

I BLAND

Weidman & Warnesou,
Bookbinders,
No. 322 4 $\frac{1}{2}$ Street, N. W.,
Washington, D. C.

I BLAND

Division of Mollusks
Sectional Library

QL
31
B5 B64
Mou.

A

COMPLETE LIST

OF

Division of Mollusks
Sectioned Library

THE SCIENTIFIC PAPERS

OF

THOMAS BLAND, F. G. S.

FROM 1852 TO 1883. /

BY

ARTHUR F. GRAY.

PRINTED AT THE SALEM PRESS,
SALEM, MASS.

1884.

PREFACE.

THE compiler takes pleasure in placing before students of American Conchology, a complete list of the scientific writings of Mr. Thomas Bland, who has so thoroughly studied the mollusks of North America and the West Indies. His contributions to Geographical Distribution of the Terrestrial Mollusks, his notes on Classification, Dentition, Anatomy, etc., have been most valuable; and it is with the hope that the list may render these papers more accessible that their titles are now brought together in chronological order.

Many of the papers have been published jointly with Mr. Wm. G. Binney; such joint publications are indicated by an asterisk (*) which is prefixed to their respective titles.

The papers published in the "*Journal de Conchyliologie*," were translated into French by M. H. Crosse from Mr. Bland's original manuscripts.

The compiler here acknowledges the kindly aid of Mr. Bland who has most materially aided him in the preparation of the list.

ARTHUR F. GRAY.

Danversport, Mass.,
Feb., 1884.

LIST OF PAPERS.

1852-1883.

1. Catalogue of the Terrestrial Shells of St. Thomas, West Indies.—Prof. C. B. Adams. Contributions to Conchology, I, No. 11, pp. 215-224, Oct., 1852.
2. On the *Clausiliæ* of America. Same, pp. 224-228; same date.
3. Catalogue of Terrestrial Shells collected by T. Bland in New Grenada, in 1851.—Same, pp. 228-230, and No. 12, pp. 231-233; same date.
4. Facts and Principles relating to the Origin, and the Geographical Distribution of Mollusca.—Am. Journ. Sci. and Arts, 2nd Series, Vol. XIV, pp. 389-404, Nov., 1852.
5. Notes sur les causes de l'érosion des coquilles fluviatiles.—Journ. de Conch., Vol. IV, No. 3, pp. 306-308, July, 1853.
6. Note on the Geographical Distribution of the Terrestrial Mollusks which inhabit the Island of St. Thomas, W. I.—Annals Lyc. Nat. Hist., N. Y., Vol. VI, pp. 74-75, 1854.
7. On the Absorption of Parts of the Internal Structure of their Shells by the Animals of *Stoastoma*, *Lucidella*, *Trochatella*, *Helicina* and *Proserpina*.—Same, pp. 75-77.
8. On *Proserpina opalina*, C. B. Ad., and *Helix proserpinula*, Pfr.—Same, pp. 77-78.
9. Notes on Certain Terrestrial Mollusks which inhabit the West Indies.—Same, Vol. VI, pp. 147-155, Oct., 1855.
 [This paper contains the following notes, viz.:
 I. On the Occurrence of *Pupa bicolor*, Hutton, in the Island of St. Thomas.
 II. On the Animal of *Proserpina*.
 III. On the Structure of the Axis of the Shell of *Cylindrella*.
 IV. Corrections and Additional Facts, especially as to the Habitat of Sundry Species.]
10. Description of two New Species of North American *Helicidæ*.—Same, pp. 277-280, pl. IX, Feb., 1858.
 [*Helix Edwardsi* and *H. sculptilis* described.]

11. Remarks on certain Species of North American *Helicidae*; with Note on the Toothed Helices of North America.—Same, Vol. VI, pp. 280–302, 336–362, pl. IX, Feb., 1858; Vol. VII, pp. 26–39, Jan., 1859, pp. 115–142, Apr., 1860, pp. 420–448, pl. IV, Feb., 1862.

[These papers were also issued in pamphlet form:—Part I, New York, 1858; Part II, New York, 1860; Part III, New York, 1862; all repaged. The new species described are *Helix pustuloides*, *Postelliana auriformis*, *espiloca*, *introferens*, *Christyi*, *Wheatleyi*, *Carpenteriana*, *Downiana*, *tridontoides* and *labrosa*.]

12. Notice of Land and Fresh water Shells collected by Dr. J. G. Cooper, in the Rocky Mountains, etc., in 1860.—Same, Vol. VII, pp. 362–370, pl. IV, June, 1861.

[This paper was published jointly with Dr. J. G. Cooper; it contains descriptions of *Helix polygyrella* and *Mullani*.]

13. On the Geographical Distribution of the Genera and Species of Land Shells of the West India Islands, with a Catalogue of the species of each Island.—Same, pp. 335–361, June, 1861.

[Also published in pamphlet form, with dedication to the memory of the then late Prof. C. B. Adams and his son C. B. Adams, with Preface, 1861.]

14. On the Family *Proserpinacea*, with Description of a New Species of the Genus *Proserpina*.—Same, Vol. VIII, pp. 13–17, May, 1863.

[*Proserpina Swifti* described.]

15. Remarks on Classification of North American Helices by European Authors, and especially by H. & A. Adams and Albers.—Same, Vol. VIII, pp. 17–40, Oct., 1863.

[Together with and included under this title, will be found a "Catalogue of the Species of Helix which inhabit North America (exclusive of the Pacific Coast and Mexico) arranged especially with reference to the forms of the Shells and showing the Genera and Subgenera in which they are placed by Pfeiffer and Albers; "also "Descriptions of the principal Genera and Subgenera, in which certain North American Species of Helix are arranged by Albers, 'Die Helicen' 2nd Ed.," with an Addendum containing "Catalogue of the Species of Helix which inhabit North America West of the Rocky Mountains, from the extreme North to the northern limit of Mexico, exclusive of those marked † in the preceding Catalogue."]

16. Note on the Buccal Plate (Jaw) in certain Genera of the Family *Cyclostomacea*.—Am. Journ. Conch., Vol. I, pp. 45–46, pl. 5, Feb., 1865.

17. Note on Certain Insect Larva-Sacs described as Species of *Valvatae*.—Ann. Lyc. Nat. Hist., N. Y., Vol. VIII, pp. 144–149, May, 1865.
18. Memoir of Charles B. Adams, late Professor of Zoölogy in Amherst College, Massachusetts, with Portrait.—Am. Journ. Conch., Vol. I, pp. 191–204, July, 1865.
19. Notes on Certain Terrestrial Mollusca, with Descriptions of New Species. Ann. Lyc. Nat. Hist., N. Y., Vol. VIII, pp. 155–170, with wood-cuts, November, 1865.

[Genus *Proserpinella* formed, and *Proserpinella Berendti*, *Stenopus ? Guildingi*, *Helix conspecta*, *Succinea Sillimani*, *S. Strehliana* and *S. Ferrilli* described.]

20. Remarks on the Origin and Distribution of the Operculated Land Shells, which inhabit the Continent of America and the West Indies, with a Catalogue of the American species.—Am. Journ. Conch., Vol. II, pp. 54–63, Jan., 1866, pp. 136–143, April, 1866.
21. Note on the Internal Structure of *Megaspira*. Same, Vol. II, p. 64, with wood-cut, Jan., 1866.
22. Remarks on the Distribution of the Inoperculated Land Shells which inhabit the Continent of America and the West Indies.—Same, Vol. II, pp. 349–370, Oct., 1866.

[Mr. Bland adds a "Catalogue of the Genera and Subgenera (of Inoperculated Land Shells) which are specifically represented on the American Continent and in the West Indies," and describes with much detail the peculiar features of the distribution of the Inoperculates in the different West Indian sub-provinces.]

23. Descriptions of New Species of North American Land Shells.—Same, Vol. II, pp. 371–374, pl. 21, Oct., 1866.

[New species described are: *Helix Jacksoni*, *H. Febigeri*, *H. significans*, and *Succinea Higginis*.]

24. Notes on certain Terrestrial Mollusca, with descriptions of new species.—Ann. Lyc. Nat. Hist., N. Y., Vol. IX, pp. 76–85, with figures, April, 1868. (Continued from Vol. VIII, p. 170.)
25. Notes on the Land Shells of Trinidad, Grenada and Dominica, and also of Curacao and Buen Ayre, W. I.—Am. Journ. Conch., Vol. IV, pp. 177–192, Feb., 1869.

26. Additional Notes on the Geographical Distribution of Land Shells in the West Indies. *Ann. Lyc. Nat. Hist., N. Y., Vol. IX*, pp. 238-241, June, 1869.
27. On the Lingual Dentition studied by the Microscope and Photography.—*Am. Journ. Conch., Vol. V*, pp. 37-38, pl. XI, July, 1869, by Mr. W. G. Binney, with a Note by Thos. Bland.
- *28. Land and Fresh-water Shells of North America, Part I; Pulmonata Geophila (in connection with Mr. W. G. Binney) pp. 316 and wood-cuts.—*Smithsonian Misc. Collections, Washington, 1869.*
- *29. Notes on Lingual Dentition of Mollusca, No. 1.—*Ann. Lyc. Nat. Hist., N. Y., Vol. IX*, pp. 281-295, wood-cuts, Feb., 1870.
- *30. Notes on Lingual Dentition.—*Am. Journ. Conch., Vol. VI*, pp. 202-215, wood-cuts, and pl. IX, April, 1871.
31. Notes relating to the Physical Geography and Geology of, and the Distribution of Terrestrial Mollusca in certain of the West India Islands.—*Proc. Am. Phil. Soc., pp. 56-63, March, 1871.*
- *32. Note on the genus *Pineria*, and on the Lingual Dentition of *Pineria Viequensis*, Pfr.—*Ann. Lyc. Nat. Hist., N. Y., Vol. X*, pp. 22-27, Feb., 1871.
- *33. Notes on the Lingual Dentition of *Pompholyx effusa*.—*Am. Journ. Conch., Vol. VI*, pp. 312-313, pl. XVIII, June, 1871.
- *34. On the Lingual Dentition of *Clausilia tridens*, Chemn.—*Same, Vol. VII*, pp. 28-29, pl. II, Aug., 1871.
- *35. On the Lingual Dentition of *Helicina occulta*.—*Same, Vol. VII*, pp. 29-30, pl. II, Aug., 1871.
- *36. On the Lingual Dentition of *Limnæa appressa*, Say, and *Limnæa megasoma*, Say.—*Same, Vol. VII*, pp. 161-162, pl. XII, Nov., 1871.
- *37. On the Lingual Dentition of *Veronicella*.—*Same, Vol. VII*, pp. 163-164, pl. XII, Nov., 1871.

- *38. On the Lingual Dentition of *Helix turbidiformis*, Pfr., and other species of Terrestrial Mollusca.—Ann. Lyc. Nat. Hist., N. Y., Vol. X, pp. 79–82, pl. II, July, 1871.
39. Description of a New Species of Mollusk of the genus *Helicina*.—Same, Vol. X, pp. 186–187, May, 1872.
[*Helicina Gloynei*.]
- *40. On the Systematic Arrangement of North American Terrestrial Mollusca.—Same, Vol. X, pp. 158–169, April, 1872.
[In connection with above “Note on *Helix inversicolor*, Fer. and other species from Mauritius,” pp. 169–170, appeared.]
- *41. On the Lingual Dentition and Jaws of Terrestrial Mollusca, No. 3.—Am. Journ. Conch., Vol. VII, pp. 174–184, March, 1872.
- *42. On the Lingual Dentition of *Blandiella*, *Geomelania* and *Amphibulima*.—Same, Vol. VII, pp. 185–186, pl. XVII, March, 1872.
- *43. On the Lingual Dentition of *Nanina*.—Same, Vol. VII, pp. 188–189, pl. XVII, March, 1872.
- *44. On the Lingual Dentition of *Macroceramus Gossei*, Pfr.—Same, Vol. VII, p. 187, pl. XVII, March, 1872.
- *45. On the Generic Position of *Helix Newberryana*.—Same, Vol. VII, pp. 190–191, pl. XVII, March, 1872.
- *46. Notes on the Lingual Dentition of certain species of North American Land Shells.—Proc. Phila. Acad. Nat. Sci., pp. 135–137, 1872.
- *47. On the Relations of Certain Genera of Terrestrial Mollusca of, or related to, the sub-family *Succininae*, with Notes on the Lingual Dentition of *Succinea appendiculata*, Pfr.—Ann. Lyc. Nat. Hist., N. Y., Vol. X, pp. 198–207, pl. IX, Oct., 1872.
- *48. Description of *Hemphillia*, a new genus of Terrestrial Mollusks.—Same, Vol. X, pp. 208–211, pl. IX, Oct., 1872.
[*Hemphillia glandulosa* described.]
- *49. On the Lingual Dentition of Certain Terrestrial Pulmonata, foreign to the United States [with] Additional Note on the Genus *Amphibulima*.—Vol. X, pp. 219–225, Dec., 1872, Jan., 1873.

- *50. On the Lingual Dentition of *Gæotis*.—Same, Vol. X, pp. 252–255, pl. XI, Jan., 1873.
- *51. Note on a Curious Form of Lingual Dentition in *Physa*.—Same, Vol. X, pp. 255–257, pl. XI, Jan., 1873.
- *52. On the Lingual Dentition and Jaw of Certain Terrestrial Pulmonata from the United States, with Remarks on their Systematic Value.—Proc. Phila. Acad. Nat. Sci., pp. 240–256, pl. I, 1873.
- *53. On *Prophysaon*, a new Pulmonate Mollusk, on *Ariolimax*, on *Helix lychnuchus* and other species.—Ann. Lye. Nat. Hist., N. Y., Vol. X, pp. 293–311, pl. XIII–XIV, 1873.
54. On the Physical Geography of, and the Distribution of Terrestrial Mollusca in the Bahama Islands.—Same, Vol. X, pp. 311–324, June, 1873.
55. Note sur la distribution géographique de l'*Amphibulima patula*, Bruguière.—Journ. de Conch., Vol. XXI, pp. 342–347, Oct., 1873.
56. On the Lingual Dentition and Anatomy of *Achatinella*, and other Pulmonata.—Ann. Lye. Nat. Hist., N. Y., Vol. X, pp. 331–351, pl. XV, XVI, Nov., 1873.
57. Description of a New Species of *Helix* and Note on *H. Mobiliana*, Lea.—Ann. Lye. Nat. Hist., N. Y., Vol. X, pp. 361–363, Jan., 1874.
- [*Helix (Mesodon) Wetherbyi* described.]
58. Notes on Certain Terrestrial Mollusks, with Descriptions of New Species.—Same, Vol. XI, pp. 72–87, Feb., 1874.
- [Species described are: *Zonites Lansingi*, *Helix Sargenti*, *Macroceramus Swifti*, *M. Klatteanus*.]
59. Note on Classification of the *Achatinellæ*.—Same, Vol. XI, pp. 191–194, Nov., 1875.
- [This paper was appended to a paper "On Genitalia, Jaw and Lingual Dentition of certain species of Pulmonata," by W. G. Binney.]
60. Note on the Sub-generic Character of *Helix Jamaicensis*, Chemn., and on certain Terrestrial Mollusks from Haiti; with Description of a New Species of *Helix* from Colorado.—Same, Vol. XI, pp. 146–154, May, 1875.
- [*Helix Ingersollii* described.]

61. Examen critique de certaines espèces du Continent Américain et des Antilles, décrites dans la Monographie des *Helicina* (Conchologica Iconica) de L. Reeve (2) comme appartenant à ce genre.—Journ. de Conch., Vol. XV, pp. 245–252, June, 1875.

[An abridged translation was published in the Quar. Journ. Conch., Vol. I, pp. 105–107, Nov., 1875, with Notes by the translator, C. P. Gloyne.]

62. Notes on certain Terrestrial Mollusks, with description of a New Species of the Genus *Amphibulima*.—Ann. Lyc. Nat. Hist., N. Y., Vol. XI, pp. 197–200, Nov., 1875.

[*Amphibulima Rawsonis* and *Helix Van Nostrandii* described.]

63. Note on the Genus *Bourciera*.—Quar. Journ. Conch., Vol. I, p. 128, Feb., 1876.

64. Catalogue of the Terrestrial Air-breathing Mollusks of the United States and Adjacent Territories of North America, Oct., 1878.

[A list published for private distribution.]

65. Notes entitled “Alfred R. Wallace on the Colors of Animals.”—Science News, Vol. I, pp. 52–55 and 84–86, Dec., 1878, and Jan., 1879.

[These Notes have especial reference to the colors of the shells of Terrestrial Mollusks.]

66. Description of a New Species of *Triodopsis* from New Mexico.—Ann. N. Y. Acad. Sciences, Vol. II, pp. 115–116, with wood-cuts, Nov., 1880.

[*Triodopsis Levettei* described.]

67. On the Relations of the Flora and Fauna of Santa Cruz, West Indies.—Same, pp. 117–126, Jan., 1881.

68. Notes on *Macroceramus Kieneri*, Pfr., and *M. pontificus*, Gould.—Same, pp. 127–128, with wood-cuts, Jan., 1881.

69. Descriptions of two New Species of *Zonites*, from Tennessee.—Same, pp. 368–369, with wood-cuts, May, 1883.

[*Zonites Wheatleyi* and *Z. petrophilus*.]

70. Notes on the Land Shells which inhabit the Islands of Aruba, Curacao and Buen Ayre.—Same, pp. May, 1883.

71. In "*Contributions to the Natural History of the Valley of Quito*, II, by the late Prof. James Orton.—*Am. Nat.*, Vol. V, pp. 693–698. Nov., 1871. The author published: "Notes on the Terrestrial Mollusca of the Valley of Quito, with a Catalogue of the Species," by T. Bland, pp. 696–698.
72. In "Island Life," by Alfred Russel Wallace, Part II, Chap. XII (New York Edition, p. 256, 1881), the author published a "List of the Land Shells of Bermuda," furnished by T. Bland.

THOMAS BLAND was born at Newark, Nottinghamshire, England, Oct. 4, 1809. His father, Dr. Thomas Bland, was a physician. His mother was a Shepard, and a niece of Richard Shepard, who was a conchologist, from whom she acquired a love of natural history which led her to make collections of plants, minerals and shells, and this love of nature was inherited by her son Thomas. He was educated at Charter House School in London, where he was a classmate of Thackeray. He subsequently studied law and entered upon its practice in London. In May, 1836, he became a Fellow of the Royal Geological Society of London. In 1842 he removed to Barbadoes and thence to Jamaica, where he resided until about 1850, collecting largely in various departments of natural history, especially in conchology. While at Jamaica he made the acquaintance of Prof. C. B. Adams, then of Middlebury College, Vermont. A close friendship ensued which ended only with the untimely death of the latter in 1853. In 1850 Mr. Bland returned to England, and after a stay of a few months, accepted the appointment of superintendent of a gold mine at Marmato, New Granada. In 1852 he removed to New York, where the remainder of his life was spent in various agencies connected with mining and other enterprises. Of late years he had suffered much from impaired health, becoming for the last few months incapacitated for mental labor, and on the 20th August, 1885, he passed peacefully away.

Though Mr. Bland was always interested in general science, he seems to have received the special direction toward the study of terrestrial mollusks from his intimate friendship in Jamaica with Prof. Adams. He devoted himself to the wonderfully rich fauna of the West India islands, and continuing the labors which Prof. Adams had begun, he soon became a leading authority on that branch. His general knowledge of science led him to devote particular attention to the subject of geographical distribution, so philosophically treated in his published papers. When in South America, he collected largely and corresponded on the subject with all the prominent European conchologists. Again, on removing to New York, he became, through Prof. Adams, acquainted with the American conchologists, and formed a strong friendship especially with Mr. Wheatley and Mr. Redfield. Through the latter he became a member of the New York Lyceum of Natural History, and was for many years a most useful member of its publication committee. He was also a member of the Natural History Societies of Boston, Philadelphia, and other American cities, and the intimate personal friend and correspondent of all the American conchologists.

In 1855 he became acquainted with Mr. W. G. Binney, who was just commencing the continuation of his father's work on the Terrestrial Mollusks of North America. An intimate friendship was established which was only broken by the death of Mr. Bland. The association of these two in the study of our land shells resulted in a series of publications which has thoroughly elucidated the subject. If these publications have any excellence, it is owing to the happy combination of untiring zeal and inherited love of the subject, with all the traditions of the collections and collectors on one side, and on the other the absence of prejudice, the extended experience, the general scientific training and especially the philosophic mind of Mr. Bland.

A detailed catalogue of Mr. Bland's scientific writings, seventy-two in number, has been prepared and published by Mr. A. F. Gray.

Finally, it must be said that Mr. Bland was a genial acquaintance and a most self-sacrificing friend, ever ready with assistance, advice, encouragement or consolation, as these qualities might be required.

W. G. B.

FACTS AND PRINCIPLES
RELATING TO THE ORIGIN
AND THE
GEOGRAPHICAL DISTRIBUTION
OF
MOLLUSCA.

BY THOMAS BLAND, F.G.S., London.

IN preparing this paper, the following works have been particularly consulted, viz,—*Introduction to the Mollusca of the United States Exploring Expedition*. By A. A. GOULD, M.D. December, 1851; and *Catalogue of Shells collected at Panama, with Notes on their Synonymy, Station, and Geographical Distribution*. By C. B. ADAMS, Professor of Zoology, &c. in Amherst College, Massachusetts. New York, 1852.

We estimate these works as highly valuable contributions to science, and especially so with respect to the subject of the geographical distribution of Testaceous Mollusca.

The attention of these authors has for some years been directed to this question. It is discussed by Dr. Gould in his "*Report on the Invertebrata of Massachusetts*," dated March, 1840,—also

in his paper on "*The results of an examination of the shells of Massachusetts, and their Geographical distribution,*" read in February, 1841, before the Boston Society of Natural History, (published in the third volume of the Society's Journal,) and in his subsequent works.—Professor Adams takes up the subject in his "*Second Annual Report on the Geology of the State of Vermont,*" dated October, 1816, as well as in his later publications.

The latter author has had the particular advantage of working somewhat extensively in the wide field of nature. His labors in Jamaica, when confined to the *terrestrial* shells, revealed to him the existence of a distinct, though limited zoological province, and enabled him to demonstrate, that the area of the marine Caribbean province, comprises several distinct terrestrial insular faunas. On extending his inquiries to the *marine* shells of the coasts of this country, of Jamaica and the neighboring island, and of Panama, he found means of approximately defining the limits of two marine zoological provinces, viz. the "Caribbean," and "Panama." An important step towards this object is gained, as regards the latter, by the publication mentioned at the commencement of this article, and the author is now employed, we understand, in the preparation of a more complete work, illustrative of the former.

We desire to shew the interest and value which are attached to the question of the geographical distribution of shells,—not only generally, as part of the animal kingdom, but in its especial reference to geology. Although it may appear that much has been discovered and written on the subject, it will be equally apparent that very much remains to be worked out.

We propose also to refer to the causes of error on the subject, and to the question of the origin of species, which is intimately connected with the fact, that different regions of the globe, both of land and water, are inhabited by distinct groups of animals and plants.

It being our wish to excite increased attention to these subjects, we have preferred quoting largely from works of authority, to offering a summary of views and opinions in language of our own.

Buffon first pointed out the want of *specific* identity between the land quadrupeds of America, and those of the old world. Humboldt demonstrated that zones of elevation on mountains correspond to parallels of latitude, the higher with the more northern or southern, as the case might be. But for a lucid and succinct account of the progress and extent of our knowledge of the geographical distribution of species, both of plants and animals, we must refer to the admirable chapters relating to it, in Sir Charles Lyell's *Principles of Geology*.

That author justly observes, that "the extent of this parcelling out of the globe amongst different *nations*, as they have been termed, of plants and animals—the universality of a phenomenon so extraordinary and unexpected, may be considered as one of the most interesting facts clearly established by the advance of modern science."—p. 590. (*Eighth edition, London, 1850.*)

The geographical distribution of shells (to which portion of the animal kingdom our remarks will be confined) has received, and continues to receive much attention on the part of American naturalists,—indeed more so, it would seem, than from those of Europe. We may mention, by way of illustration, the total absence of all allusion to the topic, in the interesting "*Introduction to Conchology*," of Dr. George Johnston. (*London, 1850.*) The first direct reference to the subject in works of authors of the United States, is, we believe, in Dr. Gould's *Report on the Invertebrata of Massachusetts*, (*Cambridge, U. S., 1841.*) In his Introduction, he says,—"No attempt has hitherto been made to give an account of all the shells of any particular region on this continent. No book exists in which we may find descriptions of any considerable proportion of the whole number of the shells of the United States." In his "Recapitulation," Dr. Gould particularizes the following instance of geographical limitation occurring in the state of Massachusetts: "Cape Cod, the right arm of the Commonwealth, reaches out into the ocean some fifty or sixty miles. It is nowhere many miles wide; but this narrow point of land has hitherto proved a barrier to the migrations of many species of Mollusca. Several genera and numerous species which are separated by the intervention of only a few miles of land, are effectually prevented from intermingling by this Cape, and do not pass from one side to the other." p. 315. Dr. Gould asserts, that of the 197 marine species then known, 83 do not pass to the south shore, and 50 are not found on the north shore of the Cape.

