.

2. Hydrobia jenkinsii.—A small shell of the family Rissoidæ inhabiting the Thames estuary both in Essex and Kent. It was discovered only a few years ago, and was first described in 1889.

3. Assiminea grayana.—A small estuarine pulmonobranch found on the banks of the Thames between Greenwich and Gravesend, on mud at the roots of aquatic plants. It has been discovered more than sixty years.

But besides the above-named species there are a considerable number of well-marked varieties of shells which seem to be peculiar to our islands. A list of these has been kindly furnished me by Mr. Theo. D. A. Cockerell, who has paid much attention to the subject; and after omitting all those whose peculiarities are very slight or whose absence from the continent is doubtful, there remain a series of forms some of which are in all probability really endemic with us. This is the more probable from the fact that an introduced colony of *Helix nemoralis* at Lexington, Virginia, presents numerous varieties among which are several which do not occur in Europe.[1] The following list is therefore given in the hope that it may be useful in calling attention to those varieties which are not yet positively known to occur elsewhere than in our islands, and

[1] See "The Virginia Colony of Helix nemoralis," T. D. A. Cockerell. in *The Nautilus*, Vol. III. No. 7, p. 73.

thus lead, ultimately, to a more accurate knowledge of the facts. It is only by obtaining a full knowledge of varieties, their distribution and their comparative stability, that we can ever hope to detect the exact process by which nature works in the formation of species.

LIST OF THE SPECIES AND VARIETIES OF LAND AND FRESHWATER SHELLS WHICH, SO FAR AS AT PRESENT KNOWN, ARE BELIEVED TO BE PECULIAR TO THE BRITISH ISLES OR NOT FOUND ON THE CONTINENT.

LIMACIDÆ.

1. Limax marginatus, *var.* MACULATUS. Ireland ; frequent, very distinct.
2. ,, ,, ,, DECIPIENS. Ireland and England.
3. ,, flavus, *var.* SUFFUSUS. England ; Melanic form.
4. ,, ,, ,, GRISEUS. England ; Melanic form.
5. Agriolimax agrestis, *var.* NIGER. Yorkshire. Melanic. Azores.
6. ,, ,, ,, GRISEUS. England. Melanic.
7. Amalia gagates, *var.* RAVA. W. of England.
8. ,, sowerbyi, *var.* RUSTICA. England.
9. ,, ,, ,, NIGRESCENS. Surrey and Middlesex.
10. ,, ,, ,, BICOLOR. Ealing.
11. Hyalina crystallina, *var.* COMPLANATA. Near Bristol.
12. ,, fulva, *var.* ALDERI.
13. Vitrina pellucida, *var.* DEPRESSIUSCULA. S. England, Wales.

HELICIDÆ.

14. Arion ater, *var.* ALBO-LATERALIS. England, Wales, Isle of Man ; very distinct.
15. ,, hortensis, *var.* FALLAX. England. Common at Boxhill.
16. GEOMALACUS MACULOSUS. Kerry and Cork. Three varieties have been described, one of which occurs in Portugal.
17. Helix aspersa, *var.* LUTESCENS. England. Not rare perhaps in France.
18. ,, nemoralis, *var.* HIBERNICA. Ireland.
19. ,, rufescens, *var.* MANCHESTERIENSIS. England.
20. ,, hispida, *var.* SUBGLOBOSA. England.
21. ,, ,, ,, DEPILATA. England.
22. ,, ,, ,, MINOR. England, Ireland.
23. ,, granulata, *var.* CORNEA. Lulworth, Dorset.
24. ,, virgata, *var.* SUBAPERTA. Bath.
25. ,, ,, ,, SUBGLOBOSA. England, Wales, Bantry Bay.
26. ,, ,, ,, CARINATA. Wareham, Dorset.
27. ,, caperata, *var.* MAJOR. England, Wales, Scotland. Distinct.
28. ,, ,, ,, NANA. England.
29. ,, ,, ,, SUBSCALARIS. Wales, Ireland.
30. ,, ,, ,, ALTERNATA. England, Kent.
31. ,, acuta, *var.* NIGRESCENS. England.

PUPIDÆ.

32. Pupa anglica, *var.* FALLIDA. Not rare.
33. ,, lilljeborgi, *var.* BIDENTATA. Ireland.