Professor Adams in his "*Second Annual Report on the Geology of the State of Vermont*," (*Burlington, 1846,*) notices particularly the geographical distribution of species as a subject of great importance in its application to geology. He enters on the question of the former existence of gigantic mammalia on this continent, and the time when they flourished, a subject variously treated by other authors, and refers to the evidence afforded by an examination of fossil shells. He concludes that those quadrupeds, although found "to have been mired in shell marl, which consists of the same species of freshwater shells, which now inhabit our waters," did not belong to the present geological period.

In 1848, Professor Agassiz and Dr. Gould published the first part of their "*Principles of Geology*," (*Boston, 1848,*) in which a chapter is devoted to a consideration of the "Geographical

distribution of Animals." "Notwithstanding," say the authors, "the uniform nature of the watery element, the animals which dwell in it are not dispersed at random; and though the limits of the marine may be less easily defined than those of terrestrial faunas, still, marked differences between the animals of great basins are not less observable. Properly to apprehend how marine animals may be distributed into local faunas, it must be remembered that their residence is not in the high sea, but along the coasts of continents, and on soundings." p. 191. And farther,—“A very influential cause in the distribution of aquatic animals is the depth of the water; so that several zoological zones, receding from the shore, may be defined, according to the depth of the water; much in the same manner as we mark different zones at different elevations in ascending mountains. The Mollusks and even the fishes found near the shore in shallow water, differ, in general, from those living at the depth of twenty or thirty feet, and these again are found to be different from those which are met with at a greater depth.”—p. 192.

In the various numbers of his "*Contributions to Conchology*," (No. 1, published in Sept., 1849, and No. 10, the last, in Nov., 1851,) Professor Adams describes the curious local distribution of the terrestrial shells of Jamaica, and corrects many errors with regard to them. He found some species improperly attributed to Jamaica, and other species peculiar to that island, referred to other localities. It is now satisfactorily proved, that of the 357 species, the whole number of strictly terrestrial shells at present known to inhabit Jamaica, not more than 10 species are found in other islands.

In "*Contributions*" No. 4, Professor Adams remarks, "With this extremely local distribution of the terrestrial Mollusca in the West Indies may be associated the great fact of their geological history,—that these islands have, since the later tertiary periods, been in the process of elevation,—that they are the harbingers of a future continent, unlike the groups in the Pacific, which are the remains of ancient continents. Coincident with these two general facts in the West Indies is also a third,—that their coral reefs are all fringing, and that coral islands are wanting."

In August, 1850, the Professor read, (at the meeting of the American Association for the Advancement of Science,) a paper "*On the nature and origin of the Species of the Terrestrial Mollusca in the island of Jamaica*," (republished in "*Contributions*" No. 10.) From this paper we make the following extract: "Notwithstanding the difficulty of exploration in tropical regions, the island of Jamaica presents remarkable facilities for the investigation of subjects which are connected with the geographical distribution of species. Among the *terrestrial shells*, typical forms exist in great profusion. These forms are of every conceivable grade of value, from varieties up to genera and families.

They have also a determinate geographical distribution. The facts on these subjects are even more numerous than those which are expanded over the whole temperate regions of North America. In this respect, therefore, the island is a miniature continent. Probably the same is true of each of the larger Antilles."

We now refer to the work of the late Dr. Binney, on "*The Terrestrial Air-Breathing Mollusks of the United States*," (Boston, 1851,) published, since his death, under the able editorship of Dr. Gould. This work is indeed an imperishable record of the talents and love of science of its author,—a noble legacy to his country.

Dr. Binney highly appreciated the value of a study of the geographical distribution of shells. His first volume contains some interesting chapters relating to the subject,—we refer especially to the eighth. In that, and other parts of the book, various comparative tables of the habitats of shells are introduced, and the value of a complete series, including especially those of limited districts which present strongly marked topographical or climatal peculiarities, is pointed out.

The ninth chapter is devoted to "Geological relations." The most important inference, with respect to the geological history of this continent, deduced by Dr. Binney from his consideration of its fossil terrestrial shells is thus stated:—

"That our existing species of land Mollusks were living at a period which, though recent in a geological sense, was anterior to the last geological revolution, when the surface of this portion of the earth was brought to its present condition, and to the existence of the higher orders of animals which now inhabit it, and even to that of the extinct mammalians which are known only by their gigantic remains."—p. 185.

Stimpson, in his "*Shells of New England*," (Boston, 1851,) displays the growing interest attached to the subject before us, in his notes on the geographical, and bathymetrical, or horizontal and vertical range of each species. The observations of this author on the anatomy of the animals of many species of shells are very valuable.

The remarks of Dr. Gould in his "*Introduction to the Mollusca of the United States Exploring Expedition*," (December, 1851,) are eminently worthy of notice, as the following extracts will abundantly prove.

"The doctrine of distinct zoological regions evidently appertains to the Mollusks, and is well illustrated by them. In nearly every work, containing any considerable catalogue of shells, the same species will be found quoted as being found in widely distant regions, in different oceans, and even on opposite sides of the globe. The many thousand localities carefully noted on the records of the Expedition go to prove beyond dispute, that no such random or wide-spread distribution obtains."—p. ix.

“Another point of interest extensively elucidated by the collections of the Expedition is the occurrence of analogous species in co-ordinate regions. It is now a received fact that the animals and plants of the northernmost zones are, for the most part, identical throughout the whole circuit; and that the species gradually diverge from each other towards the equator, on the three continents; and that after passing the equator towards the south, there is not a return to the same species, and rarely to the same genera, as we should expect if variation of forms depended mainly on difference of temperature. There is, however, a return to mollusks of a kindred character and form, and oftentimes to the same genera. The analogies of specimens from distant regions are much stronger when reckoned by isothermal longitude than by isothermal latitude. In the latter case we may have analogous genera. Along our northern seas, some of the most characteristic shells are *Buccinum*, *Tritonium*, *Fusus*, *Terebratula*, *Rimula*, &c. Around Cape Horn are shells of the same types, so closely allied that they have not yet been separated as distinct genera, though peculiar in many important respects. But this resemblance does not descend to species. In the first case, however, not only have we the same genera, but the species seem to repeat each other: so that species brought from great distances east or west, are scarcely to be distinguished upon comparison.”—p. xii.

Dr. Gould gives, in illustration, a list of species from Oregon, and from the Eastern States, and observes that “mingled with these are others very different in type, which mark the two localities as constituting very different zoological regions.” He adds, “the same comparison holds good between the shells of the Gulf of California and the Gulf of Mexico.”

We would quote also the following:—

“From a consideration of the land shells collected on the Pacific Islands, it seems possible to draw some fair inferences as to the relations of the lands which once occupied the area of the Pacific Ocean, and whose mountain peaks evidently now indicate or constitute, the islands with which it is now studded. By observation of the species, we think there are strong indications that some groups of islands have an intimate relation to each other, and belonged, at least, to the peaks of the same mountain ranges, before they were submerged; while the indications are equally strong that other groups had no territorial connection.”—p. xiv.

Drawing inferences from the land shells, Dr. Gould considers that the Samoa and Friendly Islands are more intimately related to the Society Islands, though at a much greater distance, than to the Feejee Islands, and that the Feejees are more nearly allied to the islands to the westward,—such as the New Hebrides, than to the Friendly Islands on the east, though so much nearer.

The "*Catalogue of Shells collected at Panama*," (New York, 1852,) by Professor Adams, now claims our attention.

The Preface commences with the following passage:—

"The reader of the Introduction to this work, and of Dr. Gould's Introduction to his great work on the shells of the United States Exploring Expedition, may be struck with the coincidence of opinions relating to the geographical distribution of species, and to errors in the statement of habitats, and in the distinctive characters of species. The coincidence is so exact, that it might naturally be supposed that these opinions originated in a single source. Such was their origin; but that source was the book of Nature. It was not until after both Introductions had been written, that opportunities occurred for a free interchange of views with Dr. Gould. It is therefore with the liveliest satisfaction that we derive assurance of their correctness both from the extent and accuracy of Dr. Gould's knowledge, and also from the coincidence of the results of independent investigations."

Professor Adams visited Panama at the end of 1850, and in the space of six weeks collected there, and in the immediate vicinity, and at the Island of Taboga, no less than 516 species of Mollusks, of which 158 are described in the Catalogue as new, and 64 are enumerated as undetermined. He states that besides the object of making additions to the Museum of Amherst College, he desired "to ascertain, with the certainty of personal observation, what and how many species of shells exist at Panama. Having formerly collected about 500 marine species in Jamaica, near the centre of the Caribbean Zoological Province, it was thought that a comparison of these authentic materials would not be without interest."

In the Introduction, we have the result of such comparison; but our limits will admit of little more than the following extract:—

"Panama is situated near the middle of a well defined marine zoological province. Perhaps none of the species of testaceous Mollusca (to which part of the Fauna our remarks are limited) which inhabit the neighboring seas, exist south of 22° S. lat., or north of 28° N. lat., or west of the Gallapago Islands. All of the few examples of species, which are supposed to have a wider range, are more or less doubtful. Some species which inhabit the northern part of the province, and others which inhabit the southern part, may overlap the boundaries between this and the adjacent provinces. But these species present only the usual difficulty in attempting to define the limits of a zoological province.

The most definite and satisfactory method of defining the limits of this province, is to place the boundaries at the extreme limits of the range of about 99 per cent. of the species which inhabit its middle regions. Thus it will be seen that several of the species which inhabit Panama also inhabit Guaymas, in the Gulf of

California, nearly in 28° N. lat. ; but none of them inhabit San Diego, which is near 33° N. lat. In the same manner the southern limit is found near the boundary between Peru and Chili, between 22° and 24° S. lat.

The reason why the range of the species south of the equator is several degrees less than on the north side, is obvious in the Antarctic current, which sets along the west coast of South America. In like manner, on the eastern coast of North America, a polar current appears to extend the Arctic Fauna of marine shells to 41° N. lat., and the cold current along the shores of the Middle and Southern States seems to limit the tropical Fauna to about 26° or 28° N. lat. on the coast, although on the east side of the Gulf Stream it extends to the Bermuda Islands in latitude 32° N.

It will also be seen in the following pages, that a large number of the species which occur at Panama were collected by Mr. Cuming at the Gallapago Islands. But if any of the species occur in the Polynesian Islands, the number does not exceed three or four, and in these cases the specific identity of the shells is very doubtful. The western boundary of the Panama province may therefore be made to include only the Gallapago Islands."—p. 5.

Professor Adams gives a list of 20 species collected by him at Panama and Taboga, which occur also at the Gallapago Islands, from which it appears, that a larger proportion of the littoral than of the pelagic known species are common to the Gallapago Islands, and the main land; and of the pelagic species, all which are known inhabit moderate depths.

With regard to the limits of the Caribbean province, Professor Adams remarks that very few of the Caribbean species "occur north of the Bahamas, or south of Brazil, although from various sources of error many of them have been reputed to inhabit England, and various other parts of the world. Although there are several analogous species in the two provinces, in general there is a great dissimilarity."

The author thus concludes his Introduction:—

"A great amount of valuable materials, for interesting generalizations on the number and distribution of the species of marine Mollusks, has been collected by public and private expeditions. But when we consider the immense profusion of species and of individuals in tropical seas, and the confusion of the habitats of many as exhibited in the present literature of conchology, so that the plan of distribution is misrepresented,—that which has been done only stimulates the curiosity to know more, and to know more accurately. An expedition of circumnavigation, with the specific object of investigating the distribution of the testaceous Mollusks, through several tropical marine provinces, would accomplish more than the discovery of many new species: it would determine the distribution of a much greater number, in a manner which would justly inspire confidence.

Taking up British authors, we refer in the first instance to Lyell's "*Principles of Geology.*"

Lyell, in chapter 40, refers to the influence of climate on the geographical distribution of Mollusks, and to the greater uniformity of temperature in the waters of the ocean, than in the atmosphere which invests the land, as a cause of the extensive diffusion of many marine species. He mentions that some genera are peculiar to warm latitudes, others to limited regions, but admits that we cannot as yet define the submarine provinces of shells, as botanists have the provinces of terrestrial and even sub-aqueous plants.

In treating of the great range of some species, Lyell is rather unfortunate, in some at least of those which he selects by way of illustration. He gives various habitats, implying a very wide range to *Sanguinolaria rugosa*, Lam.: we feel confident, however, that analogous, but distinct species, have been confounded.

The *Cypræa moneta*, he says, "a Mediterranean shell, occurs also in South Africa, the Isle of France, the East Indies, in China, the South sea, and even as far west as Otaheite." It is possible that an inhabitant of the Indian Ocean may have a wide range, even as far east as Otaheite, but as regards the Mediterranean as a *habitat* of this shell, we would refer to the following editorial note on the species, in Lamarck's *Anim. sans Vert.*, edition of Deshayes and Milne Edwards, vol. x, p. 537:—

"Cette espèce est mentionnée dans les catalogues des coquilles de la Méditerranée: elle se trouvait à Toulon, en Corse, en Sicile; mais personne ne dit avoir vu l'animal vivant. Cette coquille, ainsi que le *Cypræa annulus*, étaient, il y a peu d'années, l'objet d'un assez grand commerce, parce qu'elles servaient de monnaie dans la traite des noirs. N'est-il pas possible que des événemens maritimes, comme des naufrages, par exemple, soient la cause de la présence de ces espèces dans les régions de la Méditerranée les plus fréquentées par le commerce, car elles ne se rencontrent pas dans les régions sauvages des Côtes de Barbarie."

Lyell also observes, that *Helix putris* (*Succinea putris*, Lam.) "so common in Europe, where it reaches from Norway to Italy, is also found in Egypt, in the United States, in Newfoundland, Jamaica, Tranquebar, and, it is even said, in the Marianne Isles."

We venture to assert that this shell does not inhabit Jamaica. Professor Adams has personally, and with much care, collected terrestrial and freshwater shells in Jamaica, aided during several years, by the zealous exertions of many friends, but all have failed in meeting with *Succinea putris*.

Dr. Binney, in his work already mentioned, refers to this shell as "not uncommon" in the United States, on the authority of Forbes and Férusac, but only as an introduced species.

Darwin, in his admirable "*Journal of Researches*," comments on the distribution of shells in the Galapagos Archipelago, and no more instructive instance of the value of the study can be afforded. The author observes:—

"The natural history of these islands is eminently curious, and well deserves attention. Most of the organic productions are aboriginal creations, found no where else; there is even a difference between the inhabitants of the different islands; yet all shew a marked relationship with those of America, though separated from that continent by an open space of ocean between 500 and 600 miles in width. The archipelago is a little world within itself, or, rather, a satellite attached to America, whence it has derived a few stray colonists, and has received the general character of its indigenous productions."—p. 145.*

Darwin, after the above generalization, enters into particulars of the peculiar fauna and flora of these islands, from which we make the following extract:—

"Of land shells I collected sixteen kinds, (and two marked varieties,) of which, with the exception of the *Helix* found at Tahiti, all are peculiar to this archipelago: a single freshwater shell (*Paludina*) is common to Tahiti and Van Diemens Land. Mr. Cuming, before our voyage, procured here ninety species of sea shells, and this does not include several species not yet specifically examined, of *Trochus*, *Turbo*, &c. He has been kind enough to give me the following interesting results; of the ninety shells, no less than forty-seven are unknown elsewhere: a wonderful fact, considering how widely distributed sea shells generally are. Of the forty-three shells found in other parts of the world, twenty-five inhabit the western coast of America, and of these eight are distinguishable as varieties; the remaining eighteen (including one variety) were found by Mr. Cuming in the Low Archipelago, and some of them also at the Philippines. This fact of shells from islands in the central parts of the Pacific occurring here deserves notice, for not one single sea shell is known to be common to the islands of that ocean, and to the west coast of America. The space of open sea running north and south off the west coast separates two quite distinct conchological provinces; but at the Galapagos Archipelago we have a halting place, where many new forms have been created, and whither these two great conchological provinces have each sent several colonists. The American province has also sent here representative species, for there is a Galapageian species of *Monoceros*, a genus found only on the west coast of America; and there are Galapageian species of *Fissurella* and *Cancellaria*, genera common on the west coast, but not

* Prof. Edw. Forbes alluding to the fauna and flora of the Galapagos Islands, observes, "We have distinct systems of creatures related to those of the nearest land by representation, or affinity, and not by identity."—*Mem. Geol. Soc. of Gr. Britain*, vol. i, p. 402, Note.

found, (as I am informed by Mr. Cuming,) in the central islands of the Pacific. On the other hand, there are Galapageian species of *Oniscia* and *Stylifer*, genera common to the West Indies and to the Chinese and Indian seas, but not found either on the west coast of America, or in the central Pacific. I may here add, that after the comparison by Messrs. Cuming and Hinds of about 2,000 shells from the eastern and western coasts of America, only one single shell was found in common, viz., the *Purpura patula*, which inhabits the West Indies, the coast of Panama, and the Galapagos. We have, therefore, in this quarter of the world, three great conchological sea-provinces, quite distinct, though surprisingly near each other, being separated by long north and south spaces either of land or of open sea."—p. 162.

Professor Edward Forbes in his able paper, "*On the connection between the distribution of the existing Fauna and Flora of the British Isles, and the Geological changes which have affected their area, especially during the epoch of the Northern Drift*," published in the first volume of the "*Memoirs of the Geological Survey of Great Britain*," (London, 1846,) gives a sketch of the distribution of marine Mollusca on the British shores, chiefly the results of his own observations. Prefatory to this sketch, he observes,—

"Our knowledge of the species and distribution of the British Mollusca is very complete, and sufficient to enable us to apply it to the elucidation of geological problems with safety and effect. When we consider the perfect state in which the testaceous species are preserved, and the facility of specific identification afforded by their shells, this becomes of great importance. In all questions respecting the age of sedimentary strata, the evidence afforded by the fossilized remains of the Mollusks must, from its completeness, always take precedence of that derived from any other class of animals. Though our native existing species have been well determined, there is no one work upon them, to which the geologist can be referred with safety, nor any comprehensive essay as yet published on their distribution."

Having cursorily traced the progress which has been made in the study of the geographical distribution of shells, (so far as a reference to a limited library would permit,) with the particular view of shewing its value, and at the same time the incompleteness of our knowledge with regard to any one zoological province, we would point out the causes which have given rise to many errors of fact and opinion on the subject, and seriously tended to impede its advancement.

These causes unquestionably are, to use the language of Dr. Gould, (*Introduction to the Mollusca of the Expedition Shells*), that "reliable notes of localities have not been taken," and that shells "are regarded as specifically identical, which, on careful comparison, are found not to be so." To these, we think, a third

may very justly be added,—the confined views entertained by authors as to the origin of species.

With respect to the first, Dr. Gould remarks truly :—

“A voyage is made to the Sandwich Islands, and all the shells brought home by the vessel are said to be shells from the Sandwich Islands, though they may have been obtained at California, the Society Islands, New Zealand, and, perhaps, half a dozen other places quite as remote from each other. A sea captain purchases a collection at Calcutta or Valparaiso, for his friends at home; and all the shells are marked as denizens of the port where they were purchased, though they might not have lived within thousands of miles. Purchased shells cannot be relied on for localities; for this end a shell must have been found containing the animal, or else dredged, or picked up on the shore, and labeled accordingly.”—p. ix.

In support of his view as to the second cause of error, Dr. Gould gives various instances, shewing the difficulty which is frequently experienced in the detection of specific differences, and offers remarks deserving the anxious attention of conchologists. He writes :—

“When, therefore, we have before us shells from widely diverse regions, apparently identical, they should be subjected to the most careful scrutiny for structural differences. If no obvious ones are detected, we may not consider the question as settled, unless the animals have been compared; and we may go even further, and require that their internal structure, as well as external features, should be examined. The number of instances where this apparent ubiquity obtains is fast diminishing, as in the cases already mentioned, in those of *Cyprea exanthema*, *Cervina* and *Cervinetta*, &c. A large proportion of the shells inhabiting the eastern and western shores of the Atlantic, have been regarded as identical; and many of them are really so. But the closer the comparison, the more it tends to diminish rather than increase the identical species. The same is found true in regard to other classes of animals. In fact the doctrine of the local limitation of animals, even now, meets with so few apparent exceptions, that we admit it as an axiom in zoology, that species strongly resembling each other, derived from widely diverse localities, especially if a continent intervenes, and if no known or plausible means of communication can be assigned, *should be assumed as different, until their identity can be proved.** Much study of living specimens must be had before the apparent exceptions can be brought under the rule.”—p. x.

* Collectors, whose attention has not been directed to geographical distribution, are frequently misled, and may unconsciously mislead others, by their habit of labeling a shell found in the *province* in which they reside, with the identical name given to a shell from a totally *different province*, because it agrees generally with the figure and description met with in some conchological work, perhaps itself not particularly distinguished for accuracy as regards habitat.

Professor Adams, in his catalogue of Panama shells, carefully adds the *stations*, and *habitat* of each species, from the authorities to which he refers in its *synonymy*,* as well as from his own experience,† and distinguishes *original*, from other testimony. He remarks in the Introduction, “on errors respecting the habitat of species,” from which we subjoin extracts,—we refer our readers to the work itself for various useful illustrative notes.

“Those who are familiar with the frequency and magnitude of the errors which occur in the works of the most celebrated authors respecting the habitats of species, will not probably accuse us of presumption for the little ceremony with which we have treated such statements. Hearsay testimony has often been received without sufficient scrutiny. In addition to the errors likely to occur in the verbal communication of statements respecting habitat, naturalists at home are of course subject to all the mistakes which the original collectors have made. These persons often mix the collections made in various places, and depend on memory for the localities, although they are often unable to distinguish the species when placed side by side.

Another class of errors, we fear, must be laid to the charge of the writers themselves. When we see a marine species affirmed to inhabit the Mediterranean, Senegal, the Indian Ocean, New Holland, &c., we may often suspect the error to arise more or less from erroneous testimony. But when one species is referred to two distinct zoological provinces, which are known to contain analogous but not identical species, we must sometimes suspect the author of confounding such species.”—p. 24.

“For all these causes of error there is but one remedy, and that is not infallible. Rejecting the testimony of careless and incompetent observers, and all hearsay testimony, we must rely on the testimony of competent observers. We may hope for accuracy when they shall remember, that a very few errors may essentially change the aspect of the plan of distribution, and prevent all correct generalizations.”—p. 25.

It would be unfair to withhold a statement of the opinion of Dr. Binney on this branch of our subject. His chapter in the work previously mentioned, we refer to vol. 1, chap. iii, entitled “Of some of the obstacles impeding the study of zoology, and the means of overcoming them,” is unquestionably replete with interest. In his comments, contained in that chapter, on the hy-

* The plan pursued by Professor Adams as regards synonymy, is worthy of universal adoption. The synonyms are arranged in chronological order, and the dates of the authorities referred to are added.

† *Station*, says Lyell, speaking of plants, indicates the peculiar nature of the locality where each species is accustomed to grow,—by *habitation* is meant a general indication of the country where a plant grows wild. The terms so defined, he adds, express each a distinct class of ideas, which have been often confounded together, and which are equally applicable to zoology.—*Principles of Geology*.

pothesis, "that the animals of the respective continents, however near their affinities may be, are in every case specifically distinct from each other," he observes:—

"The question of the identity of these closely allied species must eventually be decided by their anatomy, but in the mean time we believe it to be perfectly safe to adopt this axiom, that species, whencesoever derived, possessing the same characters, are identical. We view this to be a more rational course than to consider them to be the *analogues* of each other, a convenient but indefinite mode of expression, which may be used to cover every degree of similitude from a general analogy to a close affinity hardly admitting of distinction."—p. 76.

We are quite alive to the danger which exists of the abuse, by naturalists, of the hypothesis which Dr. Binney deprecates, but we must not argue against its use, from its abuse.

Judging from the general tenor of Dr. Binney's work, we do not hesitate to assert our belief, that had he lived to pursue the subject further, he would not only have concurred in the views expressed by Dr. Gould, and entertained by him in common with many of the most eminent men of the day, but himself have largely contributed to our knowledge of *analogous* species.

Our limits do not permit us to enter as fully into the question of the origin of species, as its very important connection with that of geographical distribution demands.

Professor Forbes, in his before-mentioned paper in the "*Memoirs of the Geological Survey of Great Britain*," takes for granted, at the outset, "the existence of specific centres, i. e., of certain geographical points from which the individuals of each species have been diffused." He adds:—

"This indeed must be taken for granted if the idea of a species, (as most naturalists hold,) involves the idea of the relationship of all the individuals composing it, and their consequent descent from a single progenitor, or from two, according as the sexes might be united or distinct."—p. 336.

Again, he writes, "My main position may be stated in the abstract as follows, viz., the specific identity to any extent, of the flora and fauna of one area with those of another, depends on both areas forming or having formed, part of the same specific centre, or on their having derived their animal and vegetable population by transmission, through migration, over continuous or closely contiguous land, aided, in the case of alpine floras, by transportation on floating masses of ice."—p. 350.

Lyell, in his *Principles of Geology*, refers most of the exceptions to the general rule, that distinct groups of species occupy separate regions, to "disseminating causes now in operation," and proposes the following hypothesis:

"Each species may have had its origin in a single pair, or individual, where an individual was sufficient, and species may have

been created in succession, at such times, and in such places as to enable them to multiply and endure for an appointed period, and occupy an appointed space on the globe." p. 642.

We see in the writings of these authors a constant recurrence to *physical agents*, as the sole cause of the distribution of the individuals of a species,—no suggestion that the contemporaneous introduction of several original individuals was part of the Divine plan of the Creator. "There will be no *scientific* evidence of God's working in nature," says Professor Agassiz, "until naturalists have shown that the whole creation is the *expression of a thought*, and not the *product of physical agents*."—*Lake Superior*, (Boston, 1850,) p. 145.

"However active physical agents may be, it would be very unphilosophical to consider them as the source or origin of the beings upon which they show so extensive an influence. Mistaking the circumstantial relation under which they appear, for a causal connection, has done great mischief in natural science, and led many to believe they understood the process of creation, because they could account for some of the phenomena under observation."—*Lake Superior*, p. 142.

May we not fairly remark, that Lyell, Forbes, Darwin, and other writers, overlooking the theory, that the existing species were introduced by the creation of many individuals, have been often driven to forced constructions, and applications of the effects of physical agents, to support their views as to the unity of the origin of species, and other opinions.

Dr. Binney adopted the theory of several distinct centres or foci from which species radiated, and, in his work already cited, remarks that the axiom in the philosophy of zoology, that distinct zoological regions exist, has been greatly fortified by it.

After reasoning on the subject, he adds:—"Having thus adopted the theory of distinct zoological centres, and admitting that as successive portions of the earth's surface emerged from the waters, and became adapted to sustain the different classes of animals, those races which were fitted for the then physical condition of things, were brought into being by the prolific hand of nature, we find no difficulty in supposing that under the same or similar conditions, the same species may have been created at different centres. In this way the presence of species in every part of the earth may be accounted for, and thus only can we satisfactorily explain the diffusion of the species that have been under consideration."—Vol. I, p. 148.

Prof. Agassiz in a paper on the "Geographical distribution of Animals," in the *Christian Examiner*, (Boston, March, 1850,) examines, in a masterly manner, the question of the plurality of origin of species. The following is his view of the natural distribution of animals;—"that they originated primitively over the whole extent of their natural distribution; that they originated there, not in pairs, but in large numbers, in such proportions as suits their natu-

ral mode of living, and the preservation of their species; and that the same species may have originated in different unconnected parts of the more extensive circle of their distribution."—p. 192.

Professor Agassiz enters upon the same subject in an article in the July number of the *Christian Examiner*, to which we also refer our readers.

Prof. Adams states in his *Contributions*, No. 6, the conclusions at which he had arrived from a careful study of the land shells of Jamaica.

"The distribution of the terrestrial Mollusks in Jamaica, (and probably of all Mollusks in all parts of the world,) is most easily accounted for by the following hypothesis:—that the introduction of the existing races was effected by the creation of many individuals, and that they were modelled after certain types, which were mostly local, and between which there existed, as at the present day, unequal differences, from those which merely distinguish individuals, to those of varieties, of species, of groups of species, of genera," &c. The author subsequently observes, "of course the doctrine of contemporaneous origin must have a geological latitude."

We add the explanatory statement from No. 10:—"The proof of this proposition is found in the geographical distribution of the varieties. In the great majority of species, the varieties are so distributed, that the space which is occupied by one of them coincides with that of other two or more. Now, if the circumstances of locality had produced the local types by modifications of one original type of the species, then all the varieties which inhabit a locality should have been affected. In that case, all the varieties in any given place would have the same geographical limits. But the contrary more frequently occurs. Each variety has its own limits of distribution. If a few coincide in the boundary of their province, on the other hand one is often found to have an extent of distribution, which is equal to that of two or more other varieties. But such a geographical coincidence of one variety with several other varieties is inconsistent with any other theory than that of an original constitutional peculiarity of character in each variety. This inference is confirmed by the occasional intermingling in one locality of varieties, which differ from each other as much as those which occupy distinct regions. If then we assume the original independent creation of all the varieties, each originally represented by at least several individuals, the facts of distribution become explicable with the greatest facility. The same statements might be made respecting entire species, and even groups of species and genera. Some are very local, and others, more widely distributed, occupy the ground of several local species. We have then indistinct varieties, distinct varieties, doubtful species, good species, and groups of species, and all the intermediate types, distributed in the same manner."

873

Notes on certain Terrestrial Mollusks which inhabit the West Indies.

By T. BLAND. Read June 4 and Oct. 22, 1855.

I. ON THE OCCURRENCE OF PUPA BICOLOR HUTTON IN THE ISLAND OF ST. THOMAS.

Shortly after communicating to the Society Mr. R. J. Shuttleworth's Catalogue of the Terrestrial and Fluvial Shells of St. Thomas (Ann., Vol. iv., p. 68), I received another species, which had just been discovered in that island, viz. *Pupa bicolor* Hutton.

A dead shell was found there in February, 1854, by one of the family of Mr. A. H. Riise, and a considerable number of live and dead specimens have since been collected in the same locality, near the town, in "Berg's Garden" by the "Gut" which runs behind the Protestant Episcopal Church.

On receipt of some of the shells I submitted them to Mr. J. H. Redfield, who determined the species.

Benson, in Ann. and Mag. of Nat. Hist., Vol. iv., 2d series (1849), mentions that the beautiful vermilion and yellow tints (seen through the shell, which is diaphanous and colorless), first attracted his attention to the animal in Bundelkhund in 1825, and that he subsequently took it at the foot of the Himalayas, in Rohilkhund; in the Do-ab of the Ganges and Jumna; at Jounpore and Mirzapore, in the Benares division, north and south of the Ganges; and on the west bank of the Hooghly river, near Calcutta. In 1847 he met with it at Point de Galle in Ceylon, and Dr. Cantor found it, though rarely, in Pulo

Penang. Benson did not collect it at the Mauritius, though Pfeiffer ascribes it (*P. Largillierti* Phil.), on the authority of Largilliert, to the Isle of Bourbon.

Benson says that *Pupa bicolor* "shelters itself in the ground under the loose stones, bricks, or wood." At Bhamoury, he got it "by digging at the root of a tree." The *station* of the species is the same in St. Thomas.

Pupa bicolor belongs to *Ennea*, a subgenus of *Pupa*, proposed by H. and A. Adams in their *Genera of Mollusks*. Pfeiffer, in *Malak. Blatt.*, 1855, enumerates 22 species, of which 14 inhabit Africa and adjacent islands, including Madagascar,—4 the East Indies and Ceylon,—the habitat of the remaining 4 being unknown.

The occurrence of this species in the Island of St. Thomas, W. I., is extremely interesting. Hitherto it has only been known as having the wide distribution in the East, described by Benson, and it belongs to a subgenus (founded on the characters of the shell) not otherwise represented in the Western Hemisphere.

Under these circumstances, and considering the recent discovery of the species in a limited area near the town and harbor of St. Thomas, I can only look upon it as having been accidentally introduced by the agency of man.

II. ON THE ANIMAL OF PROSERPINA.

In a paper published in the *Annals of the Lyceum* (vol. iv., p. 75), I explained that the animals of the species embraced in the Fam. *Helicinacea*, and also in the genus *Proserpina*, destroy the spiral column and septa of their shells. In another paper (*Ann.*, l. c., p. 77), I showed that *P. opalina* C. B. Adams, having the spiral column and septa entire, must be restored to *Helix*, in which genus Adams originally placed it, and I proposed for it the specific name, *infortunata*.

Examination of the animals of this species, and of species of Proserpina, has proved the accuracy of the conclusion derived from the shells alone.

The Hon. Edw. Chitty, on the receipt of copies of my papers, informed me of his previous discovery that the animal of Proserpina is nearly allied to that of Helicina, having one pair of tentacles only, with eyes at their external bases, the head produced into a "snout," while the animal of *P. opalina* is the same as of Helix.

Mr. Chitty has since verified his description of the animal, and M. Poey confirms its correctness as to the number of tentacles, having examined the animal of the Cuban species.

The characters of both animal and shell are such as to suggest the possible existence of an *operculum*, but Chitty and Poey have not been able to detect any such appendage.

D'Orbigny, in Moll. Cuba I. (1841), judging from the shell alone (though he failed to find an operculum), and as Poey expresses it, "por un feliz presentimiento," included Proserpina (under the generic name of *Odontostoma*) with Helicina and Cyclostoma, in *Cyclostomida*, while Poey in his "Memorias," vol. i., p. 392, having knowledge of the animal, establishes the family *Proserpinacea*.

The discovery of the nature of the animal of Proserpina is of great interest, with especial reference to the question of the value of the operculum, in any natural arrangement of the Terrestrial Mollusks having two tentacles with basal eyes.

Pfeiffer, in his Monographia, and Gray in the British Museum Catalogue, place all such Mollusca in the Order *Pneumonopoma*, which they divide into the two sub-orders, *Opisophthalma* and *Ectophthalma* (with reference to the position of the eyes behind or in front of the tentacles), the former Order including the Family *Aciculacea*, and the latter *Cyclostomacea* and *Helicinacea*; one of the characters of the Order, and of course of the sub-

orders and families, being an operculum. These authors, moreover, in the further subdivisions into genera, rely greatly, and in my opinion unduly, on the nature of the operculum.

The arrangement thus briefly described, must therefore be remodelled, since it now improperly excludes *Proserpinacea*, which family, though inoperculate, is from all its other characters, both of animal and shell, entitled to admission into the same Order which contains the sister family *Helicinacea*.

III.—ON THE STRUCTURE OF THE AXIS OF THE SHELL OF CYLINDRELLA.

On a late examination of some of the Jamaica *Cylindrellæ*, I noticed the curious structure of the axis of *C. elatior* C. B. Ad., and was led to compare it with other species. Looking at these shells externally, it has probably been assumed that the axis is perpendicular, supporting the revolving septa, in the same manner as a column forms the central support of a spiral stairway. This is not, however, universally the case. I was surprised to find that the axis in *C. elatior* (Pl. v. fig. 19) is spiral, the diameter of the volutions increasing gradually towards the base of the shell, and to such an extent as to exhibit, looking into the aperture, an open perforation, equal to about one-third of the diameter of the shell; the lower whorls being like a spiral stairway constructed with a conical well-hole, instead of a column.

The formation of the axis in *C. tenera* C. B. Ad., and *C. tenella* C. B. Ad., is the same, and also, I imagine, in the other Jamaica allied species, although the fact is not discoverable on examination of their apertures.

The structure of *C. Agnesiana* C. B. Ad., is shown in Pl. v. fig. 16. In other species the axis has revolving lamellæ,—there are two in *C. pruinosa* Mor. (Pl. v. fig. 17), and from three to six in *C. Oviadoiana* Orb., within each of the whorls,—the number increasing towards the base of the shell.

I directed the attention of Poey to the formation of *C. elatior*, and he sent me a specimen marked *C. Oviadoiana*, and opened so as to exhibit the extraordinarily developed lamella shown in Pl. v. fig. 18. I have since detected the same in two other specimens; in one it is on the outer side of the axis in the second whorl, and in the other, it extends from the third to the second whorl, counting upwards from the base.

On subsequent more careful examination, Poey found the axis of *C. Oviadoiana* as I have above stated, and that the shell forwarded to me, of which he had other specimens, is of a different species,—the large lamella figured being constant, as well as other characters sufficiently distinguishing it. He has described it as *C. strangulata*.

Observations on the internal structure of shells are not devoid of scientific value, aiding in the determination of the genus, as in the case of *Proserpina opalina*, and of the species in that of *Cylindrella strangulata*.

IV.—CORRECTIONS AND ADDITIONAL FACTS, ESPECIALLY AS TO THE HABITAT OF SUNDRY SPECIES.

HELIX CASSIQUIENSIS NEWCOMB, M. S.

Pfeiffer and Reeve erroneously attribute this species to Cuba. Dr. Newcomb assures me that he collected it near the Cassiquia Creek, in Demerara, from whence its specific name.

HELIX COGNATA FER.

No habitat is assigned by authors to this species. It is from Jamaica, and I am indebted to the Hon. E. Chitty for several fine specimens.

HELIX CONSPERSULA PFR.

This is also a Jamaica species, from whence I have received it,—it is by no means abundant.

HELIX CORNU-MILITARE L.

Pfeiffer refers this fine species, on the authority of Dr. Jay, to the Sandwich Islands. Many individuals were collected in 1853 in that part of the Island of Haiti, which constitutes the Dominican Republic, by Sallé, who favored me with a specimen.

HELIX FORMOSA FER.

This species has been generally attributed to Guadaloupe. I have received a considerable number, one with the animal alive, from the Rev. A. Hamilton, who collected them in Antigua.

HELIX ORBICULATA FER.

Pfeiffer gives Guayana and Cayenne as habitat; numerous specimens were presented to me by the late Mr. J. M'Murray, collected by him in St. Lucia.

HELIX PALLASIANA PFR.

Bermuda is stated by Pfeiffer, erroneously I believe, to be the habitat of this species; he refers to the shell as in Mr. Cuming's possession. In the cabinet of Mr. Lounsbury, I lately detected a shell which agrees pretty closely with Pfeiffer's description, entirely so with Reeve's figure, and identical with two specimens unnamed in the collection of Mr. J. H. Redfield, received from Dr. Newcomb, as from the Bonin Islands. Mr. Shuttleworth informed me in 1854, that he had an individual of this species from Mr. Cuming, who gave as habitat, the Corean Archipelago. I found no trace of it in Bermuda, nor did the late Professor C. B. Adams.

HELIX PENICILLATA GOULD.

Dr. Gould admits, in correspondence with M. Poey and myself, that his shell is a variety of *H. Cubensis* Pfr. I do not know *H. penicillata* Pfr., Mon. iii. No. 1287.

HELIX SAGRAIANA D'ORB.

This hitherto rare species has recently been rediscovered by Dr. Gundlach, with others equally interesting, in the mountains between Guajaibon and Rangel, from twenty to thirty leagues west of Havana. Pfeiffer describes (Mon. i.) a shell under this name, attributing it to California, on the authority of Sowerby—he probably refers to Orbigny's species, being in error as to the habitat. Poey (Memorias i.) suppresses it as a Cuban species, evidently misled by Pfeiffer.

I would here acknowledge my great obligation to Dr. Gundlach for specimens of this and other rare Cuban shells, contributed by him to my cabinet, in the most handsome and liberal manner.

HELIX SIMILARIS FER.

Among shells lately received through me from Barbadoes, Mr. Shuttleworth detected this widely distributed species. Pfeiffer gives Cuba as one of its localities, on the authority of Rang, but it has not been discovered or communicated to Poey, who excludes it in his Cuban catalogue.

BULIMUS AULACOSTYLUS PFR.

This species was described in the Annals of the Lyceum, Vol. iv. p. 14 (May, 1854), as *B. lentiginosus*, by Mr. J. H. Redfield. Pfeiffer's description was *read* before the Zoological Society of London, in March, 1852, but first *published*, I believe, in the third volume of his Monographia, the introduction to which bears date May, 1853. The delay in the publication of the Society's Proceedings was certainly very inconvenient, leading to doubt and uncertainty as to priority. Pfeiffer, on the authority of the Rev. E. Hartvig (not Hartwig), in Mus. Cuming, ascribes the species to St. Lucia. It was collected by the late J. M'Murray, who gave specimens to Mr. Hartvig, as he informs me, as from St. Lucia. Mr. H. sent the shell to Mr. Cuming. I received several specimens

from Mr. M'Murray, with a written note as to its station and habitat for the information of Mr. Redfield. The note in question fixes as habitat the district of San Fernando, in the Island of Trinidad, and also a spot near the junction of the Massaroony and Essequibo rivers, in Demerara.

CYLINDRELLA TRICOLOR PFR.

Mr. Shuttleworth found this pretty species, to which no habitat is assigned by Pfeiffer, among Jamaica shells received by me from the Rev. F. R. Holland. A number of specimens collected in that island have since been sent to me by Mr. Chitty, who has described it in his Contributions to Conchology, No. i. p. 11, as *C. Mangeri* Wood var. *raphivina*.

CYCLOSTOMA VERSICOLOR PFR.

The habitat of this species is not given by authors. I received three specimens from Mr. M'Murray, which were, he assured me, collected by himself in Jamaica. Mr. Shuttleworth determined the species.

CYCLOSTOMA RUFILABRUM BECK. BILABRE MENKE.

Specimens have lately been collected in St. Croix, on estates "Rust op Twist," and "Cane Bay," by Mr. A. H. Riise, of St. Thomas, from whom I have received a great number. Menke admits, I am informed, that it is his *bilabre*, which he ascribed erroneously to New Holland.

CYCLOSTOMA BEAUJANUM PET.

This Guadeloupe species was described by Mr. J. H. Redfield, in the Annals of the Lyceum, Vol. iv. p. 131, under the name of *C. inornatum*. I have since received specimens from M. Petit.

ON THE
GEOGRAPHICAL DISTRIBUTION
OF THE
GENERA AND SPECIES OF LAND SHELLS
OF THE
WEST INDIA ISLANDS,
WITH
A CATALOGUE OF THE SPECIES OF EACH ISLAND.

BY
THOMAS BLAND, F.G.S., LONDON,

MEMBER OF THE LYCEUM OF NATURAL HISTORY, NEW YORK; CORRESPONDING MEMBER OF THE
ACADEMY OF NATURAL SCIENCES, PHILADELPHIA, &c.

REPRINTED FROM THE ANNALS OF THE LYCEUM OF NATURAL HISTORY, NEW YORK.
VOL. VII.

NEW YORK:
BAILLIÈRE BROTHERS, 440 BROADWAY.

LONDON:
H. BAILLIÈRE,
219 REGENT ST.

MELBOURNE:
F. BAILLIÈRE.

PARIS:
J. B. BAILLIÈRE ET FILS,
RUE HAUTEFEUILLE.

MADRID:
B. BAILLY-BAILLIÈRE,
CALLE DEL PRINCIPE.

1861.

To

THE MEMORY OF

CHARLES B. ADAMS,

LATE PROFESSOR OF ZOOLOGY IN AMHERST COLLEGE, MASS.;

WHO DIED IN JANUARY, 1853, AT THE ISLAND OF ST. THOMAS, WEST INDIES,
IN THE THIRTY-NINTH YEAR OF HIS AGE;

AND

OF HIS ELDEST SON,

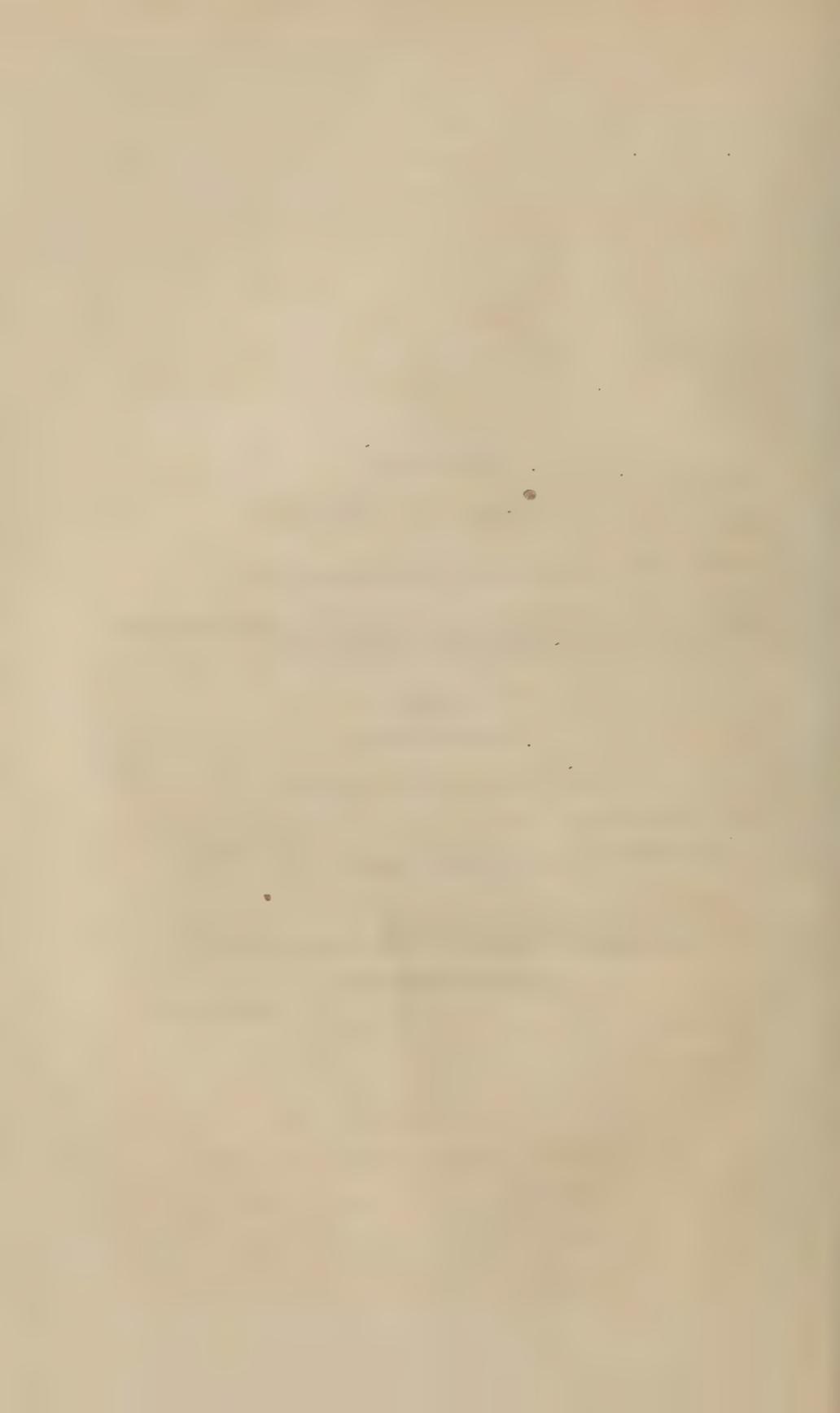
CHARLES B. ADAMS,

WHO DIED IN BROOKLYN, LONG ISLAND, N. Y., IN SEPTEMBER, 1861,
AT THE EARLY AGE OF TWENTY YEARS,

THIS PAPER, ON A SUBJECT WHICH MUCH INTERESTED THE LATTER, AND TO OUR
KNOWLEDGE OF WHICH THE FORMER LARGELY CONTRIBUTED,

Is affectionately Dedicated

BY THE AUTHOR.



P R E F A C E .

My attention was especially directed to the subject of the distribution of the land shells of the West Indies in 1849, by Professor C. B. Adams, with whom I then, in the island of Jamaica, had first the pleasure of becoming acquainted. In conjunction with the Hon. Edward Chitty, I aided him in his researches in that island. During the same year, after his return to the United States, Professor Adams commenced the publication of his "Contributions to Conchology." I continued in correspondence with him until the middle of 1852, in the Autumn of which year I resided for several months at Amherst; he was then engaged in issuing his admirable work on the Shells of Panama.

Zoological Geography at this time very much engrossed the attention of Prof. Adams, as well as my own; and our discussions on the subject resulted in the publication by him, in No. 11 of the "Contributions," (Oct., 1852) of a paper entitled "Hints on the Geographical Distribution of Animals, with especial reference to the Mollusca," and by myself, in the American Journal of Science and Art (Nov. 1852) of one bearing the title of "Facts and Principles relating to the Origin and the Geographical Distribution of Mollusca."

In order to improve his impaired health, and earnestly wishing to complete the collection of facts, with a view to an elaborate work on the Caribbean Zoological Province, Professor Adams determined upon a visit to the West Indies. He left New York for the Island of St. Thomas early in December, 1852, arrived there on the 17th, and took up his abode, as he had been kindly invited to do, with our mutual friend, Mr. Robert Swift. On the 18th of the same month the Professor wrote to me, describing the great number of individuals of marine and terrestrial species of shells which he had collected during a stay at Bermuda, on his passage to St. Thomas, of less than forty-eight hours. As an illustration of his activity and enthusiasm, I extract the following passage from the letter referred to, the last which I received from him:—"I was perfectly enraptured with Bermuda for scenery and shells. I must have taken three or four thousand specimens, not yet assorted.

It will be curious to learn the distribution of the land shells on the different islands. Mr. John H. Redfield, you, and myself must make a special expedition to Bermuda, have a skiff, and visit them all."

At the end of December the Professor was attacked by a fever then prevalent, and died on the 19th of January, 1853. A tablet in the graveyard at St. Thomas, recording that it was "erected by his friends, resident in the United States, who appreciated his worth, and sympathized with him in his pursuits," marks the spot where his remains repose.

After the death of Professor Adams, Mr. John H. Redfield and myself, at the request of his widow, Mrs. Mary H. Adams, took charge of his duplicate shells, and I continued much of his correspondence.

Enjoying such, and other great advantages, especially the active co-operation of my esteemed friend Mr. John H. Redfield, I pursued the study of the West India land shells.

It would be difficult to enumerate the names of all to whom I have been indebted for information and specimens, but I have mentioned many in the Notes appended to the annexed Catalogue. To all I offer my grateful acknowledgments, particularly to my worthy friend Mr. Hugh Cuming, of London, for his unvarying kindness and liberality.

I should also express my great obligations to Professor Poey and Dr. Gundlach of Havanna; to them Naturalists generally owe very much of their knowledge of the fauna of Cuba. From an intimate correspondence with the former (carried on since 1852), I personally have derived much instruction and encouragement.

The invaluable Monographs, and other works of Dr. Pfeiffer, have afforded assistance, the importance of which cannot be over-estimated.

The subject of Zoological Geography has latterly met with increased, and I may add, since the appearance of Mr. Darwin's remarkable work on the Origin of Species, increasing attention.

The facts as to the distribution of land shells compared with that of other organized beings, are peculiar, and this appears to be an appropriate time for the publication of such data and information as I have collected on the questions involved.

Accordingly, and in performance of the obligation which I assumed on the decease of Professor Adams, I have prepared the subjoined paper.

By a strange and sad coincidence I received, a few months ago, much assistance in the compilation of the Catalogue and Tables from the Professor's son, my young friend, Charles B. Adams, whose recent untimely death I sincerely lament.

T. BLAND.

On the Geographical Distribution of the Genera and Species of Land Shells of the West India Islands; with a Catalogue of the Species of each Island.

BY THOMAS BLAND.

Read, June 17, 1861.

Reprinted from the Annals of the Lyceum of Natural History, New York.

THE researches carried on, especially during the last fifteen years, have developed the extraordinary richness in *Land Shells* of the West India Islands. To the late Professor C. B. Adams belongs to a great extent the merit of directing the attention of Naturalists to the subject, and it has, since the result of his first visit to Jamaica was published, been zealously followed up.

The West Indies consist of a curvilinear chain of islands extending in a south-east and then southerly direction from the coast of Florida in North America, to the Gulf of Paria, on the east coast of Venezuela in South America. The portion of the Atlantic Ocean, in a manner inclosed by these islands and the shores of the adjacent continents, is divided into two great basins—the Gulf of Mexico and the Caribbean Sea. The former is separated to a considerable extent from the latter by the Island of Cuba, the western end of which lies about midway between Florida and the peninsula of Yucatan; the distance from the island to Florida being about 140, and to Yucatan about 120 miles. The Gulf of Mexico is about 1000 miles long, and has an average width of 650, or thereabouts. The Caribbean Sea is in length 1400, and in width at the narrowest part about 400 miles.

The islands are divided into three groups, viz. the Bahamas, the Great Antilles (Cuba, Jamaica, Hayti, and Porto Rico), and the Lesser Antilles; the area of the first group is estimated to be 5,424, of the second 75,638, and of the last, 4,961 square miles. Of the great Antilles, Cuba, with the Isle of Pines,

contains 43,412, Jamaica 4,256, and Porto Rico 2,970 square miles; the area of Hayti is said to be about 25,000 square miles. The area of the whole, including the Bermuda group, and also Curaçao and Buen Ayre, being less than that of England, with Wales and Scotland.

The Bermudas are situate in the Atlantic Ocean, 580 miles E. by S. from Cape Hatteras, and 645 miles N. E. from the nearest point of the Bahamas.

Looking cursorily at a map, the idea is suggested that the West Indies formed at some period a part of the adjacent continents, but there is no conclusive, if indeed any evidence of the fact.

The depth of the basin in which the waters of the Gulf of Mexico are held is very great: on the north side of Cuba, within five miles of the shore near Havana, there is an abrupt descent to the bottom of nearly a mile! Still greater depths exist in the Caribbean Sea. The islands, in fact, stand as pinnacles resting on the solid crust of the earth in the watery abyss. There is evidence to show, that the last important geological movement of the greater number, if not of all the islands, and of the adjacent parts of the contiguous continents, was of an elevatory character. The geological changes, indeed, which have occurred since the islands can have formed part of any continent, must have been enormous.

Humboldt (*Cosmos*, v. p. 421) remarks on the parallelism of the volcanic fissure extending from south to north through the islands of St. Vincent, St. Lucia, Martinique, and Guadeloupe, with that of Central America, and also on the intersection of a great basin of which, in his view, the Gulf of Mexico and Caribbean Sea form a part, by the plutonic mountain chain ranging from west to east, from Cape Catoche in Yucatan, through Cuba, Haiti, and Porto Rico to Tortola and Virgin Gorda, parallel with the granite and gneiss chain of Caraccas.

The mountains in Cuba, Jamaica, and Hayti, attain a height of from 7,000 to 8,000 feet; further to the eastward they de-

crease in height, being in Porto Rico under 4,000, in the Virgin Islands less than 2,000, and in Virgin Gorda only a few hundred feet. The strait which lies between Virgin Gorda and Anguilla separates the region just referred to from the islands to the south, in some of which there is still active volcanic agency. In this latter chain of islands, the mountains rise from 2,500 to 5000 feet. Anguilla, at the northern extremity, and Barbuda and Barbadoes to the eastward of the chain, have comparatively but little elevation.

The number of species of land shells described by Pfeiffer in his Monographs and publications of later date, exceeds 6000, of which nearly one-sixth inhabit the West Indies.* This appears, perhaps, the less extraordinary, when it is considered that about one-half of all the known species are peculiar to islands.

Darwin, in his "Origin of Species," remarks:—"The species of all kinds which inhabit oceanic islands are few in number, compared with those on equal continental areas. Alph. de Candolle admits this for plants, and Wollaston for insects." The author adds, "Although in oceanic islands the number of kinds of inhabitants is scanty, the proportion of endemic species (*i. e.* those found nowhere else in the world) is often extremely large." Dr. J. D. Hooker, in his "Introductory Essay to the Flora of Tasmania," observes, that the total number of species which islands contain, seems to be invariably less than an equal continental area possesses; and the relative numbers of species to genera (or other higher groups) are also much less than in similar continental areas."

Now it is true with respect to land shells, that the proportion of insular endemic species is great, but the number of species, and also their number relatively to genera, far exceed in amount those which inhabit equal continental areas. By way of illus-

* In using the general term "West Indies," I include Bermuda, and also Curaçao, and the adjacent island of Buen Ayre.

tration, I may mention, that the entire American continents, from Greenland to Cape Horn, have afforded very few more species than the West India Islands.

Prof. C. B. Adams notices (*Cont. to Conchology*, p. 213) that if large groups of such islands as the West Indies should be united in a common area of dry land, "there would be Zoological provinces containing five to tenfold as many species as any which now exist."

Darwin refers to the striking and important fact in regard to the inhabitants of islands, that their affinity is "to those of the nearest mainland without being actually the same species." He instances the Gallapagos Archipelago, "where almost every production of the land and water bears the unmistakable stamp of the American Continent." This instance, as regards land shells, is peculiarly appropriate. In the Gallapagos, *Bulimus*, the genus most largely developed in South America, is alone represented. Dr. Hooker, in the Essay already referred to, asserts "that most of those Australian orders and genera which are found in other countries around Australia, have their maximum development in Australia at points approximating in geographical position towards those neighboring countries." The generic affinity of the land shells of the West India Islands to those of the adjacent parts of the American Continents is certainly intimate, but the existence of several genera not represented on the Continents shows other relationships—the operation, it may be, of local causes. Seeing, moreover, the greater number of both genera and species, absolutely and proportionately, in the islands under consideration, it may not unreasonably be suggested that the insular stamp has rather been impressed on the fauna of the adjacent continents, than the reverse.

Woodward (*Manual*, p. 387) referring to the Madeiras, and the problem of their colonization, observes—"There is evidence that this mountain group has not arisen newly from the sea, and great probability that it has become insulated by the sub-

sidence of the surrounding land. The character and arrangement of its fauna are probably nearly the same now as when it formed part of a continent." The origin and condition of the West Indies are very different. The presumption is, if indeed there be not evidence of the fact, that the elevation of the islands was gradual—that the tertiary beds which occur there were deposited after the elevation of the central mountains, and the inland cliffs and terraces plainly traceable (I have personally noticed them in Jamaica, Haiti, and Barbados) indicate subsequent elevatory movements, synchronous probably with those which upraised the adjoining continents. There is no reason for believing that subsidence of contiguous lands caused the geographical isolation of this group of islands, certainly not within the period subsequent to the introduction of existing species. The characteristics of the insular faunas were probably the same at the time of their origin on the islands as at present.

As the number of species of land shells in insular provinces is generally much greater proportionally to the area of the provinces than in a continental province, of which the Madeira group is itself a striking example, it may with more reason be assumed that the land shells originated there after, and not anterior to the isolation of the group. Continents by submergence become islands, and islands by emergence become continents, but, as Prof. C. B. Adams* remarks, "such changes require an amount of time exceeding one geological period, during which time there is a change of faunas."

Dr. Hooker states, as a general result of investigation, that the sinking islands, those (so determined by Darwin) characterized as atolls, or as having barrier reefs, contain comparatively fewer species, and fewer generic types than those which are rising. The West Indies are in the latter category, while the

* The paper entitled "Hints on the Geographical Distribution of Animals with special reference to the Mollusca," by C. B. Adams, in the Contributions, is extremely interesting, and worthy of more notice than it appears to have received.

Madeira Islands (although not in either at the present period), if the number of species of land shells be any criterion, have not been since the origination of such species in the former. Wollaston (*On the Variation of Species*, p. 129) quotes it as the opinion of Lyell that the Madeira beds in which fossil *Helices* are found were deposited anterior to the destruction of the "Atlantic Province," of which the Madeira Islands are supposed to have been a part; whereas the condition of the fauna would lead to the supposition of its insular rather than continental origin.

Wollaston, referring especially to three species of *Helix* found in the Madeiras, says, "that these are actual species (saved alive from their fellows, after the wholesale destructions in this Atlantic province had been completed), and no results of insular development, is demonstrated by the fact that two of them (for the third has apparently become extinct*) have not altered one iota since the *fossil period*." From that and other similar facts, he concludes,—first, that this *quondam* continent was densely stocked at the beginning with foci of radiation created expressly for itself; and, secondly, that the areas which these various creatures had overspread, before the land of passage was broken up, was extremely limited,—or, which amounts to the same thing, that *their migratory progress was unusually slow*." As regards the West Indies, the "*quondam* continent" question does not arise,—there is no evidence of the breaking up of "the land of passage." Not only are each of the larger islands, according to Wollaston's views, "foci of radiation," but as he states is the case in Madeira, so is it in the West Indies, scarcely a gorge or woodland sierra exists within their bounds "which does not harbor some species essentially its own; and in many instances the ranges of these creatures are so local or confined, that they might be easily overlooked in their respective neighborhoods."

I admit to the fullest extent the slow migratory progress of

* The species referred to, *H. tiarella* W. & B., has since been found alive.

terrestrial mollusks, but do not believe in any save very trifling modifications of species being induced by local conditions and influences. Causes now in operation are insufficient to account for the present distribution of land shells on such groups of islands as the West Indies, and speaking generally, I can only refer the origin of their faunas to creation subsequent to the elevation of the insulated areas.

Such insular faunas, Professor Adams remarks, "prove that the islands which they inhabit, have been geographically separate since an era anterior to the introduction of the existing species." But this conclusion, he adds, "does not depend on the assumption that the species would have dispersed themselves over several islands, if they had not always been restrained by water; but on the fact that such small zoological provinces exist nowhere on continents."

Pfeiffer, in his Monographs, divides the inoperculate land shells, including the Proserpinaceæ, into thirty-three genera, of which twenty are specifically represented on the continents of America, and eighteen in the West India Islands. The subjoined table shows the distribution of the latter. *Ceres*, peculiar to North America (Mexico), and *Anostoma*, *Tomigerus*, and *Megaspira*, belonging to the southern continent, are not found in the islands, and *Ennea* and *Proserpina* are wanting on the continents.

It will be seen that *Vitrina* of North America, and also *Proserpina*, belonging to that part of the continent by affinity, are found only in the islands west of Portorico, while of the genera of the southern continent *Streptaxis* is represented only in Trinidad, *Clausilia* in Portorico, *Tornatellina* in Portorico and islands east and south* of it, and *Balea* in Cuba. As regards genera, and also the relative number of species, as shown in

* Here, and in the tables, I refer to those islands of which lists of species are given in the catalogue. With the islands actually east and south of Portorico I include Curaçao and Buen Ayre.

Table I., the islands west of Portorico are more connected with North America, and those east and south with South America. Portorico itself has in both respects marked affinities with each of the continents.

	North America.	South America.	North and South America.	Islands West of Portorico.	Portorico.	Islands E. and S. of Portorico.
Helix.....	*	*	*	*
Streptaxis.....	*	*
Ennea.....	*
Bulimus.....	*	*	*	*
Spiraxis.....	*	*
Orthalicus.....	*	*	*
Achatina.....	*	*	*	*
Oleacina.....	*	*	*	*
Tornatellina.....	*	*	*
Pupa.....	*	*	*	*
Macroceramus.....	*	*	*	*
Cylindrella.....	*	*	*	*
Balea.....	*	*
Clausilia.....	*	*
Vitrina.....	*	*
Simpulopsis.....	*	*	*
Succinea.....	*	*	*	*
Proserpina.....	*

In 1855 Pfeiffer published a catalogue of the Helicæ arranged in numerous subgenera, but his as well as other similar classifications have not been generally adopted. They seem indeed in many cases extremely arbitrary, and it is not my present intention to enter more than incidentally upon the subject of the geographical distribution of such subgenera, although they afford striking examples of the connexion between the continents and islands which I point out in this paper.

The relative number of species to genera, of *Helix* and *Bulimus* for instance, in different parts of America and the islands, and the increased number of genera in tropical America, as exhibited in Table I., are interesting facts.

The operculate land shells are divided by Pfeiffer in his Monograph into forty-four genera, of which thirteen are found in America, and twenty in the West Indies. He has since pro-

TABLE I.

LIST OF THE GENERA OF LAND SHELLS FOUND IN THE WEST INDIA ISLANDS,

SHOWING THE COUNTRY IN WHICH EACH GENUS IS MOST NUMEROUSLY REPRESENTED, THE NUMBER OF SPECIES DESCRIBED, AND ALSO THE NUMBERS WHICH INHABIT THE ISLANDS AND CERTAIN PARTS OF THE AMERICAN CONTINENT.

Names of Genera.	No. of Species in Pfeiffer's Monographs.	Pacific Coast of N. Am., N. to Mazatlan.	Eastern N. Am., N. to Rio Grande.	Mexico, not included in other column.	Central and South America.	Cuba and Isle of Pines.	Jamaica.	Haiti.	Portorico and Vieque.	Islands E. and S. of ditto.	Countries in which the Genera are most numerously represented.
INOPERCULATA.											
HELICEA.											
Helix.....	2139	31	117	31	161	89	92	36	32	56	Widely distributed.
Streptaxis.....	43	..	..	..	18	..	..	..	..	1	S. America.
Ennea.....	30	..	..	..	..	..	..	..	..	2	Africa.
Bulimus.....	1100	9	17	27	479	24	18	11	24	68	South America.
Spiraxis.....	62	..	..	17	11	5	7	3	..	..	Mexico and West Indies west of Portorico.
Orthalicus.....	20	1	2	4	15	1	1	..	..	2	South America.
Achatina.....	180	1	4	5	11	16	19	3	3	10	Africa and West Indies west of Portorico.
Oleacina.....	108	..	6	20	20	17	22	5	5	1	North America and W. I. west of Portorico.
Tornatellina.....	27	..	..	..	6	..	..	..	1	5	Widely distributed.
Pupa.....	236	1	16	..	7	23	9	3	5	8	Europe.
Macroceramus.....	19	..	1	..	1	15	1	11	1	5	West Indies west of Portorico.
Cylindrella.....	143	..	4	20	7	50	48	24	3	9	" " " "
Balea.....	9	..	..	..	2	1	..	..	..	..	Widely distributed.
Clausilia.....	386	..	..	..	5	..	..	..	1	..	Europe.
Vitrina.....	87	..	2	..	?	..	..	1	..	..	Asia and Africa.
Simpulopsis.....	16	..	..	3	9	..	..	1	1	..	South America.
Succinea.....	139	4	16	2	12	8	4	2	4	16	America and West Indies.
PROSERPINACEA.											
Proserpina.....	6	..	..	..	..	2	4	..	..	..	West Indies west of Portorico exclusively.
OPERCULATA.											
ACICULACEA.											
Geomelania.....	24	..	..	..	..	..	25	..	..	..	West Indies west of Portorico exclusively.
Truncatella.....	21	1	4	1	..	9	5	..	3	8	North America and West Indies.
CYCLOSTOMACEA.											
Cyclotus.....	62	..	..	1	18	1	11	1	..	2	South America.
Cyclophorus.....	133	..	..	2	10	..	..	..	..	3	Asia.
Megalomastoma.....	30	..	..	..	3	13	..	1	2	2	West Indies west of Portorico.
Jamaica.....	2	..	..	..	..	..	2	..	..	..	" " " " exclusively.
Licina.....	4	..	..	..	..	..	2	..	..	..	" " " " "
Choanopoma.....	24	..	..	..	..	14	12	6	5	2	" " " " "
Ctenopoma.....	15	..	1	..	..	18	3	1	..	..	" " " " "
Adamsiella.....	14	..	..	..	..	1	12	..	..	..	" " " " "
Cyclostomus.....	100	..	..	..	..	1	14	1	..	2	Africa.
Tudora.....	27	..	..	1	..	6	16	2	..	1	West Indies west of Portorico.
Diplopoma.....	..	..	..	..	..	1	..	..	..	..	" " " " exclusively.
Cistula.....	34	..	..	1	10	11	6	1	2	2	" " " " "
Chondropoma.....	58	..	1	2	4	37	..	12	4	6	" " " " "
HELICINACEA.											
Stoastoma.....	21	..	..	..	..	..	19	..	1	..	" " " " 1 species in Ins. Opara.
Trochatella.....	29	..	..	..	1	16	7	3	..	..	" " " " "
Lucidella.....	2	..	..	..	..	..	2	..	..	..	West Indies west of Portorico exclusively.
Helicina.....	219	..	6	23	41	43	10	12	13	20	Widely distributed.
Schasicheila.....	3	..	3	..	..	..	..	..	..	..	Mexico, 1 sp. in New Providence, Bahamas.
Alcadia.....	24	..	..	..	..	8	14	1	..	2	West Indies west of Portorico.

NOTE.—The numbers of species in the *Islands* include those described since Pfeiffer's Monographs were published. The species which are common to more than one island are enumerated as belonging to each. The numbers in the different sections of N. America are from the lists by Mr. W. G. Binney, published by the Smithsonian Institution.

posed another, *Diplopoma*, which is peculiar to Cuba. *Bourciera* and *Hydrocena*, represented on the southern continent, do not inhabit the islands. The following table displays the distribution of the insular genera.

	North America.	South America.	North and South America.	Islands West of Portorico.	Portorico.	Islands E. and S. of Portorico.
<i>Geomelania</i>	*
<i>Truncatella</i>	*	*	*	*
<i>Cyclotus</i>	*	*	*
<i>Cyclophorus</i>	*	*
<i>Megalomastoma</i>	*	*	*	*
<i>Jamaicia</i>	*
<i>Licina</i>	*
<i>Choanopoma</i>	*	*	*
<i>Ctenopoma</i>	*	*
<i>Adamsiella</i>	*
<i>Cyclotomus</i>	*	*
<i>Tudora</i>	*	*	*
<i>Diplopoma</i>	*
<i>Cistula</i>	*	*	*	*
<i>Chondropoma</i>	*	*	*	*
<i>Stoastoma</i>	*	*
<i>Trochatella</i>	*	*
<i>Lucidella</i>	*
<i>Helicina</i>	*	*	*	*
<i>Sehasicheila</i>	*	*
<i>Alcadia</i>	*	*

As regards the operculate shells the generic connexion of the islands west of Portorico seems to be greatest with the northern continent, and of those east and south with South America, while Portorico holds an intermediate position. The richness of the West India Islands in operculate genera peculiar to themselves, is very remarkable. The relative number of species to genera on the continents and islands, as with the inoperculate shells, is also noticeable.

The existence in Opara, one of the Polynesian Islands, of the only species of *Stoastoma** found elsewhere than in the West Indies is the more curious, seeing that *A. octona* inhabits that

* *S. succineum* Sowb. of Opara differs considerably from the species of the West Indies. Gray separates it from the others, under the subgeneric name of *Electrina*. The shell is smooth, not spirally costate.

island, *Pupa Paredesii* Orb. is attributed to it as well as to South America, and several species of other genera nearly allied to West Indian forms also occur in it.

In Table II. lists are given of those species, inhabitants of the West Indies, which are found in other parts of the world, and also of those which are in more than one of the islands. Certain of the islands are distinguished by name,—the last column includes those E. and S. of Portorico and Viéque. The object of the Table is to show the *specific*, as of Table I. the *generic* connexion of the islands with the N. and S. American continents.

The only species common to Europe and the West Indies are *B. acicula* Müll. (Bermuda), *B. decollatus* L. (Cuba), and *B. ventrosus* Fer. (Bermuda),—the two former occur also in the southern part of Eastern N. America. *H. similaris* Fer., a widely distributed species, found in Brazil, inhabits Barbados, but not Cuba, as stated by Pfeiffer (Mon. Hel. I.). *S. unguis* Fer. referred to Guadeloupe by Beau, is also said to belong to Bolivia. The other S. American species mentioned in Table II. are found north of the Equator.

There are twenty-three species of N. America, and twenty-one (exclusive of *H. similaris* and *S. unguis*) of S. America, N. of the Equator, *O. undatus* and *A. octona* being in both, which also occur in the West Indies. Omitting the two latter species, the following is the distribution of the others.

<i>N. American Species.</i>		<i>S. American Species.</i>
In Bermuda	2	None.
In Bahamas, Cuba, and I. of Pines .	15	None.
In Jamaica	6	1
In Haiti	4	2
In Portorico and Viéque	6	3
Total in Islands W. of Viéque . . .	18	3
Total in Islands E. and S. of Viéque.	7	18

Of species found in Portorico and Viéque (not on the continents) ten are in the islands to the westward, and twenty-one

in those to the east and south. These facts show, the distribution of species being considered, a result similar to that arrived at with regard to the distribution of genera, viz. that the islands west of Portorico are more related to the N. American, and those east and south to the S. American continent—Portorico (with Viéque) being connected with both. It is also noticeable (Table I.) that the species of N. American generic type which are represented in the islands west, and also east and south of Portorico, are generally more numerous in the former, and those of S. American character in the latter.

Only one operculate species, *Helicina subglobulosa* Poey, is common to the American continents and the islands. With that exception all the operculated species inhabiting the islands W. of Portorico (exclusive of *Truncatella**) are peculiar to those which they respectively inhabit, while six found in Portorico and Viéque occur in the islands to the eastward.

The following is the number of species in the islands:—

<i>Inoperculate.</i>		<i>Operculate.</i>
Islands W. of Portorico.		
Cuba and I. of Pines	251	179
Jamaica	225	160
Haiti	100	41
	576	380
Portorico and Viéque	80	30
Islands E. and S. of Viéque	183	50

The large proportion of operculate species in the islands W. of Portorico, and the diminution of them in that island, and the islands E. and S. of it, is very remarkable. The relative proportion of operculate and inoperculate species prevailing on the continents is shown in Table I. The species common to

* I omit *Truncatella* in Table II., having, as I consider, insufficient data as to the distribution of the species, which are, however, included in the Catalogue.

more than one island are enumerated as belonging to each; but the number peculiar to the islands exceeds one thousand.

The foregoing remarks are with regard to the relationship of the West India Islands generally with the American continents, and the division of the islands into two groups, those west and those east and south of Portorico, which itself rather belongs to the latter, but this gives an inadequate idea of the interesting and peculiar character of these Insular faunas. My limits preclude any very extended observations; but I propose to state some, at least, of the most striking facts as to the relationships of the islands *inter se*.

The Bahamas, Cuba, and the Isle of Pines are especially connected; Cuba has 17 species found also in Jamaica, 8 in Haiti, 15 in Portorico, and 13 in the islands east and south of Portorico. The development of the subgenus *Strophia* (Pupa), of *Macroceramus*, *Megalomastoma*, *Ctenopoma*, *Chondropoma*, *Trochatella*, and *Helicina*, the occurrence of the only *Balea*, and the absence of *Geomelania*,* *Jamaicia*, *Licina*, *Stoastoma*, and *Lucidella* are the principal peculiarities of the Cuban fauna. With respect to Jamaica, there are common to it and to Cuba 17, to Haiti 4, to Portorico 10, and to the islands east and south of that island 10 species. The numerous representatives of *Sagda* (*Helix*), *Proserpina*, *Adamsiella*, *Cyclostomus*, *Tudora*, and *Alcadia*, the exclusive presence of *Geomelania*, *Jamaicia*, *Licina*, *Stoastoma* (with the exception of one species in Portorico and one in Opara), and *Lucidella*, and the absence of *Strophia* (Pupa), *Megalomastoma*, and *Chondropoma*, greatly distinguish Jamaica from the neighboring islands. I doubt whether any province in the world of equal area is so rich as Jamaica both in genera and species. Haiti has in common with Cuba 8, with Jamaica 4, with Portorico 8, and with the islands east and south of the latter 8 species. This island has the following peculiarities—the development of *Macroceramus*

* Information received at a late moment induces me to suspect the occurrence of *Geomelania* in Cuba.

and *Chondropoma*, the occurrence of the only species of *Vitrina*, and the absence of *Proserpina* and genera peculiar to Jamaica. *Strophia* and *Megalomastoma*, which prevail in Cuba, but are not in Jamaica, are represented in Haiti. The only insular species of *Simplulopsis* are in Haiti and Portorico; those two islands, nearly equidistant from North and South America, have not the species of *Orthalicus* which inhabits both sections of the continent and the islands more immediately adjacent to them. I should remark that several of the species common to Cuba, Jamaica, and Haiti, are otherwise widely distributed.

No other conclusion, under all the circumstances stated, can be arrived at, but that Cuba with the Isle of Pines and the Bahamas, Jamaica, and Haiti, are entitled to be ranked as three distinct zoological provinces; although Haiti has certainly more relationship with Cuba on the one side and Portorico on the other, than exists between it or Cuba with Jamaica.

Portorico (with Viéque) is characterized by the occurrence of the only species of *Clausilia*, and one of *Tornatellina*, two South American genera, absent on the islands westward, a single one of *Stoastoma*, the absence of several genera of *Cyclostomaceæ* which are found in the islands to the westward, by the increased number of *Bulimi* relatively to *Helix*, and the diminished representation of *Macroceramus* and *Pupa*. Portorico is unmistakably related to St. Croix, St. Thomas, St. John, Tortola, Anegada, St. Bartholomew, and Anguilla, as those islands are *inter se*. *Megalomastoma** is not represented further to the eastward of Portorico than St. John (I am not certain as to Tortola), and *Macroceramus* than Anguilla, to the south of which neither of them occurs. *Ennea*† has one species

* *Megalomastoma* is found fossil in the Eocene strata of the Isle of Wight and Paris.

† As to the occurrence of *Ennea bicolor* Gould in St. Thomas, see my remarks in the *Annals* VI. p. 147. Mr. Theo. Gill subsequently discovered the same species in Trinidad; its occurrence there also is a curious fact.

(the same being found in India) in St. Thomas and Trinidad. *Strophia*, which occurs in Portorico, has a semi-fossil species in St. Croix, but disappears in the islands east and south of Portorico, with the solitary exception of *S. uva* in Curaçao. The islands above-mentioned as being related to Portorico, have, in common with many of those south of Anguilla, species of *Bulimi* which also occur in South America.*

St. Christopher, Antigua, the French islands, and those further south, are all more or less connected *inter se*, and in a marked manner with South America. The preponderance of *Bulimus*, and the paucity of operculated genera and species, are noticeable. No representative of the family Cyclostomacea has yet been found in Barbados. The single *Streptaxis*, discovered by Mr. Gill in 1859, occurs in Trinidad. *Plecochilus* (a subgenus of *Bulimus*), characteristic of South America, only inhabits the islands east and south of Portorico, with the exception of one species, *P. glaber*, attributed, but I think erroneously, to Haiti. *Stenopus*, a subgenus of *Nanina* (separated from *Helix*), is peculiar to St. Vincent. The number of species common to the French West India Islands, and French Guiana, but absent in the intermediate islands, as shown by Drouët (Vide *Mal. Blatt*, 1860, p. 126), is remarkable. In connexion with the fact that the Spanish Islands of Cuba and Portorico have more species in common than either has with Haiti which lies between them, can the partial similarity of faunas be attributed to increased intercourse between the inhabitants belonging in modern times to the same European nation? Some of the species common to the continent and islands, and to more than one island, are, size and habits considered, such as are most likely to have been distributed by human agency.

On the whole, Portorico, with Viéque, and the islands eastward towards Anguilla, may be considered as forming a distinct province, and the remaining islands, more to the south, as

* Woodward (*Manual*, p. 388) remarks on several species common to St. Thomas and the Canary Islands, but none such exist.

another. Whether the division (based on the distribution of the Land Shells) of the West Indies generally into two groups, the one extending eastward from the Northern Continent to Anguilla, and the other southerly from Anguilla to the South American coast, has any connexion with the geological relations of the two mountain chains remarked upon by Humboldt, to which I have already referred, is a curious subject of inquiry.

The extent to which species vary, especially in the larger islands of the West Indies, deserves notice. Dr. Hooker says, "It has been remarked (Bory de St. Vincent, in *Voy. au Quatre Iles de l'Afrique*) that the species of islands are more variable than those of continents, an opinion I can scarcely subscribe to, and which is opposed to Darwin's facts, inasmuch as Insular Floras are characterized by peculiar genera, and by having few species in proportion to genera."

It appears to me that Bory de St. Vincent's observation does, and that "Darwin's facts" do not, apply to land shells. I admit, however, that even on continents their tendency to variation is considerable.

Dr. Hooker remarks—"If a genus is numerically increasing, and consequently running into varieties, it will present a group of species with complex relations *inter se*; if, on the contrary, it is numerically decreasing, such decrease must lead to the extinction of some varieties, and hence result in the better limitation of the remainder." Now, without adopting Dr. Hooker's and Darwin's views as to the origin of species, and their greater limitability by the extinction of varieties, I would state that as in the great majority of the genera of land shells there are numerous groups of species with complex relations *inter se*, that fact may indicate their comparative recent creation. The geological record,* of prior date to the tertiary formations, has

* A small fossil body resembling a land shell of the genus *Pupa* was found by Lyell, with fossil reptilian remains, in the interior of an erect fossil tree in the coal measures of Nova Scotia.

little evidence of the existence of terrestrial species of shells. The wonderful development both of genera and species on islands, especially those the later geological movements of which have been of elevation, do not at least negative the indication above suggested.

With respect to the *Freshwater Shells* of the West Indies, which are by no means numerous, the distribution of the genera shows the same connexion of the islands west of Portorico with the northern, and of those east and south with the southern continent of America, as do the Land Shells. Of *Melania* five species occur in Cuba, none in the other islands; one of *Melanopsis* inhabits Jamaica. The only *Unio* in the islands is found in Cuba. Two or three species of *Ampularia* are in Cuba, and one in Jamaica, of North American type, while *A. rugosa* Lam., of South America, occurs in Trinidad and Tobago, and *A. Knorri* Phil, closely allied to *A. cornu arietis*? L., of New Granada, also inhabits the former island. The species of other genera, which are in the islands westward of Portorico, do not generally extend to the islands east and south of it. Several, however, have a remarkably wide distribution. *Planorbis lucidus* Pf. occurs in Cuba, Jamaica, Portorico, and Guadeloupe; *Ancylus obscurus* Hald., of North America, in Jamaica, Portorico, St. Thomas, and Guadeloupe; and *Amnicola crystallina* Pf., which I found abundant in the river Magdalena, at Barranquilla, New Granada, inhabits Cuba, Jamaica, Portorico, Viéque, St. Thomas, St. John, Tortola, and Guadeloupe.*

* The wide distribution, on the continent of North America, of some of the Unionidæ is really wonderful. Mr. Isaac Lea mentions, in a communication made in 1858 to the Philadelphia Academy, that some species common in the Ohio River, as high up as Pittsburg, are found also in Moose River of Hudson's Bay, 52° N.; in the Red River of the North, 50° N.; in Upper Missouri, 47° N.; and in the Big Sioux, 43° N.; also as far south as Louisiana.

The same remark applies to several terrestrial species of North America. *H. alternata* Say is found from Labrador to Texas, and from the Atlantic ocean to the Rocky Mountains. *H. arborea* Say, which, according to Beau, occurs in Guadeloupe, inhabits an equally wide area, and extends even into New Mexico.

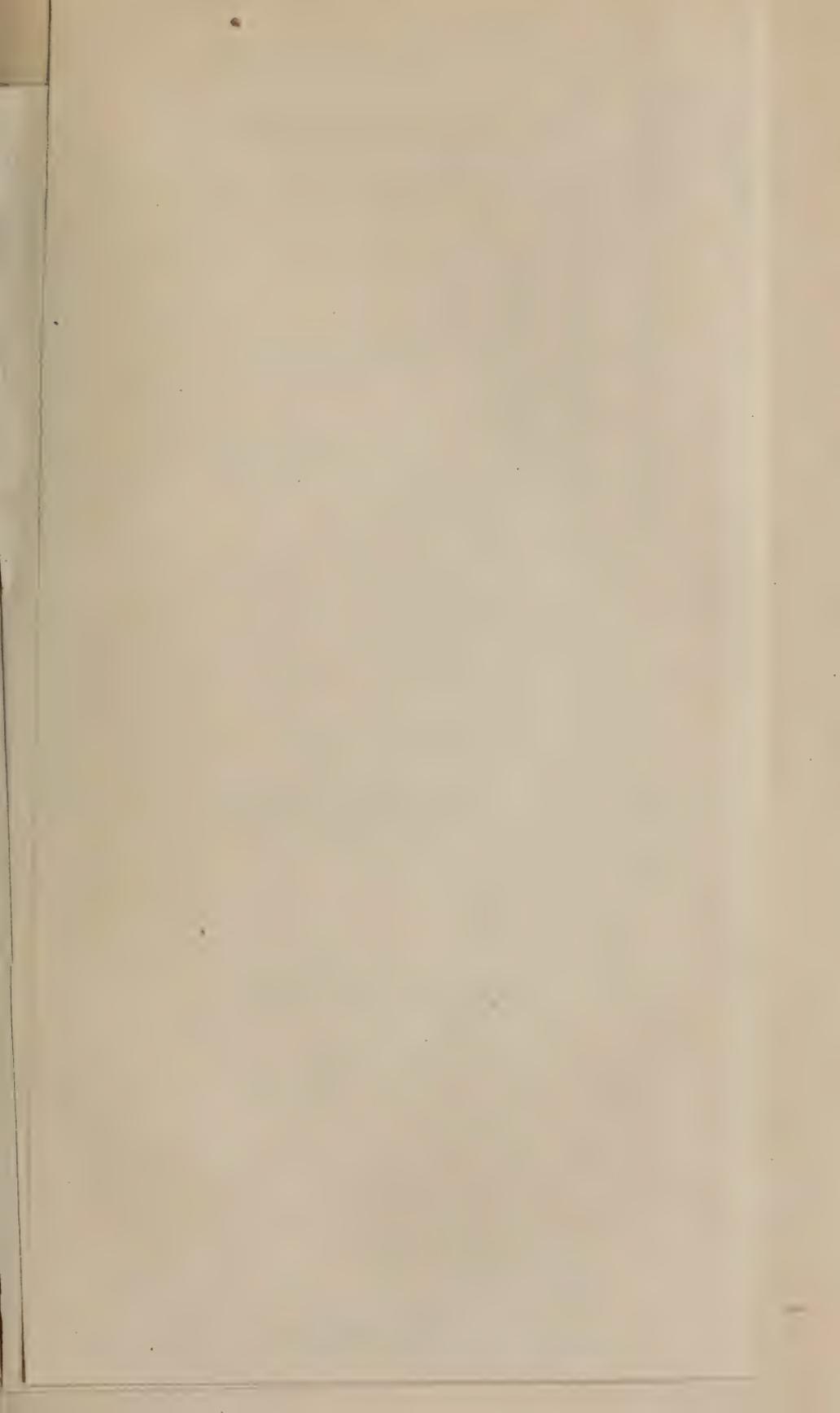
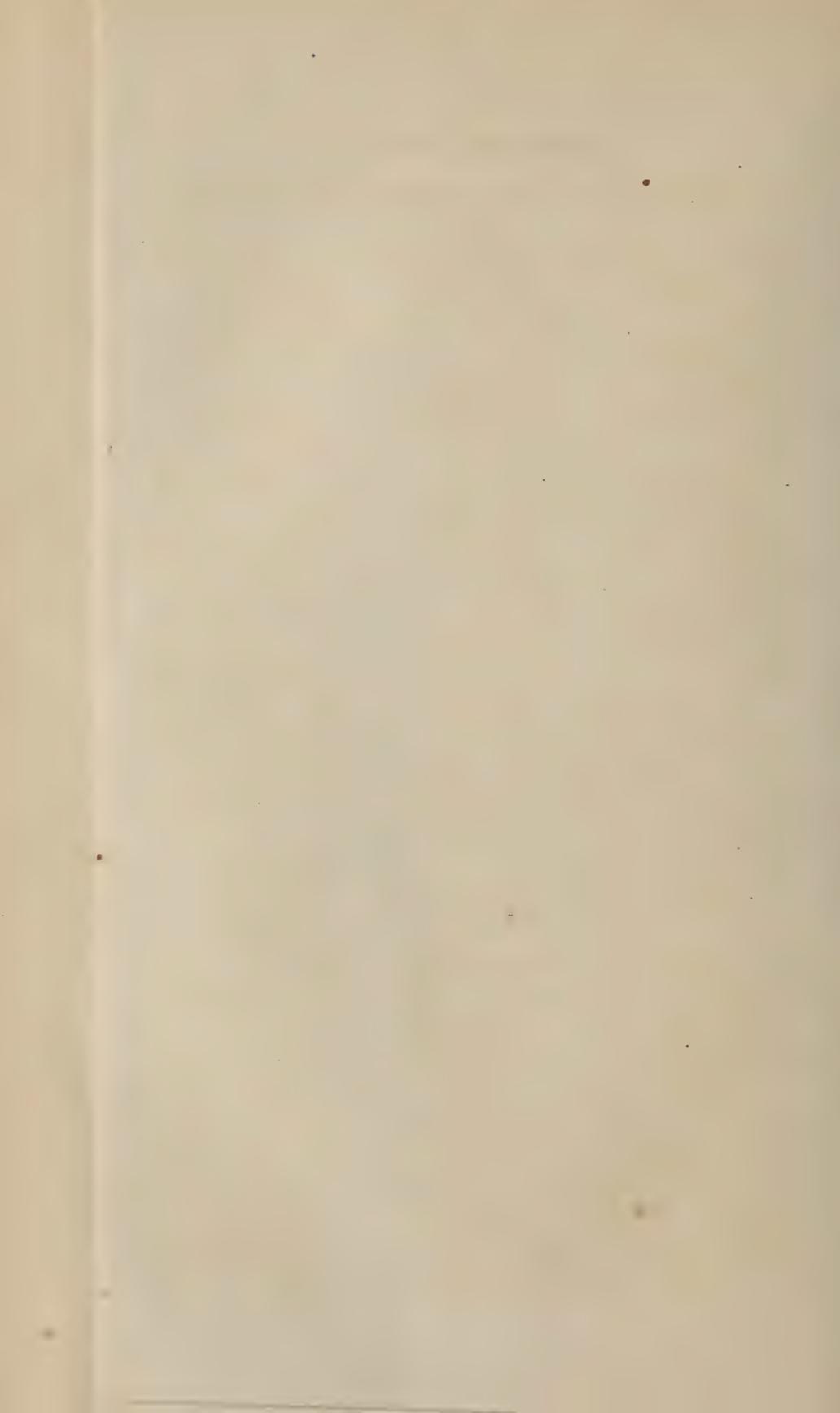


TABLE II.

LIST OF THE SPECIES OF LAND SHELLS, INHABITANTS OF THE WEST INDIA ISLANDS,

WHICH ARE FOUND IN OTHER PARTS OF THE WORLD; AND ALSO OF THOSE WHICH OCCUR IN MORE THAN ONE OF THE ISLANDS.

Name of Species.	From the part of Eastern North America to the West Indies, on the N. E. or south of Mazatlan	Cuba, including the Isle of Pines.	Jamaica.	Haiti.	Porto Rico and Vieques.	From the Antilles north of the Equator	West Indies east and south of Porto Rico as far as the Cape of the Hope.	When the species occurs in one island only, the name of the island is given.
HELIX.								
arborea Say.....	♦	Guadeloupe.
badia F.....	♦	
Boothiana P.....	..	♦	a f. in St. Croix.
caracolla L.....	
Carpenteriana Bld.....	♦	
denticens F.....	
discolor F.....	Martinique.
dioscoricola Ad.....	Vieque.
eucasta Sh.....	♦	
Gundlachi P.....	♦	St. Thomas.
Isabella F.....	♦	Barbadoes.
indentata Say.....	♦	
indistincta F.....	♦	
Josephina F.....	♦	a f. in St. Christopher.
lychnuchus Müll.....	♦	
margineola Gm.....	♦	a f. in St. Croix.
microdonta Dh.....	♦	In Bermuda and N. P., Bahamas.
minusculea By.....	♦	
nemorulina Pet.....	♦	
notabilis Sh.....	♦	
nuxdenticulata Ch.....	♦	Martinique.
orbiculata F.....	♦	
Otonis P.....	♦	
pachygastra Gray.....	♦	
paludosa P.....	♦	
provisoria P.....	♦	N. P., Bahamas.
similaris F.....	♦	In Brazil and Barbadoes.
subaquila Sh.....	♦	
turbiniformis P.....	♦	
varians Mk.....	♦	N. P., Bahamas.
vortex P.....	♦	Also in Bermuda.
STREPTAXIS.								
deformis F.....	♦	Trinidad.
ENNEA.								
bicolor Gould.....	♦	St. Thomas, Trinidad, and East Indies.
BULIMUS.								
acicula Müll.....	♦	Also in Bermuda.
auris-Silenti Born.....	♦	St. Vincent.
Barbadensis P.....	♦	
Caracensis Rv.....	♦	
chrysalis P.....	♦	
decollatus L.....	♦	Also in Europe.
elongatus Bolt.....	♦	Also in Buen Ayre.
exilis Gm.....	♦	
fraterculus F.....	♦	
glaber Gm.....	♦	
Goodalli Müll.....	♦	
gracillimus P.....	♦	St. Thomas.
husta P.....	♦	
limnoides F.....	♦	
marginatus Say.....	♦	St. Croix.
multifasciatus Lam.....	♦	
nitidulus P.....	♦	Also in Bermuda.
oblongus Müll.....	♦	
octonoides Ad.....	♦	
sepulchralis Py.....	♦	N. P., Bahamas.
stramineus Guild.....	♦	St. Vincent.
subula P.....	♦	
Swiftianus P.....	♦	
terebuster Lam.....	♦	
ventrosus F.....	♦	Bermuda and Europe.
Viequeensis F.....	♦	Vieque and Barbadoes.
Vincentinus P.....	♦	St. Vincent.
Orthalicina.								
undatus Br.....	♦	Trinidad.
Achatina.								
fasciata Lam.....	♦	
Gundlachi P.....	♦	
octona Ch.....	♦	
Oleacina.								
oleacea F.....	♦	Also N. P., Bahamas.
solidula P.....	♦	
venusta P.....	♦	
Tornatellina.								
Antillarum Sh.....	♦	Grenada.
Funcki F.....	♦	Guadeloupe.
lamellata P. and M.....	♦	
Pupa.								
contracta Say.....	♦	
hexodon Ad.....	♦	
isostoma P.....	♦	Also N. P., Bahamas.
incana By.....	♦	
Jamaicensis Ad.....	♦	Also in Bermuda.
microstoma P.....	♦	
pellucida.....	♦	
striatella Fr.....	♦	Also N. P., Bahamas.
tenuidens Ad.....	♦	
Macroceramus.								
Gossei P.....	♦	Also N. P., Bahamas.
microdon P.....	♦	St. Thomas, St. John, Tortola.
signatus Guild.....	♦	Tortola and Anguilla.
Cylindrella.								
collaris F.....	♦	
pallida Guild.....	♦	
Poayana O.....	♦	
tricolor P.....	♦	
Succinea.								
angustior Ad.....	♦	
approximans Sh.....	♦	
Barbadensis Guild.....	♦	Barbadoes, also Bermuda.
Bermudensis P.....	♦	
Candeana Lea.....	♦	Also Bermuda.
fulgens Lea.....	♦	ditto.
margarita P.....	♦	
patula Brug.....	♦	
Riisei P.....	♦	St. Croix.
rubescens Dh.....	♦	Martinique.
Sagra O.....	♦	
unguis F.....	♦	Guadeloupe and Bolivia.
Megalomastoma.								
Antillarum Sowb.....	♦	St. Thomas and St. John.
Choanopoma.								
sulcatum F.....	♦	Vieque and St. Bartholemew.
Chondropoma.								
Newcombianum Ad.....	♦	St. Thomas and St. John.
Santa-cruzeuse P.....	♦	St. Croix and St. Thomas.
Helicina.								
fasciata Lam.....	♦	St. Thomas.
foveata P.....	♦	St. John.
phasianella Sowb.....	♦	St. Thomas and St. John.
subfusca Mk.....	♦	
subglobulosa Py.....	♦	
Alcaldia.								
rubella P.....	♦	St. Thomas and St. John.



CATALOGUE OF THE LAND SHELLS OF THE WEST INDIA ISLANDS.

[Abbreviations. Ad., C. B. Adams, F., Férussac, G., Gundlach, P., Pfeiffer, Py, Poey, W. & M., Weinland and Marten.]

Anegada.

HELIX.
notabilis Sh.

Anguilla.

MACROCERAMUS.
signatus Guild.

Antigua (1).

HELIX.
formosa F.

BULIMUS.
Caracasensis Rv.
exilis Gm.
fraterculus F.
subula P.

ACHATINA.
octona Ch.

CISTULA.
Antiguensis Sh.

Bahamas (2).

HELIX.
Bahamensis P.
(N. P. and Turk's Is.)
gallopavonis Val. (Tk's Is.)
microdonta Dh. (N. Prov.)
multifasciata W. & M.

(Crooked Is.)

provisoria P. (N. P.)
Troscheli P. (Tk's Is.)?
varians Mk. (N. P.)

BULIMUS.
nitidulus P. (Tk's Is.)
sepulchralis? Py. (N. P.)

OLEACINA.
solidula P. (N. P.)

PUPA.
alvearia Kust. (N. P.)
iostoma P. (Tk's Is.)
pellucida P. (Tk's Is.)
striatella F. (N. P.)
Weinlandi Kurr. (Cr. Is.)

MACROCERAMUS.
Gossei P. (N. P.)

CYLINDRELLA.
Bahamensis P. (N. P.)

CISTULA.
scabrosa Humph. (T. Is.)

CHONDROPOMA.
biforme P. (Tk's Is.)
Hjalmarsoni P. (Tk's Is.)

HELICINA.
candida P. (Tk's Is.)

SCHASICHELLA.
minuscula? P. (N. P.)

Barbados (3).

HELIX.
Isabella F.
similaris F.
vortex P.

BULIMUS.
Barbadensis P.
Caracasensis Rv.
exilis Gm.
fraterculus F.
fuscus Guild.
Goodalli Mil.
oblongus Müll.
octonoides Ad.
subula P.
Viequensis P.

ACHATINA.
Gundlachi P.
octona Ch.

TORNATELLINA.
Antillarum Sh.

PUPA.
Barbadensis P.
Jamaicensis Ad.
pellucida P.

CYLINDRELLA.
costata Guild.

SUCCINEA.
Barbadensis Guild.
Bermudensis P.

TRUNCATELLA.
Barbadensis P.
HELICINA.
Barbadensis P.
conoidea P.
substriata Gray.

Bermuda (4).
Ins. St. George.

HELIX.
Bermudensis P.
circumfirmata Redf.
microdonta Dh.
ochroleuca F.?
vortex P.

BULIMUS.
nitidulus P.
ventrosus F.

ACHATINA.
acicula Müll.

PUPA.
Jamaicensis Ad.
pellucida P.

SUCCINEA.
Bermudensis P.

fulgens Lea.
margarita P.
TRUNCATELLA.
subcylindrica Gray.
HELICINA.
convexa P.

Buen Ayre.

BULIMUS.
elongatus Bolt.

Cuba (5).

HELIX.
alauda F.
amplecta G.
Apollo P.
Auberi O.
auricoma F.
avellana F.
Baracoensis Gut.
Bartlettiana P.
Bayamensis P.
Bonplandii Lam.
Boothiana P.
Carpenteriana Bld.
cecticulus G.
comta G.
crassilabris P.
Cubensis P.
cyclostomoides P.
debilis P.
deflexa P.
Dennisoni P.
emarginata G.
euclasta Sh.
fuscolabiata Py.
gilva F.
gracilis Py.
Guanensis Py.
Guantanamoensis Py.
Gundlachi P.
Gutierrezii Py.
immersa G.
imperator Mtf.
incrustata Py.
jactata G.
Jeannereti P.
Lescaillie G.
Letranensis P.
Lindeni P.
lucipeta Py.
maculifera Gut.
marginelloides O.
melanocephala G.
Mina P.

- minuscula By.
 Montetaurina P.
 morbida Mor.
 multistriata Dh.
 muscarum Lea.
 naevula Mor.
 notata Py.
 Ottonis P.
 ovum-reguli Lea.
 paludosa P.
 Parraiana O.
 parallela Py.
 paucispira Py.
 Pazenis Py.
 pemphigodes P.
 penicillata P.
 Petitiana O.
 picta Born.
 Poeyi Pet.
 proboscidea P.
 prominula P.
 provisoria P.
 Rangelina P.
 rari-pila Mor.
 rostrata P.
 rufo-apicata Py.
 Sagemon Bk.
 Sagraiana O.
 saxicola P.
 scabrosa Py.
 stigmatica P.
 suavis G.
 sulphurea Mor.
 supertexta P.
 tephritis Mor.
 tichostoma P.
 transitoria P.
 translucens G.
 Trinitaria G.
 turbiniformis P.
 versicolor Born.
 vortex P.
- BULIMUS.**
- acuticostatus O
 angustatus G.
 assurgens P.
 decollatus L.
 gigas Py.
 Goodalli Mil.
 gracillimus P.
 hasta P.
 homalogyrus Sh.
 lucidus Py.
 Manzanillensis G.
 marginatus Lay.
 Marielinus Py.
 nitidulus P.
 octonoides Ad.
 Poeyanus P.
 sepulchralis Py.
- strictus Py.
 subula P.
 terebraster Lam.
- SPIRAXIS.**
- Cubaniana O.
 episcopalis Mor.
 melanielloides G.
 paludinooides O.
 suturalis P.
- ORTHALICUS.**
- undatus Brug.
- ACHATINA.**
- abdita Py.
 Blainiana Py.
 consobrina O.
 elata G.
 exilis P.
 emarginata Swain?
 fasciata Müll.
 Gundlachi P.
 octona Ch.
 picta Rv.
 Poeyana P.
 pusilla P.
 pygmaea P.
 subulatooides O.
 Trinitaria G.
- OLEACINA.**
- cyanozoaria G.
 Lindoni P.
 oleacea F.
 orysacea O.
 Ottonis P.
 regularis G.
 saturata G.
 sicilis Mor.
 solidula P.
 subulata P.
 translucida G.
 Trinitaria G.
- PUPA.**
- Cumingiana P.
 cyclostoma K.
 Gundlachi P.
 incana By.
 iostoma P.
 marginalba P.
 maritima P.
 marmorata P.
 microstoma P.
 multicosta K.
 Mumia Brug.
 Mumiola P.
 neglecta Arango.
 pellucida P.
 Proteus G.
 Sagraiana P.
 scalarina G.
 sculpta Py.
 striatella F.
- tenuidens Ad.
 tumidula Dh?
 venusta Py.
 vulnerata K.
- MACROCERAMUS.**
- amplus G.
 angulosus G.
 catenatus G.
 claudens G.
 costulatus G.
 festus G.
 Gossei P.
 Gundlachi P.
 inermis G.
 Jeannereti G.
 notatus G.
 Pazi G.
 pictus G.
 turricula P.
 unicarinatus Lam.
- CYLINDRELLA.**
- acus P.
 angulifera G.
 Brooksiana G.
 Camoensis P.
 cinerea P.
 coeruleans Py.
 crispula P.
 cyclostoma P.
 discors Py.
 elegans P.
 Elliotti Py.
 Fabreana Py.
 fastigiata G.
 gracillima Py.
 Gundlachiana Py.
 Humboldtiana P.
 integra P.
 interrupta G.
 intusmalleata G.
 irrorata G.
 laevigata G.
 lateralis Paz.
 Lavalleana O.
 marmorata Sh.
 minuta G.
 nubila Py.
 ornata G.
 Oviedoiana O.
 perla G.
 Philippiana P.
 planospira P.
 plicata Py.
 Poeyana O.
 porrecta Gould.
 producta G.
 Rugeli Sh.
 Sagraiana P.
 Sauvalleana G.
 scalarina Sh.

- Shuttleworthi Py.
 Sowerbyana P.
 strangulata Py.
 subita Py.
 torquata Mor.
 Turcasiana G.
 uncata G.
 variegata P.
 ventricosa G.
 volubilis Mor.
- BALEA.**
 Canteroiana G.
- SUCCINEA.**
 angustior Ad.
 fulgens Lea.
 Gundlachi P.
 macta Py.
 nobilis Py.
 ochracina G.
 Sagra O.
 tenuis G.
- TRUNCATELLA.**
 bilabiata P.
 capillacea G.
 Caribæensis Sow.
 elongata Py.
 filicosta G.?
 lirata Py.?
 pulchella P.
 scalaris Mich.
 subcylindrica Gray.
- CYCLOTUS.**
 minimus G.
 perdistinctus G.
- MEGALOMASTOMA.**
 alutaceum Mk.
 apertum Py.
 auriculatum O.
 bituberculatum Sow.
 complanatum P.
 digitale G.
 Gundlachi P.
 leoninum P.
 Mani Py.
 seminudum Py.
 tortum Wood.
 ventricosum O.
- CHOANOPOMA.**
 alatum P.
 Arangianum G.
 auricomum G.
 Daudinoti G.
 decoloratum G.
 eburneum G.
 fragile G.
 minium G.
 majusculum Mor.
 perplicatum G.
 Pretrei O.
 tractum G.
- Yaterasense P.
 Yunquense P.
- CENOPOMA.**
 argutum P.
 bilabiatum O.
 coronatum Py.
 deficiens G.
 denegatum Py.
 echinatum Py.
 enode Py.
 Garridoianum Py.
 honestum Py.
 immersum G.
 nigriculum G.
 nodulatum Py.
 perspectivum G.
 rotundatum Py.
 nobilium P.
 sculptum G.
 semicoronatum G.
 sordidum G.
 torquatum Gut.
- ADAMSIELLA.**
 chordatum G.
- CYCLOSTOMUS.**
 Rangelinus Py.
- TUDORA.**
 canescens P.
 erectum G.
 excurrens G.
 lurida G.
- DIPLOPOMA.**
 architectonicum G.
- CISTULA.**
 Agassizi Charp.
 agrestis G.
 catenata Gould.
 illustris Py.
 inculta Py.
 interstitiale G.
 limbiferum Mk.
 Mackinlayi G.
 pallida P.
 procax Py.
 radula P.
- CHONDROPOMA.**
 abnatum G.
 Candeanum O.
 claudicans Py.
 crenimargo P.
 decurrens Py.
 Delatreanum O.
 dilatatum G.
 egregium G.
 Gutierrezii G.
 harpa P.
 irradians Sh.
 laetum Gut.
 latilabre O.
 latum G.
- marginalbum G.
 moestum Sh.
 neglectum G.
 obesum Mk.
 Ottonis P.
 oxytremum G.
 perlatum G.
 Pfeifferianum Py.
 pictum P.
 Poeyanum O.
 revinctum Py.
 revocatum G.
 rufopictum G.
 Sagebieni Py.
 semicanum Mor.
 sericatum Mor.
 Shuttleworthi P.
 solidulum G.
 tenebrosum Mor.
 textum G.
 unilabiatum G.
 violaceum P.
- TROCHATELLA.**
 chrysostoma Sh.
 conica P.
 dilatata Py.
 hians Py.
 Pettiana O.
 petrosa G.
 politula Py.
 regina Mor.
 rubicunda G.
 Sloaneis P.
 Sloanei O.
 stellata Val.
 subunguiculata Py.
- HELICINA.**
 acuminata Val.
 adspersa P.
 Bastidana Py.
 Bayamensis Py.
 bellula G.
 Blandiana G.
 Briarea Py.
 chrysochasma Py.
 ciliata Py.
 columellaris G.
 concinna G.
 continua G.
 declivis G.
 elongata O.
 exserta G.
 glabra Gould.
 globulosa O.
 granum P.
 jugulata Py.
 Lembeyana Py.
 littorcola G.
 Mayarina Py.
 nitida P.

Orbignyi P.
Poeyi P.
proxima G.
pulcherrima Lea.
pyramidalis Sow.
Reeveana P.
remota Py.
retracta Py.
rotunda O.
rubromarginata G.
rugosa P.
Sagraiana O.
silacea Mor.
spectabilis G.
straminea Mor.
subdepressa Py.
subglobulosa Py.
submarginata Gray.
Titanica Py.

ALCADIA.

capax G.
dissimulans Py.
gonostoma G.
Gundlachi P.
hispida P.
incrustata G.
minima O.
velutina Py.
PROSERPINA.
depressa O.

Curacao.

HELIX.
pentodon Mke.
PUPA.
uva L.
TUDORA.
megacheila P. & M.

Grenada (°).

HELIX.
perplexa F.
BULIMUS.
Caraccasensis Rv.
glaber Gm.
octonoides Ad.
subula P.
TORNATELLINA.
Funcki P.
CYCLOTUS.
Granadensis Sh.
HELICINA.
Heatei P.

Grenadines.

HELIX.
perplexa F.
ORTHALICUS.
undulatus Guild. (*Union I.*)

Guadeloupe (°).

HELIX.
arborea Say.
badia F.
Baudoni P.
dentiens F.
Josephinæ F.
lychnuchus Müll.
pachygastra Gr.
Schrammii Fisch.
BULIMUS.
Caraccasensis Rv.
chrysalis P.
elongatus Bolt.
exilis Gm.
Lherminieri Fisch.
limnoides F.
ACHATINA.
octona Ch.
OLEACINA.
Guadeloupensis P.
TORNATELLINA.
lamellata P. & M.
CYLINDRELLA.
collaris F.
SUCCINEA
Candeana Lea.
depressa Rang.
patula Br.
unguis F.
TRUNCATELLA.
Caribæensis Sow.
clathrus Lowe
modesta Ad.
scalaris Mich.
CYCLOPHORUS.
Beauianus Pet.
Schrammi Sh.
CHONDROPOMA.
crenulatum F.
HELICINA.
fasciata Lam.
Guadaloupensis Sow. ?
rhodostoma Gray ?
similis Sow. ?

Haiti (°).

HELIX.
acuminata P.
Albersiana P.
angistoma F.
angustata F.
Audebardi P.
Caracolla L.
cepa Müll.
cornu-militare L.
crispata F.
desiderata P.
dilatata P.
disculus Dh.

dissita Dh.
Dominicensis P.
excellens P.
Gaskoini P.
Haitensis W. & M.
hilum W. & M.
Hjalmarsoni P.
indentata Say.
indistincta F.
Justi F.
lampas Müll. ?
leucoraphe P.
loxodon P.
monodonta Lea.
Phaedra P.
polyodon W. & M.
prunosa P.
ptycoraphe W. & M.
pubescens P.
sarcocheila Mörch.
strumosa P.
trizonalis Grat.
undulata F.
vortex P.

BULIMUS.

Caraccasensis Rv.
Dominicus Rv.
exilis Gm.
glaber Gm. ?
hasta P.
marginatus Say.
Moussoni P.
nitidulus P.
rectus P.
Salleanus Rv.
Santanensis P.

SPIRAXIS.

Dunkeri P.
Richardi P.
Salleana P.

ACHATINA.

impressa P.
octona Ch.
virginea L.

OLEACINA.

biplicata W. & M.
oleacea F.
ptycoraphe W. & M.
terebræformis Sh.
texta W. & M.

PUPA.

glans Kust.
microstoma P.
striatella F.

MACROCERAMUS.

angulatus W. & M.
cyrtopleurus P.
formosus Wood.
Gundlachi P.
Hermanni P.

lineatus Br.
Ludovici P.
Richaudi Pet.
signatus Guild.
tenuiplicatus P.
virgineus W. & M.

CYLINDRELLA.

Adamsiana P.
arcuata W. & M.
crenata W. & M.
cristata W. & M.
Dominicensis P.
Eugenii Dornh.
fasciata Ch.
flammulata P.
Gouldiana P.
Gruneri Dunk.
Guigouana Pet.
Hjalmarsoni P.
Laterradii Grat. *Ins. Bente.*
Ludersi P.
malleata P.
Menkeana P.
monilifera P.
obesa W. & M.
puncturata P.
Salleana P.
sericea P.
tricolor P.
tumidula W. & M.
Weinlandi P.

SIMPULOPSIS.

† Dominicensis P.

VITRINA.

—? sp. ind.

SUCCINEA.

Dominicensis P.
margarita P.

CYCLOTUS.

flocosus Sh.

MEGALOMASTOMA.

Orbignyi P.

CHOANOPOMA.

Adolfi P.
Puertoplatense P.
Rosaliae P.
solutum Rich.
tentorium P.
Wilhelmi P.

CTENOPOMA.

Dominicense P.

CYCLOSTOMUS.

Aminensis P.

TUDORA.

nobilis P.
pupaeformis Sow.

CISTULA.

cinclidodes P.

CHONDROPOMA.

adulterinum P.

blandum P.
Caricae P.
eusarcum P.
hemiotum P.
litturatum P.
Loweianum P.
magnificum Sallé.
Petiteanum P.
Salleanum P.
semilabre Lam.
simplex P.

TROCHATELLA.

elegantula P.
opima Sh.
virginea Lea.

HELICINA.

cingulata P.
Dominicensis P.
festiva Sow.
globosa Gray.
malleata P.
oleosa P.
pygmaea P. & M.
rufa P.
rugosa P.
Salleana P.
versicolor P.
viridis Lam.

ALCADIA.

succinea P.

I. of Pines.

HELIX.

auricoma F.
Bonplandii Lam.
Boothiana P.
comes Py.
Pityonesica P.

BULIMUS.

Beathinus Py.
Poeyanus P.
strictus Py.
terebra Py.

ACHATINA.

fasciata Müll.

OLEACINA.

follicularis Mor.
oleacea Fer.
orysacea Mor.
solidula P.
subulata P.

CYLINDRELLA.

pruinosa Mor.

MEGALOMASTOMA.

procer Py.

TUDORA.

Moreletiana Pet.
pupoides Mor.

CHONDROPOMA.

dissolutum P.

TROCHATELLA.

callosa Py.
stellata Mor.
luteo-apicata Py.

HELICINA.

scopulorum Mor.
PROSERPINA.
globulosa O.

Jamaica (°).

HELIX.

abnormis P.
acuta Lam.
albicans P.
alligans Ad.
alveus Ad.
ambigua Ad.
angustispira Ad.
anomala P.
Anthoniana Ad.
aspera F.
atavus Sh.
Bainbridgei P. ?
Blandiana Ad.
Boothiana P.
brevior Ad.
brevis Ad.
Bronni P.
Buddiana Ad.
cara Ad.
Carmelita F.
Chemnitziana P.
cognata F.
columellata Ad.
connectens Ad.
conspersula P.
Cookiana Gm.
diminuta Ad.
dioscoricola Ad.
epistylionides F.
epistylulum Ad.
Foremaniana Ad.
fuscocinata Ad.
fuscolabris Ad.
fuscula Ad.
Gossei Ad.
graminicola Ad.
Haldemaniana Ad.
Hollandi Ad.
immunda Ad.
inconspicua Ad.
ingens Ad
invalida Ad.
invasa P.
Jacobensis Ad.
Jamaicensis Ch.
Jayana Ad.
lamellifera Ad.
lucerna Müll.
Mac Murrayi Ad.

- margarita P.
 McNabiana Chitty.
 minuscula By.
 munda Ad.
 nemoraloides Ad.
 nobilis Ad.
 Okeniana P.
 osculans Ad.
 pallescens Sh.
 paludosa P.
 patina Ad.
 peracutissima Ad.
 peraffinis Ad.
 perdepressa Ad.
 picturata Ad.
 pila Ad.
 pretiosa Ad.
 propenuda Ad.
 Proserpinula P.
 ptychodes P.
 rufula P.
 Schroeteriana P.
 similis Ad.
 - Simpson P.
 simulans Ad.
 sincera Ad.
 sinuata Müll.
 sinuosa F.
 soror F.
 Spengleriana P.
 spiculosa Sh.
 spreta Ad.
 straminea Alb.
 strangulata Ad.
 subconica Ad.
 tenerrima Ad.
 torrefacta Ad.
 tridentina F.
 triptycha Sh.
 tumida P.
 turbiniformis F.
 valida Ad.
 virginea Ad.
- BULIMUS.**
- confertus P.
 erubescens P.
 Goodalli Mil.
 hortensis Ad.
 immaculatus Ad.
 Jamaicensis Rv.
 laeviusculus Ad.
 macrospira Ad.
 marginatus Say.
 minimus Ad.
 monodon Ad.
 nitidiusculus Ad.
 nitidulus P.
 octonoides Ad.
 pallidus Ad.
 rufescens Gray.
- subula P.
 terebella Ad.
- SPIRAXIS.**
- aberrans P.
 Adamsiana P.
 brevis Ad.
 contorta Chitty.
 costulosa Ad.
 inusitata Ad.
 mirabilis Ad.
- ORTHALICUS.**
- undatus Brng.
- ACHATINA.**
- Adamsiana Chitty.
 arcuata P.
 costulata Ad.
 curvilabris P.
 Gossei P.
 gracilior Ad.
 Gundlachi P.
 iota Ad.
 levis Ad.
 longispira Ad.
 micans Ad.
 octona Ch.
 osculans Ad.
 parvula Chitty.
 pellucens Ad.
 puella Ad.
 solitaria Ad.
 striosa Ad.
 tenera Ad.
- OLEACEA.**
- angiostoma Ad.
 Blandiana Ad.
 costulosa Ad.
 Dominicensis Gm.
 Gayana Ad.
 Griffithsi Ad.
 Ingallsiana Ad.
 Jamaicensis P.
 leucozonias Walch.
 ligata Ad.
 nemorensis Ad.
 nitida Ad.
 perplexa Ad.
 Philippiana P.
 Philippi Ad.
 procera Ad.
 propinqua Ad.
 proxima Ad.
 similis Ad.
 unicolor Ad.
 venusta Ad.
 vicina Ad.
- PUPA.**
- contracta Say?
 exilis Ad.
 Grévillei Chitty.
 hexodon Ad.
- Jamaicensis Ad.
 Jardineana Chitty.
 lata Ad.
 pellucida P.
 tenuidens Ad.
- MACROCERAMUS.**
- Gossei P.
- CYLINDRELLA.**
- abbreviata Dh.?
 Agnesiana Ad.
 alabastrina P.
 alba Ad.
 amethystina Chitty.
 aspera Ad.
 Augustae Ad.
 Baquieana Chitty.
 Blandiana P.
 brevis P.
 columna Ad.
 costulata Ad.
 cylindrus Ch.
 dubia Chitty.
 Dunkeriana P.
 elatior Ad.
 elongata Ch.
 Gossei P.
 gracilis Wood.
 Gravesii Ad.
 Hollandi Ad.
 Humboldtiana P.?
 humilis Ad.
 hydrophana Chitty.
 inornata Ad.
 lata Ad.
 macrostoma P.
 Maugeri Wood.
 megacheila Chitty.
 nobilior Ad.
 ovata Desh.?
 Pearmaneana Chitty.
 princeps Ad.
 pupaeformis Ad.
 pusilla Ad.
 Robertsi Ad.
 rosea P.
 sanguinea P.
 seminuda Ad.
 similis Ad.
 simplex Ad.
 striata Chitty.
 subula F.
 tenella Ad.
 tricolor P.
 variegata P.?
 zebrina P.
 zonata Ad.
- SUCCINEA.**
- angustior Ad.
 contorta Ad.

- latior Ad.
Sagra O.
- GEOMELANIA.**
affinis Ad.
Beardsleana Ad.
conica Ad.
costulosa Ad.
elegans Ad.
exilis Ad.
expansa Ad.
fortis Ad.
gracilis Ad.
Greyana Ad.
Hilliana Ad
inornata Chitty.
Jamaicensis P.
magna Ad.
media Ad.
minor Ad.
parva Chitty.
pauperata Ad.
procera Ad.
pygmaea Ad.
pyramidata Ad.
sinuosa Chitty.
striosa Ad.
typica Ad.
vicina Ad.
- TRUNCATELLA.**
Adamsi P.
Caribaensis Sow.
modesta Ad.
pulchella P.
scalaris Mich.
- CYCLOTUS.**
asperulus Som.
corrugatus Sow.
crassus Ad.
dubiosus Ad.
Jamaicensis Ch.
jugosus Ad.
palescens Ad.
perpallidus Ad.
subrugosus Sow.
saturalis Sow.
varians Ad.
- JAMAICIA.**
anomala Ad.
Moussoniana Ad.
- LICINA.**
dubia Gm.
labeo Müll.
- CHOANOPOMA.**
Chittyi Ad.
fimbriatulum Sow.
granosum Ad.
Hillianum Ad.
interruptum Lam.
lima Ad.
- lincina L.
lincinellum Lam.
mite P.
pulchrum Wood.
scabriculum Sow.
spinulosum Ad.
- CTENOPOMA.**
Campbelli Ad.
pisum Ad.
Wilkinsoni Ad.
- ADAMSIELLA.**
chlorostoma Sow.
Grayana P.
ignilabris Ad.
intermedia Ad.
mirabilis Wood.
miranda Ad.
monstrosa Ad.
moribunda Ad.
Pearmaneana Chitty.
pulchrior Ad.
variabilis Ad.
xanthostoma Sow.
- CYCLOSTOMUS.**
albus Sow.
Banksianus Sow.
Bronni Ad.
Chevalieri Ad.
crenulosis Ad.
Humphreyanus P.
Jayanus Ad.
lamellosus Ad.
Redfieldianus Ad.
retrorsus Ad.
serecinus Ad.
tectilabris Ad.
thysanoraphe Sow.
Yallahensis Ad.
- TUDORA.**
Adamsi P.
armata Ad.
Augustae Ad.
avena Ad.
Barklyana Chitty.
columna Wood.
fascia Wood.
fecunda Ad.
Griffithiana Ad.
maritima Ad.
mutica Ad.
papyracea Ad.
pauperata Ad.
simulans Ad.
Tappaniana Ad.
versicolor P ?
- CISTULA.**
dislocata Baird.
lugubris P.
mordax Ad.
sagittifera Ad.
- Sauliae Sow.
Shephardiana Ad.
- STOASTOMA.**
Agassizianum Ad.
Anthonianum Ad.
Blandianum Ad.
Chittyanum Ad.
Cumingianum Ad.
Fadyenianum Ad.
Gouldianum Ad.
Hollandianum Ad.
Jayanum Ad.
Leanum Ad.
Lindsleyanum Ad.
Moricanianum Ad.
Petitianum Ad.
Pfeifferianum Ad.
Philippianum Ad.
pisum Ad.
Redfieldianum Ad.
Tappanianum Ad.
Vilkinsoniae Ad.
- TROCHATELLA.**
Chittiyana P.
Grayana P.
Josephinae Ad.
nobilis Ad.
pulchella Gray.
Tankervillei Gray.
tenuis Ad.
- LUCIDELLA.**
aureola F.
nana P.
- HELICINA.**
Adamsiana P.
ampliata Ad.
aurantia Gray.
costata Gray.
depressa Gray.
Jamaicensis Sow.
lineata Ad.
maxima Sow. ?
neritella Lam.
nobilis Ad.
- ALCADIA.**
Browni Gray.
citrinolabris Ad.
consanguinea Ad.
dubiosa Ad.
Gossei P.
hirsuta Ad.
Hollandi Ad.
macilenta Ad.
major Gray.
megastoma Ad.
microstoma Ad.
palliatu Ad.
pusilla Ad.
solitaria Ad.

PROSERPINA.

- bidentata Ad.
linguifera Jonas.
nitida Gray.
pisum Ad.

Marie-Galante.

HELIX.

- badia F.

HELICINA.

- fasciata Lam.

Martinique.

HELIX.

- auridens Rang.
badia F.
bracteola F.
crassidens P.
dentiens F.
desidens Rang.
discolor F.
lychnuchus Müll.
nigrescens Wood. ?
nucleola Rang.
nuxdenticulata Ch.
obesa Bk.
orbiculata F.
pachygastra Gray.
parilis F.
stenostoma P.

BULIMUS.

- chrysalis P.
elongatus Bolt.
Martinicensis P.
multifasciatus Lam.

ACHATINA.

- semitarum Rang.

CYLINDRELLA.

- collaris F.

SUCCINEA.

- Candeana Lea.
haliotoidea Mitt.
rubescens Dh.

CYCLOTUS

- Martinicensis Sh.

CYCLOPHORUS.

- rufescens Sow.

CHOANOPOMA.

- occidentale P.

HELICINA.

- Antillarum Sow.
fasciata Lam.
platycheila Mulhf.
plicatula P.
striatula Sow.

Portorico ⁽¹⁰⁾.

HELIX.

- angulata F.
Arcibensis P.

bryodes Sh.

- Caracolla L.
concolor F.
dermatina Sh.
diaphana Lam.
euclasta Sh.
Gundlachi P.
lima F.
Luquillensis Sh.
marginella Gm.
minusecula By.
musicola Sh.
obliterata F.
plagioptycha Sh.
Portoricensis P.
Riisei P.
squamosa F.
subaquila Sh.
velutina Lam.
vortex P.

BULIMUS.

- alabastrinus Sh.
elongatus Bolt.
exilis Gm.
fraterculus F.
Gompharium Sh.
Goodalli Mil.
hasta P.
Hjalmarsoni P.
liliaceus F.
margaritaceus Sh.
marginatus Say.
nitidulus P.
octonoides Ad.
opalescens Sh.
stylodon Sh.
subula P.
Swiftianus P.
terebraster Lam.

ACHATINA.

- acicularis Sh.
octona Ch.

OLEACINA.

- glabra P.
interrupta Sh.
Portoricensis P.
sulculosa Sh.
terebraeformis Sh.

TORNATELLINA.

- Antillarum Sh.

PUPA.

- hexodon Ad.
microstoma P.
pellucida P.
striatella F.

MACROCERAMUS.

- microdon P.

CYLINDRELLA.

- pallida Guild.

Portoricensis P.

Riisei P.

CLAUSILLA.

- tridens Ch.

SIMPULOPSIS.

- Portoricensis Sh.

SUCCINEA.

- approximans Sh.
hyalina Sh.
Riisei P.

TRUNCATELLA.

- clathrus Lowe.
pulchella P.
subcylindrica Gray.

MEGALOMASTOMA.

- cylindraceum Ch.
verruculosum Sh.

CHOANOPOMA.

- decussatum Lam.
senticosum Sh.

CISTULA.

- lineolata Lam.
Riisei P.

CHONDROPOMA.

- Blauneri Sh.
Newcombianum Ad.
Newtoni Sh.
Swifti Sh.

STOASTOMA.

- Portoricense P.

HELICINA.

- fasciata Lam.
foveata P.
Hjalmarsoni P.
phasianella Sow.
striata Lam.
subfusca Menke.
trochulina O.
umbonata Sh.
vinosa Sh

St. Bartholomew.

HELIX.

- notabilis Sh.

CHOANOPOMA.

- sulculosum F.

St. Christopher.

HELIX.

- Josephinae F. s. f.

BULIMUS.

- exilis Gm.
fraterculus F.
multifasciatus Lam.

SUCCINEA.

- patula Brug.

HELICINA.

- fasciata Lam.

St. Croix (11).

HELIX.
Caracolla L. *s. f.*
marginella Gm. *s. f.*
Santacruzensis P.
variegata Ch. ?
vortex P.

BULIMUS.
elongatus Bolt.
extinctus P. *s. f.*
fraterculus F.
marginatus Say.

PUPA.
rudis P.

CYLINDRELLA.
chordata P.

SUCCINEA.
Riisei P.

CYCLOSTOMUS.
fallax P. ?

CISTULA.
rufilabris Beck.

CHONDROPOMA.
Santacruzense P.

St. John.

HELIX.
euclasta Sh.
nemoralina Pet.
notabilis Sh.
subaquila Sh.

BULIMUS.
elongatus Bolt.
fraterculus F.
Goodalli Mil.
octonoides Ad.
subula P.
Swiftianus P.

ACHATINA.
octona Ch.

PUPA.
pellucida P.

MACROCERAMUS.
microdon P.

CYLINDRELLA.
pallida Guild.

SUCCINEA.
approximans Sh.

MEGALOMASTOMA.
Antillarum Sow.

CHONDROPOMA.
Newcombianum Ad.

HELICINA.
phasianella Sow.
subfusca Mk.

ALCADIA
rubella P.

St. Lucia (12).

HELIX.
orbiculata F.

BULIMUS.
aulacostylus P.

St. Martin.

BULIMUS.
elongatus Bolt.
exilis Gm.

St. Thomas (13).

HELIX.
euclasta Sh.
Gundlachi P.
incerta F. *s. f.*
nemoralina Pet.
subaquila Sh.
vortex P.

ENNEA.
bicolor Gould.

BULIMUS.
Barbadensis P.
diaphanus P.
elongatus Bolt.
exilis Gm.
fraterculus F.
Goodalli Mil.
gracillimus P.
octonoides Ad.
subula P.
Swiftianus P.

ACHATINA.
Gundlachi P.
octona Ch.

PUPA.
Jamaicensis Ad.
pellucida P.

MACROCERAMUS.
microdon P.

CYLINDRELLA.
gracillicollis F. ?
pallida Guild.

SUCCINEA.
approximans Sh.
Barbadensis P.

TRUNCATELLA.
clathrus Lowe.
pulchella P.
subcylindrica Gray.

MEGALOMASTOMA.
Antillarum Sow.

CHONDROPOMA.
Newcombianum Ad.
Santacruzense P.

HELICINA.
foveata P.
subfusca Menke.

ALCADIA.
rubella P.

St. Vincent.

HELIX.
cruentata Guild.
livida Guild.

BULIMUS.
auris-Sileni Born.
exilis Gm.
limnoides F.
oblongus Müll.
stramineus Guild.
undulatus Guild.
Vincentinus P.

SUCCINEA.
Cuvieri Guild.
tigrina Less.

HELICINA.
occidentalis Guild.

Tobago.

BULIMUS.
oblongus Müll.

Tortola.

HELIX.
nemoralina Pet.
notabilis Sh.

ACHATINA.
octona Ch.

TORNATELLINA.
Antillarum Sh.

MACROCERAMUS.
microdon P.
signatus Guild.

CYLINDRELLA.
pallida Guild.

CHONDROPOMA.
Tortolense P.

Trinidad (14).

HELIX.
discolor F. ?

STREPTAXIS.
deformis F.

ENNEA.
bicolor Gould.

BULIMUS.
Caraccasensis Rv.
fraterculus F.
glaber Gm.
multifasciatus Lam.
oblongus Müll.

ORTHALICUS.
undatus Brug.

ACHATINA.
octona Ch.

TORNATELLINA.
Antillarum Sh.

CYLINDRELLA.
Trinitaria P.

CYCLOSTOMUS.
citrinus Sow.

	Vieque.		
HELIX.		BULIMUS.	SUCCINEA.
Caracolla L.		elongatus Bolt.	approximans Sh.
diaphana Lam.		exilis Gm.	CHOANOPOMA.
dioscoricola Ad.		fraterculus F.	decussatum Lam.
euclasta Sh.		octonoides Ad.	senticosum Sh.
Gundlachi P.		Swiftianus P.	sulculosum F.
lima F.		Viequensis P.	HELICINA.
marginella Gm.		ACHATINA.	fasciata Lam.
plagioptycha Sh.		octona Ch.	foveata P.
Riisei P.		PUPA.	phasianella Sow.
subaquila Sh.		pellucida P.	vinosa Sh.

NOTES.

1. *Antigua*.—The species which have come under my notice from this island, and St. Christopher, were collected by the Rev. A. Hamilton.

2. *Bahamas*.—The New Providence shells were collected by Mr. Wm. Cooper, and Mr. T. Smitten,—those from Turk's Island by Mr. Theo. Gill and others.

3. *Barbados*.—For these shells I am indebted to the late Rev. J. Parkinson, Mr. Gill, &c. *B. oblongus* Müll. was introduced by Mr. Parkinson from St. Vincent.

4. *Bermuda*.—Collections were made by the late Prof. C. B. Adams, also by Mr. R. Swift, Mr. Temple Prime, myself, and others. As to *H. microdonta* Dh. extensively distributed as *H. delitescens* Sh. see my remarks, *Annals* vii. p. 140.

5. *Cuba*.—I have been liberally supplied with Cuban species, especially by Prof. Poey, Dr. Gundlach, Mr. Shuttleworth, Bishop Elliott, &c. Some errors may be detected in the Catalogue arising from differences of opinion and also of classification, of Poey and Pfeiffer. I should quote the following from Poey, *Mem.* ii. p. 406—" *Helices rostrata* P., *marginelloides* O., *Pazensis* Py., *transitoria* P., *Arangiana* Py., *Gutierrezii* Py., *marginatoides* O., *mina* P., varietates sunt H Sagemonis; quod in itinere Cl. J. Gundlach demonstratum est. Transitiones exstant; animal in omnibus idem est." As to *H. Carpenteriana* Bland, see *Annals* vii. p. 133.

The occurrence in species belonging to Cyclostomacea, of a perforation at the upper margin of the aperture, is peculiar, I believe, to those inhabiting Cuba and the Bahamas. See Poey, *Mem.* ii. p. 40.

6. *Grenada and Grenadines*.—Dr. W. Newcomb collected in Grenada, and I have received shells from him, Rev. J. Parkinson, and Mr. R. Swift.

7. *Guadeloupe*.—I have had comparatively few authentic specimens from the French islands. Beau in his Catalogue (1858) excludes several species generally attributed to this island.

8. *Haiti*.—I am principally indebted for Haitian shells to M. Sallé, Mr. Cuming, and Mr. Swift. The discovery of *Vitrina* was made by Mr. Hjalmarson, in 1859.

9. *Jamaica*.—Very numerous specimens collected by Prof. C. B. Adams, Mr. Chitty, M. Roy, myself, and others, have come under my notice. Pfeiffer *Mon.* iv. treats *Geomelamia Greyana* C. B. Ad., as a *Cylindrella*—it was so originally described by Adams, but he subsequently corrected the error. Many new species of *Cyclotus* and *Stoastoma* were described by Mr. Chitty in the *Zool. Proc.* in 1857, but as they do not appear to have been adopted, I omit them.

10. *Portorico and Viéque*.—I received very many of the species of these islands, collected by the late Mr. Blauner, from Mr. Shuttleworth—also from Messrs. Swift, Riise, Knox, and others.

11. *St. Croix*.—For these shells, as well as for those from St. John and Tortola I am principally indebted to Mr. A. H. Riise, H. Krebs, R. Swift, and H. Haägenssen. Two semi-fossil species of *Cyclostoma* have been described by Pfeiffer—*C. basicarinatum* and *C. chordiferum*.

12. *St. Lucia*.—I am satisfied that the information afforded by the late Mr. McMurray as to the habitat of *B. anlacostylus* Pfr., was incorrect. It belongs to St. Lucia, as originally stated by the Rev. E. Hartvig.

13. *St. Thomas*.—Nearly all the species were collected by myself in 1852. See my Notes in *Cont. to Conch.*, p. 215, and *Annals*, vi. p. 74.

14. *Trinidad*.—From the late Mr. McMurray, and especially Mr. Theo. Gill, I received these shells.

The names of several islands do not appear in the Catalogue, because I am ignorant as to the species inhabiting them—Dominica, for instance, from which I have never seen or even heard of any species. Further examination of Haiti, and other islands, as well as of the Continents of America, will doubtless afford many new species, but I do not anticipate that they will sensibly affect the conclusions at which I have arrived with regard to the faunas of the islands.

Although disagreeing with Pfeiffer as to the nomenclature and synonymy of some of the West India species, my limits do not permit of reference to such questions. In the Catalogue I have adopted his classification, and in a few instances have exercised my own judgment as to species, where I differ from him. Much labor has been bestowed on the Catalogue, and I would mention that my chief object in publishing it is to show the grounds on which my views as to the geographical distribution of the species generally are founded.

At page 11 the numbers of Inoperculate and Operculate species which occur in the islands E. and S. of Viéque are stated to be 183 and 50, the species common to more than one island being enumerated as belonging to each. The actual numbers, reckoning each species once only, are 103 Inoperculate, and 43 Operculate.

Notice of Land and Freshwater Shells collected by Dr. J. G. Cooper in the Rocky Mountains, etc., in 1860.

BY T. BLAND AND J. G. COOPER.

Read June 17, 1861.

Reprinted from the Annals of the Lyceum of Natural History, New York, Vol. VII., June, 1861.

THE shells, which form the subject of this paper, were collected by Dr. J. G. Cooper, during the progress of a military expedition under the command of Major Blake, U.S.A. The party went from St. Louis in the Spring of 1860 by steamboat to Fort Benton, crossed over the mountains from that point to the waters of the Columbia River, where it again embarked, and proceeded to the Pacific Coast.

Dr. Cooper forwarded his notes and specimens to Mr. W. Cooper, who placed them in the hands of Mr. T. Bland with a view to the preparation of the subjoined notice.

Helix Townsendiana Lea, Trans. Amer. Phil. Soc., vi. 99, pl. 23, f. 80.

This species was brought by Mr. Nuttall, Dr. Townsend, and the United States Exploring Expedition from the neighborhood of the Wahlamat, near its junction with the Columbia River. Dr. Cooper collected many examples, varying much in size, but none so large as those which we have seen from Oregon.

The following is a copy of his note on the specimens,—“The numerous small specimens were found in the dry prairie at the junction of Hell Gate and Bitter Root Rivers, and as I met with larger ones of various sizes in more damp situations of the woods, from an elevation of 4800 feet down to 2200 feet, at the base of the Bitter Root Range, I presume that the former is a dwarfed variety, such as is found also west of the Coast Mountains in Washington Territory. This is the most wide-spread species I have seen.” Other specimens forwarded by Dr.

Cooper are labelled, "both slopes of the Bitter Root Mountains from 5600 feet to 2200 feet."

In Binney's Terr. Moll. II. 162, the greatest transverse diameter of Oregon examples, is said to be $1\frac{3}{8}$ inch.

The following are the measurements of large and small specimens from Dr. Cooper's shells.

Diam. maj. 23, min. 20, Alt. 13 mil.

" " 17, " 13 $\frac{1}{2}$, " 9 "

The small variety is generally more strongly and coarsely wrinkled.

Dr. Cooper in the Pacific R. R. Report, gives Puget's Sound, W. T., as a habitat of this species,—it has also been found at Cape Disappointment, on the borders of Oregon and Washington Territory.

Helix Mullani, nov. sp.

T. subobtecte-umbilicatâ, globoso-depressâ, fusco-corneâ, irregulariter striatâ, epidermide tenui, sub lente lineis spiralibus, et tuberculis (setos gerentibus?) munitâ, sub epidermide nitidâ; spirâ brevi; anfr. $5\frac{1}{2}$ —6 convexis, ultimo antice gibbo, vix descendente, basi læviusculo, ad aperturam valde constricto; aperturâ subtriangulari, obliquâ, dente brevi, albo, linguiformi, in pariete aperturali intrante subcoarctatâ; perist. albo, vel rufo-corneo, expanso, fornicatim reflexo, bidentato, dentibus duobus albis in margine calli positus, 1 inferiore lamelliformi, altero, sæpe obsoleto, parvo; margine columellari umbilicum mediocrem pervium semioccultante.

Shell with umbilicus partially covered, globose-depressed, dark horn colored, irregularly striated, having a thin epidermis with microscopic spiral lines, and tubercles (the latter with hairs?); beneath the epidermis shining; spire short; whorls $5\frac{1}{2}$ to 6, convex, the last gibbous above, scarcely descending, the base rather smooth, much constricted at the aperture; aperture subtriangular, oblique, with a short white linguiform parietal

tooth; peristome white, or reddish horn colored, thickened, expanded, and roundly reflected, with two teeth on the margin of the callus, the lower one lamelliform, the other small, often obsolete, the columellar margin partially covering the middling sized pervious umbilicus.

Diam. maj. $13\frac{1}{2}$, min. 11, Alt. 7 mill.

Station.—Under logs and in dry pine woods.

Habitat.—Dead specimens found near Coeur d'Aléne Mission, Coeur d'Aléne Mountains;—living ones on the west side of the Bitter Root Mountains, Washington Territory, J. G. Cooper!; St. Joseph's River, 1st Camp, Oregon, Cabinet of W. G. Binney.

Remarks.—This species is most nearly allied in form to *H. Columbiana* Lea* (*H. labiosa* Gould), the peristome is however not only more thickened, but also singularly reflected behind the plane of the aperture, producing a canal behind it, leading from the upper margin into the umbilicus. Being tridentate it has some alliance with *H. tridentata* Say, but that shell is of coarser texture, more depressed, has a more open umbilicus, and the form of the peristome and teeth are different.

Dr. Cooper found a beautiful hyaline specimen under a stone "by the Bitter Root River, at an elevation of 4000 feet, on a hill called 'Half Way' 30 miles below the junction." This variety is much depressed, translucent, delicately striated, and has the parietal tooth only. The very thin epidermis shows the spiral lines, and the last whorl numerous scars of the tubercles mentioned in our description of the species. In Mr. Binney's specimen from Oregon the umbilicus is wider, and not so much covered by the peristome as in the other examples.

The species is named in honor of Lieutenant Mullan, U.S.A., who has done much in collecting the natural products of the region in which it was found.

* A specimen of *H. Columbiana* Lea in the Cabinet of T. Bland, has a well developed parietal tooth, the same as in *H. thyroides* Say.

***Helix polygyrella*, nov. sp.**

T. late umbilicatâ, discoideâ, planulatâ, nitidâ, translucidâ, luteo-corneâ, superne costulatâ, costis ad aperturam obsoletis, basi læviusculâ, spirâ vix elevatâ; anfr. 7-8 convexiusculis, lente accrescentibus, ultimo antice breviter deflexo, intus sericibus duobus remotis trium dentium munito; umbilico ad apicem pervio; aperturâ subverticali, obliquâ, lunato-ovali; perist. superne depresso, albo, simplici, valde incrassato, marginibus dente pliciformi, elevato, albo, triangulari junctis.

Shell widely umbilicate, discoidal, flat, shining, translucent, yellowish horn colored, ribbed above, the ribs obsolete near the aperture, base rather smooth; spire scarcely elevated; whorls 7-8, somewhat convex, gradually increasing, the last slightly deflexed above, armed within with two rows of three teeth, seen through the outer wall; umbilicus pervious, of equal size to the apex; aperture subvertical, oblique, lunate-oval; peristome depressed above, white, simple, much thickened within, the margins joined by a white pliciform elevated triangular tooth.

Diam. maj. $11\frac{1}{2}$, min. $10\frac{1}{2}$, Alt. 5 mill.

Station.—Inhabits moss and decaying wood in the dampest parts of the spruce forests.

Habitat.—Common on the Cœur d'Alêne Mountains, especially on their eastern slope. J. G. Cooper!

Remarks.—This very interesting species is unlike any shell, with which we are acquainted, hitherto found on the North American Continent. Although entirely distinct from the Brazilian *H. polygyrata* Born it has some affinity with it, especially as regards the form generally, and the presence of the internal teeth. *H. polygyrata* has five teeth within the last whorl, three on the under surface of the outer wall, and two opposite to the others on the exterior of the penultimate whorl. Our species has two distinct rows of three teeth, all the teeth being on the

under surface of the outer whorl; the first row nearly opposite to the aperture, the second between the first and the parietal tooth; in one specimen, the second row is immediately behind that tooth, and visible through the shell just within the aperture.

Helix Vancouverensis Lea Trans. Amer. Phil. Soc. vi., 87, pl. 23, f. 72.

Mr. Isaac Lea described this from specimens brought by Mr. Nuttall from the banks of the Columbia River, Oregon. In 1840, Dr. Binney (Bost. Jl. iii. 372) considered it the same as *H. concava* Say, although he afterwards (Terr. Moll. ii. 166), in deference to the opinions of others, treated it as distinct. The two are certainly *very* closely allied. Dr. Gould described *H. sportella** (Bost. Proc. ii. 167) in 1846; it was brought by the U. S. Exploring Expedition from Puget Sound, Oregon. Gould's differs from Lea's species in having the incremental striæ more or less decussated by revolving lines, giving it a granulated appearance. In some individuals the decussation is to a great extent obsolete, or confined to the upper whorls only, and it seems to us that the two species cannot be separated. The same differences prevail in forms of the Cuban *H. Sagemon* Beck. *H. vellicata* Forbes is certainly identical with Lea's species.

H. Vancouverensis has a wide distribution. Dr. Cooper collected it "on the west side of the Coeur d'Alêne Mountains, W.T. in the forests of Coniferæ, &c., such as it inhabits west of the Cascade range." He remarks, "there is a wide plain between those two ranges quite uninhabitable by Helices on account of drought, for a distance of about two hundred miles, but this species and *H. Townsendiana* Lea probably extend round its north end through the forests near lat. 49° N." We have it from the vicinity of Crescent City, California (Dr. W.

* In form and sculpture *H. sportella* is curiously allied to *H. euspira* Pfr. from Venezuela.

Newcomb!), also from Oregon City, and Whidby's Island, W. T.

It is found on the Pacific coast from Puget Sound to San Diego, Lower California.

Helix strigosa Gould Proc. Bost. Soc. N. H. ii. 166.

This species was brought by the U. S. Exploring Expedition from the interior of Oregon.

Dr. Cooper found it in Washington Territory "on the Rocky Mountains by the Bitter Root River, at an elevation of 4000 feet, æstivating under logs of pine, on a steep slope of shale containing lime in veins."

The shells collected by Dr. Cooper are of smaller dimensions than those given by Gould, the former measure diam. maj. 19, min. 17, alt. 7 mill. The outer whorl is more carinated, with a more distinct reddish brown band above, and also below the periphery. In some the penultimate whorl shows at the suture its acutely carinated edge, excavated near the margin, and with an impressed line, as in *H. Cumberlandiana* Lea. The somewhat distant spiral lines at the base, intersecting the incremental striæ, produce a semi-granulated appearance. In old examples the margins of the peristome are joined by a parietal callous deposit.

This species also occurs in the Big Horn Mountains, in Nebraska, and on the Rio Piedra, in W. New Mexico.

One specimen reached us with the animal alive; kept in a glass vessel with moist grass, it deposited six young shells, each having 2-2½ whorls. The species is, it would seem, viviparous.

Helix Cooperi W. G. Binney Proc. Acad. N. S. Phila. 1858, p. 115.

Mr. Binney described this from specimens found by Dr. F. V. Hayden (Yellow Stone River Expl. Exped.), among the Black Hills of Nebraska. We can refer only to this a number

of shells collected by Dr. Cooper on the east side of Mullan's Pass, in the Rocky Mountains, W. T., Lat. $46^{\circ} 30' N.$, at an elevation of 5500 feet.

The shells, however, attain a very much larger size than those described by Mr. Binney,—his (5 whorls) are diam. maj. 15, min. 13, alt. 9 mill., whereas Dr. Cooper's specimens (6 whorls) measure diam. maj. 25, min. 23, alt. 12 mill. In those before us the outer whorl is little deflected at the aperture, and the shell, altogether larger, is less globose; the color is also different, Dr. Cooper's examples are generally of a light ash-grey color, the upper part prettily tessellated with reddish brown patches of varied shades, and the last whorl has two bands of the same color, one above and the other below the periphery. The surface in fresh specimens has a granulated appearance, the incremental striæ being crossed by numerous distinct impressed spiral lines.

This species has marked affinities with *H. strigosa* Gould, indeed, on a cursory examination might perhaps pass as a variety, but the difference in color and sculpturing, its more elevated spire, and narrower umbilicus, seem to entitle it to specific distinction.

We find a *colorless worn* specimen, with umbilicus more like that of *H. strigosa*, and which may be an elevated form of that species, or a variety of *H. Cooperi*.

This species also occurs on the Big Horn Mountains, Nebraska; on the west side of the Wind River Mountains; and on the Rio Piedra, W. New Mexico.

Helix solitaria Say Jour. Acad. N. S. Phila. ii., p. 157.

Dr. Cooper collected many specimens on both slopes of the Coeur d'Alêne Mountains, particularly in the bush and fern covered openings in the forests, at elevations exceeding 2500 feet. This well known species inhabits a wide area. Say described a single dead example from Lower Missouri. It

occurs also in Michigan, Indiana, and Ohio. A small variety, sometimes without bands, is found on Strontian Island, Lake Erie. One of Dr. Cooper's specimens has a very unusual arrangement of color,—the entire shell is dark reddish brown, with a single pale band at the periphery.

The shell found by Dr. Hayden at Bridger's Pass, Nebraska, and referred to by Mr. W. G. Binney (Proc. Acad. N. S. Phila. 1858, p. 115) as a small variety of *H. solitaria* is evidently the young state of *H. Cooperi* W. G. Binney.

Helix arborea Say Nich. Enc. iv., pl. 4, f. 4.

Dr. Cooper met with this species in damp bottom lands along the lower valley of the Hell Gate River, at an elevation of about 4500 feet. The wide distribution of *H. arborea* is remarkable, it is found from Labrador to Texas, from Florida to Nebraska, also on the Rio Chama in New Mexico. It is likewise said by Beau to inhabit the island of Guadeloupe, West Indies. Férussac, in a letter to Say (1820), the original of which is in the possession of T. Bland, expresses his belief that *H. arborea* is found in Guadeloupe.

Helix striatella Anthony Jl. Bost. Soc. N. H. iii., pl. 3, f. 2.

Dr. Cooper also found this in the same locality as *H. arborea* Say. Its range is from Canada East to Kansas, and from Pembina on the Red River of the North to Virginia.

Succinea rusticana Gould Proc. Bost. Soc. N. H. 1846, p. 187.

This species was brought by the U. S. Exploring Expedition from Oregon. Dr. Cooper collected it on the Rocky Mountains of the Bitter Root Valley, at elevations from 2500 to 4500 feet.

The following fresh water species, as determined with the assistance of Messrs. Lea, Binney, and Prime, were also collected in the mountains by Dr. Cooper:

- | | | |
|------------------------------|---|---------------------------------|
| Melania plicifera Lea | } | Hell Gate River. |
| Limnæa fragilis L. | | |
| ——— humilis Say | | |
| Physa hypnorum L. | | |
| ——— heterostropha Say | | |
| Planorbis trivolvis Say | | |
| ——— parvus Say? | } | Missouri River above the Falls. |
| Sphærium occidentale Prime | | |
| Limnæa fragilis L. | | |
| ——— bulimoides L. | | |
| ——— desidiosa S. | | |
| Physa heterostropha S. | | |
| Sphærium striatinum Lam | } | |
| Leptoxis. | | |
| Amnicola. | | |
| Ancylus. | | |
| Unio luteolus Lam. | | |
| Margaritana margaritifera L. | | |

This latter was found in the "Missouri River above the Falls, and also in the Spokan River below Lake Coeur d'Alêne." It is the purple variety, hitherto only brought from the Pacific coast.

Cooper's Shells

REMARKS ON
CLASSIFICATIONS OF NORTH AMERICAN
HELICES

BY EUROPEAN AUTHORS,

AND ESPECIALLY BY

H. & A. ADAMS AND ALBERS.

BY THOMAS BLAND.

Read October 12th, 1863.

Reprinted from the Annals of the Lyceum of Natural History, New York, Vol. viii. Oct. 1863.

No classification or arrangement of Terrestrial Mollusks, embracing the numerous Genera and Sub-genera proposed by European authors, has at present been attempted or discussed by American Conchologists.

In this paper I propose to give particulars of, and observations especially upon the classifications* by H. & A. Adams, (*Genera of Recent Mollusca*, II., London, 1855), and by Albers, (*Die Heliceen*, Leipsic, 1860, 2d Ed., by Von Martens), of the species of *Helix* which inhabit North America, exclusive of the Pacific Coast and Mexico.

* It is to be regretted that the first parts only of Gray's Catalogue of Pulmonata, London, 1855, and Guide to the Systematic Distribution of Mollusca, London, 1857, issued from the British Museum, have at present been published.

The following extracts from the lists of species given in the former work will show the views of H. & A. Adams; the corrections printed in *Italic letters*, are added by myself.

FAM. HELICIDÆ.

SUBFAM. HELICINÆ.

GEN. **Helix** L.

Subgen. POLYMITA Beck.

varians Menke.

GEN. **Macrocyclus** Beck.

Subgen. VALLONIA Risso.

annulata Case
is exigua Stimp.

costata Müll.
pulchella Müll.

GEN. **Anchistoma**† Klein.

Ariadnæ Pfr.
auriculatum Say.
avarum Say.
cereolum Muhlf.
clausum Raf.
is inflectum Say.
convexum Raf.
is monodon M. & R.
dentiferum Binn.
Dorfeuillianum Lea.
Edgarianum Lea.
fallax Say.
fraternum Say
is var. of monodon M. & R.
germanum Gould.
Hindi Pfr.
hippocrepis Pfr.
hirsutum Say.
Hopetonense Shuttl.

labyrinthicum Lea
is labyrinthicum Say.
Lecontii Lea
is loricatum Gould.
loricatum Gould.
major Binn.
is var. of albolabris Say.
monodon M. & R.
obstrictum Say.
oppilatum Mor.
palliatum Say.
pustulatum Fer.
is pustula Fer.
Roemeri Pfr.
Rugeli Shuttl.
Sayi Binn.
spinosum Lea.
Texasianum Moric.
tridentatum Say.

† "Shell orbiculate depressed, the umbilicus open or covered; whorls 5-7, the last deflexed at the aperture, often gibbous; aperture contracted, lunate, subtriangular; peristome reflexed, usually dentate; inner lip with a linguiform or tooth-like callus, often uniting the margins." In the Synonymy of *Anchistoma* H. & A. Adams have *Stenotrema Raf.*, *Ulostoma Albers*, *Triodopsis Raf.*, *Dædalocœila Beck*, *Isogonostoma Fitz.*, etc. *Gen. of Recent Moll.*, II, 205.

Troostianum Lea.	volvoxis Parr
uvuliferum Shuttl.	is var. of <i>septemvolva</i> Say?
ventrosulum Pfr.	vultuosum Gould.

Subgen. MESODON Raf.

albolabrum Say.	multilineatum Say.
appressum Say.	Pennsylvanicum Green.
elevatum Say.	thyroides Say.
Michelianum Lea	zaleta Say
is <i>Mitchelianum</i> Lec.	is <i>exoleta</i> Binn.

Subgen. POLYGYRA* Say.

fastigiatum Say	profundum Say.
is <i>fastigans</i> L. W. Say.	septemvolva Say.

GEN. **Iberus** Mont.

Subgen. CAMPYLAEA Beck.

electrinus Gould	sportella Gould
is <i>viridula</i> Menk.	is var. of <i>Vancouverensis</i> Lea.
<i>Syn. pura</i> Alder.	strigosus Gould.

Subgen. ARIANTA Leach.

Townsendianus Lea.

GEN. **Hygromia** Risso.†

Berlanderiana Moric.	planorboides Raf.
griseola Pfr.	is <i>concaua</i> Say.
hispida L.	rufescens Penn.

FAM. STENOPIDÆ.

SUBFAM. HELICELLINÆ.‡

GEN. **Sagda** Beck.

Subgen. GASTRODONTA Albers.

gularis Say.	interna Say.
--------------	--------------

* "Shell discoidal, more or less carinated on the upper edge of the whorls, umbilicated; aperture longer than broad; lips thickened, toothed or folded and continued, folds concave beneath; pillar-lip raised above the preceding whorl and concave beneath."—*Say Jour. Acad.* I. 276. 1818. *W. G. Binney's Ed.* p. 10.

† In the Synonymy of *Hygromia* is *Fruticicola* Held.—*Gen. of Recent Moll.* l. c. 214.

‡ In the text, *Helicellinæ* stands as a subfamily of *Oleacinidæ*, but in the Appendix II. 639, H. & A. Adams add the following:—"This sub-family having a caudal gland should be removed to the family *Stenopidæ*."

Remarks on Classifications of

lasmodon Phill.	multidentata Gould
lineata Say.	<i>is multidentata Binn.</i>
macilentata Shuttl.	
<i>is lasmodon Phill.</i>	

GEN. **Zonites** Montfort.

fuliginosa Griff.

Subgen. CONULUS Fitzinger.

egena Say.	Gundlachi Pfr.
fulva Drap.	ligera Say.
<i>Syn. chersina Say.</i>	stenotrema Fer.

GEN. **Discus*** Fitzinger.

alternatus Say.	planorboides Raf.
mordax Shuttl.	<i>is concava Say.</i>
<i>is var. of Cumberlandiana Lea.</i>	solitarius Say.
perspectivus Say.	striatellus Anthon.
	Vancouverensis Lea.

GEN. **Helicella**† Lamarck.

arborea Say.	nitida Müll.
caduca Pfr.	<i>Syn. hydrophila Ingalls?</i>
cellaria Müll.	placentula Shuttl.
demissa Binn.	<i>is capsella Gould.</i>
fuliginosa Griff.	pura Alder.
inornata Say.	<i>Syn. electrina Gould.</i>
intertexta Binn.	unidentata Say
lævigata Raf.	<i>is indentata Say.</i>
ligera Say.	vortex Pfr.
minuscula Binn.	

In the above lists incongruous forms both of shell and animal are placed together, allied forms are separated, and in several cases the names of species are repeated in different genera or sub-genera, and even in different families.

* *Patula Held.* is in the Synonymy of *Discus*.—*Gen. of Recent Moll. l. c. 116.*

† "Tentacles short; edge-teeth of tongue aculeate. Mantle thickened and slightly reflected; tail obliquely truncated. Shell depressed, vitreous, shining, umbilicated; whorls regularly increasing, the last not descending at the aperture; aperture rotundately lunar; peristome thin, straight." H. & A. Adams have in the Synonymy of *Helicella*, *Hyalina Fer.*, not *Schum.* and *Zonites Gray* not *Montf.*—*Gen. of Recent Moll. l. c. 118.*

Among other characteristics of the Fam. Helicidæ, H. & A. Adams give:—"foot elongated, with the hind part simple and pointed behind, not glandiferous" (II. 126); and of the Fam. Stenopidæ: "foot long and narrow, abruptly truncated behind, and furnished with a distinct, mucous, caudal gland" (II. 221); yet I find in the lists above quoted the following inconsistencies:—

FAM. HELICIDÆ.

FAM. STENOPIDÆ.

Anchistoma hirsutum Say.
 Iberus electrinus Gould.
 " sportella Gould.
 Hygromia planorboides Raf.

Zonites stenotrema Fer.
 Helicella pura Alder.
 Discus Vancouverensis Lea.
 " planorboides Raf.

Looking at the lists of species in the different genera and subgenera, I notice:—

Anchistoma cereolus Muhl. }
 " volvoxis Parr. }
 " major Binn.
 " palliatum Say.
 " Troostianum Lea.
 Zonites fuliginosa Griff.

Polygyra septemvolva Say.
 Mesodon albolabris Say.
 " appressum Say.
 Polygyra fastigiatum Say.
 Helicella fuliginosa Griff.

The arrangement of the North American Helices by Albers (*Die Heliceen*, 2d ed.) is certainly far more reliable and consistent than that of H. & A. Adams. It is based on a better knowledge of their forms and of the characters of the animals. The lists* given by the former are not simply alphabetical, as are those of the latter, but the affinities of the species are considered, their habitats stated, and geographical distribution is largely taken into account.

The following extracts (to which I also add corrections, printed in *Italic letters*) are from the above mentioned work of Albers.

* It will be understood that I extract from the lists given in both the works referred to the names only (with few exceptions) of the species which occur in North America exclusive of the Pacific Coast and Mexico.

HELICEA.

*B. Vitrianea.*GEN. XI. **Hyalina** (Fér.) Gray.1. **HYALINA** s. str.Type. *H. cellaria* Müll.

<i>cellaria</i> Müll.	<i>indentata</i> Say.
<i>viridula</i> Menke.	<i>arborea</i> Say.
<i>Syn. pura</i> Alder.	<i>Otonnis</i> Pfr.
" <i>electrina</i> Gould.	<i>is arborea</i> Say?
	<i>limatula</i> Ward.

2. **MESOMPHIX** Raf.Type. *H. olivetorum* Hermann.

<i>fuliginosa</i> Griff.	<i>demissa</i> Binn.
* <i>lucubrata</i> Say.	<i>placentula</i> Shuttl.
<i>inornata</i> Say.	<i>is capsella</i> Gould.
<i>subplana</i> Binn.	<i>ligera</i> Say.
<i>laevigata</i> Raf.	<i>intertexta</i> Binn.

4. **AMMONOCERAS** Pfr.Type. *H. euspira* Pfr.*caduca* Pfr.6. **CONULUS** (Fitz.) Moq-Tand.Type. *H. fulva* Drap.

<i>fulva</i> Drap.	<i>Fabricii</i> Beck.
<i>Syn. chersina</i> Say.	<i>Gundlachi</i> Pfr.

7. **GASTRODONTA** Albers.Type. *H. interna* Say.

<i>bicostata</i> Pfr.	<i>labyrinthica</i> Say.
<i>is gularis</i> Say.	<i>lineata</i> Say.
<i>interna</i> Say.	<i>multidentata</i> Gould
<i>gularis</i> Say.	<i>is multidentata</i> Binn.
<i>suppressa</i> Say.	<i>lasmodon</i> Phill.
<i>macilenta</i> Shuttl.	
<i>is lasmodon</i> Phill.	

* This is mentioned as from Ohio and Georgia, whereas it is a Mexican species. *H. lucubrata* Binn. (*laevigata* Raf.) is probably intended. Vide Remarks on *N. Amer. Helicidæ*. *Annals*, VII. 130.

GEN. XII. **Macrocyclus** Beck.

Type. *M. laxata* Fer.

vellicata Forbes	concava Say.
<i>is Vancouverensis</i> Lea.	(planorboides Raf.)
Vancouverensis Lea.	

C. Helicacea.

GEN. XV. **Helix** Linn.

2. MICROPHYSA Albers.

Type. *H. Boothiana* Pfr.

minuscula Binn.	incrustedata Poey.
vortex Pfr.	

5. PATULA Held.

Type. *H. rotundata* Müll.

perspectiva Say.	mordax Shuttl.
striatella Anthon.	<i>is var. of Cumberlandiana</i> Lea.
exigua Stimp.	solitaria Say.
Cumberlandiana Lea.	strigosa Gould.
alternata Say.	sportella Gould
	<i>is var. of Vancouverensis</i> Lea.

15. POLYGYRA Say.

Type. *H. auriculata* Say.

cereolus Muhl.	Ariadnæ Pfr. ?]
volvaxis Parr	Hinsi Pfr.
<i>var. of septemvolva</i> Say ?	oppilata Mor.
delitescens Shuttl.	ventrosula Pfr.
Troostiana Lea.	hippocrepis Pfr.
fatigiata Say (non Binn.)]	auriculata Say.
<i>is fastigans</i> L. W. Say.	uvulifera Shuttl.
* microdonta Desh.	avara Say.
Texasiana Moric.	

* The habitats given of *H. microdonta* are Key West and Bermuda. The Key West shell has been described by me (*Annals* VII. 138) as *H. Carpenteriana*. The Bermuda shell has been distributed at *H. delitescens* Shuttl. *in litt.*; it is, I believe, *H. microdonta* Desh.

Remarks on Classifications of

16. STENOTREMA Raf.

Type. *H. spinosa* Lea.

<i>hirsuta</i> Say.	<i>germana</i> Gould.
<i>maxillata</i> Gould.	<i>pustula</i> Fér.
<i>stenotrema</i> Fér.	<i>leporina</i> Gould.
<i>Edgariana</i> Lea.	<i>Leontii</i> Lea
<i>spinosa</i> Lea.	<i>is loricata</i> Gould.
<i>monodon</i> Rack.	<i>barbigera</i> Redf.

17. TRIODOPSIS Raf.

Type. *H. palliata* Say.

<i>Rugeli</i> Shuttl.	<i>fallax</i> Say.
<i>inflexa</i> Say	<i>tridentata</i> Say.
<i>is inflecta</i> Say.	<i>palliata</i> Say.
<i>loricata</i> Gould.	var. <i>obstricta</i> Say.
<i>clausa</i> Say.	<i>appressa</i> Say.
<i>vultuosa</i> Gould.	<i>divesta</i> Gould.
<i>hopetonensis</i> Shuttl.	<i>elevata</i> Say.

18. MESODON Raf.

Type. *H. albolabris* Say.

<i>thyreoides</i> Say.	<i>dentifera</i> Binn.
<i>bucculenta</i> Gould.	var. <i>Roemeri</i> Pfr.
<i>exoleta</i> Binn.	<i>multilineata</i> Say.
var. <i>albolabris</i> Say.	<i>pennsylvanica</i> Green.
<i>major</i> Binn.	<i>Jugalsiana</i> Shuttl.
<i>is var. of albolabris</i> Say.	<i>is Ingallsiana</i> Shuttl.
<i>profunda</i> Say.	<i>Mitchelliana</i> Lea.
<i>Sayi</i> Binn.	

20. ACANTHINULA Beck.

Type. *H. aculeata* Müll.*harpa* Say.

21. VALLONIA Risso.

pulchella Müll.
a. costata.
b. pulchella.

23. FRUTICICOLA Held.

Type. *H. hispida* L.

rufescens Penn. *hispida* L.

37. ARIONTA Leach.

Type. *H. arbustorum* L.*Townsendiana* Lea.

52. POLYMITA Beck.

Type. *H. muscarum* Lea.*varians* Menke.*submeris* Migh.*is varians* Menke.

Looking at the lists of Albers, I do not understand why *H. caduca* Pfr. should not be in the same genus with *fuliginosa*, etc. *H. labyrinthica* Say, with reflected lip, is in *Gastrodonta* (sub-gen. of *Hyalina*), but the characteristic peristome both of genus and sub-genus, as described, is of the one "tenuè, acutum, rectum," and of the other, "simplex, acutum." Pfeiffer (*Malak. Blatt.*) has this species in *Mesodon*. *H. sportella* Gould, in my opinion, var. of *Vancouverensis* Lea (*Annals* VII. 366), is in *Patula* (sub-gen. of *Helix*), while Lea's species is in *Macrocyclis*. *H. clausa* Say and *divesta* Gould are in *Triodopsis*, of which *palliata* Say is the type, but they have no teeth, and must have been misunderstood; they seem to belong rather to *Mesodon*.

H. obstricta is considered a var. of *palliata*, *albolabris* of *exoleta*, and *Roemeri* of *dentifera*; in the opinion of American Conchologists all are distinct species.

H. Ingallsiana Shuttl. (*Mesodon*), misspelt in the list quoted *Jugallsiana*, was so named in compliment to Dr. T. R. Ingalls of Greenwich, N. Y., but not described by Shuttleworth, who several years ago called my attention to it. He sent me a plate (executed under his direction), in which it is figured with *H. clausa*, *Mitchelliana*, *Pennsylvanica*, and *Columbiana*. It appears in form more like, but smaller, than *Pennsylvanica*, having a somewhat similarly shaped aperture, without, however, the callosity on the lower margin of the lip; the umbilicus partially open. I have seen no specimen agreeing with the figures.

After arranging a series of typical specimens from my Cabinet in accordance with the classification of Albers, I prepared and annex a copy of a Catalogue of all the species which inhabit North America (exclusive of the Pacific Coast and Mexico); the order in which they are given is based on that of Albers, but with changes in agreement with, and so as further to illustrate the views herein expressed.

Comparing my Catalogue with the lists of Albers, it will be noticed that I place together at the commencement, *H. fuliginosa* and the allied species. I do so because several at least of the animals of those species are known to have the mucous pore or slit on the posterior termination of the foot, in which they agree with the animal of the genus *Zonites*.

Dr. Binney (Terr. Moll. II.), in his descriptions of the animals of the undermentioned species, gives the following among other characters:

H. fuliginosa Griff.—“a double marginal furrow runs along the sides of the foot, from the head nearly to the posterior extremity, where it passes upwards, and joins that from the opposite side, leaving posteriorly a flattened rounded extremity, somewhat prominent and glandular. Upon the centre of the extremity is a longitudinal fissure, or sinus, which is sometimes expanded, and at other times closed and invisible. Secretion of mucus from the extremity profuse.” (p. 223.)

H. laevigata Raf. (*lucubrata* Binn.)—“margin of foot furrowed, furrows meeting over posterior termination. Caudal extremity bluish above, with a gland.” (p. 225.)

H. inornata Say.—“a marginal furrow extending along the edges of the foot, and meeting above and before its posterior termination. Behind the junction is a prominent, sub-conical, bluish-white gland, on the extremity of the foot.” (p. 227.)

W. G. Binney and myself are enabled, from personal observation, to corroborate the statement of Dr. Binney as to the existence of the mucous pore in *fuliginosa* and *laevigata*, and have noticed it also in *kopnodes*. Looking at the forms of the shells, I assume its presence in *friabilis* and *caduca*, and suspect that it will be found in *subplana* and *sculptilis*, although the latter has considerable affinity with *indentata*.

Gray (*Catal. of Pulmonata*, 1855) has the genus *Zonites* in the Family Arionidæ, but in a paper, "*On the Arrangement of the Land Pulmoniferous Mollusca into Families*" (*Ann. and Mag. of Nat. Hist. VI., 3d Series*, 267, 1860), he suggests important changes in the arrangement proposed in the Catalogue.

In the paper referred to he thus characterizes and remarks on the family Parmacellidæ, to which, as I understand it, he anticipates that *Zonites* will be found to belong :

"Mantle central, large, shield-like, free in front, more or less covered with a spiral shell. Young and adult alike. Foot truncated behind, with a subterminal gland. *Parmacellus*, *Mariella*, *Laconia* (Cat. pp. 62, 63), *Vitrinella*, *Nanina*, and the allied genera, will probably be found to belong to this family when the animals are more closely examined."

With the description of *Zonites*, in which he places one American species only (*eurymphalus* Pfr., from Guatemala), Gray introduces an account from Férussac (*Tab. Sys.* 10) of the animal of *H. algira* L., the type of the genus, in which the following occurs:—"If the mucous pore does not exist in this species as in the Arions, a well marked slit is to be observed in its place, to which the grooves on the upper part of the foot tend."

Albers thus describes the Genus *Zonites* :—

"ZONITES Montfort. T. umbilicata, orbiculato-convexa vel depressa, striata vel decussata, subtus laevis, nitida; anfr. 6-7 sensim accrescentes; apertura obliqua, lunaris; perist. rectum, acutum, intus leviter labiatum.

"Maxilla magna, simplex, parum arcuata, a latere attenuata, medio tuberculo valido, rostriformi munita. Palpi labiales distincti. Porus mucosus oblongus in apice pedis. Radula denticulis marginalibus elongatis, aculeiformibus. Folliculi mucosi, bursa et sagitta amatoria desunt, flagellum obsoletum, vagina papillis mucosis orbiculatim circumdata." *Die Heliceen*, 2 ed. p. 65.

Albers divides the genus into two subgenera, viz. *Aegopsis* Fitz. and *Moreletia* Pfr., of which *algirus* L. and *eurymphalus* Pfr. are the types. He has no American species excepting *eurymphalus* in the genus, and although extensively remarking on Dr. Binney's writings places *fuliginosa* and its allies

in Mesomphix, a subgenus of Hyalina, in the description of the animal of which no reference is made to the mucous pore.

I should mention that Dr. Binney (*Terr. Moll.* II. 253), in his description of the animal of *H. suppressa* Say, adds: "On the upper surface of the extremity of the foot is a longitudinal fissure or furrow, from which mucus exudes in great quantities, and which the animal shuts and closes at will." I have very lately examined the animal referred to; and find the above statement correct. Dr. Binney does not allude to that character in his notice on the animal of the very closely allied *H. gularis* Say, which I have not at present seen. Looking at the shells alone of *suppressa* and *gularis*, they seem to belong to the same genus, but the absence of the mucous pore in the animal of the latter will widely separate these species.

Differences appear to exist in the form and structure of the mucous pore or slit (subcaudal gland), requiring careful examination.

Albers, referring to the *fulcrum*, first mentioned by Lea, has in his description of the genus *Stenotrema* the following:—"In quarta parte circuitus anfractus ultimi ante aperturam, columella appendice callosa, lamelliformi, cavationem anfractus coarctante, munita est."

In my "*Remarks on certain species of North American Helicidæ*" (*Annals* VI. and VII.), and also in my "*Notes on the toothed Helices of North America*" (*Annals*, VII. 442), I made various observations on the fulcrum and its modifications, but some further explanation on the subject is necessary.

The following species have the same form of that accessory process as prevails in *spinosa*, the type of *Stenotrema*, viz.:

H. monodon M. & R.
barbigera Redf.
Edwardsi Bld.
Edgariana Lea.
stenotrema Fér.

H. hirsuta Say.
labrosa Bld.
maxillata Gould.
leporina Gould.
pustuloides Bld.

A simple, small, transverse tubercle, which I have called a modification of the fulcrum, is found in—

H. pustula Fer.	H. Troostiana Lea.
tholus W. G. By.	fastigans L. W. Say.
“ var. Mooreana W. G. By.	hippocrepis Pfr.
Dorfeuilliana Lea.	loricata Gould.

In my “Notes” above referred to I placed *H. Hazardi* in section “D. Lip reflected, with fulcrum;” but in my “Remarks” (*Annals* VI. 393) I more correctly described it as follows:—

“In *H. Hazardi* the inferior tooth of the labrum, at its inner end, is continued back within the aperture, forming a white, erect lamella on the floor of the whorl, parallel with, and leaving a narrow sinus between it and the inner wall, to which it is joined at its extremity, about $2\frac{1}{2}$ mill. from the edge of the peristome.”

In *H. vultuosa* and its near ally *H. introferens*, the lamella on the lower lip is continued within the aperture, where it terminates in a somewhat diagonal, elevated callus.

The lamella in *Hazardi*, and callus in the two above named species, placed much nearer to their apertures than the fulcrum or tubercle in those enumerated in the two preceding lists, can scarcely, perhaps, be considered as modifications of the fulcrum.

It will be noticed that Albers places in *Stenotrema* *H. pustula*, also *H. Lecontii* Lea from California (the latter as *loricata* Gould, which name has priority, in *Triodopsis*), both having the tubercle as in *Troostiana* and other species put by Albers in *Polygyra*. *H. germana* Gould, from California, also in *Stenotrema*, has no fulcrum or any modification of it.

H. spinosa and the species more immediately allied to it, having the same form of fulcrum, are grouped together in my Catalogue, while those having the tubercle and *H. Hazardi*, all polygyral in character, are separated from them. *H. leporelina* and *pustuloides*, with the fulcrum of *spinosa*, are placed apart; in general form they seem also to belong rather to *Polygyra* than *Stenotrema*. *H. vultuosa* and *introferens* precede

species determined by Albers to be in *Triodopsis*. *H. hippocrepis* (with the tubercle as in *pustula*), having a reflexed hook far within the aperture, connects the group in which the latter is placed with that embracing *auriculata* and its allies.

The value, as generic characters, of the *fulcrum* and *tubercle* above described (existing in North American species only, so far as I am informed), remains to be decided.

No scientific arrangement of the North American Helices can, however, be framed until more is known of the animals. Dr. Gray (*Ann. and Mag. of Nat. Hist.* l. c. 268) remarks on "the impossibility of defining with accuracy and certainty, from the examination of the shell alone, the genus, family, or even order to which a Mollusk may belong;" adding that, "shells similar in external appearance and character have animals of different conformation and habits." In this connexion I would mention that Mr. W. G. Binney and myself are now aiding in an investigation of the jaws and lingual teeth of as many North American species as possible, of which figures will be published in a work now being prepared for the Smithsonian Institution.

The chief object of this paper being to facilitate and encourage inquiry by affording information, I conclude by annexing to the Catalogue copies of the descriptions, given by Albers, of the principal Genera and Subgenera in which he arranges the American species of *Helix* herein mentioned.

Catalogue of the Species of *Helix* which inhabit North America (exclusive of the Pacific Coast and Mexico), arranged especially with reference to the forms of the Shells, and showing the Genera and Subgenera in which they are placed by Pfeiffer and Albers.

	PFEIFFER, 1855. <i>Malak. Blatt.</i>	ALBERS, 1860. <i>Die Heliceen.</i>
	GEN. HELIX. Subgenera.	GEN. HYALINA. Subgenera.
fuliginosa Griff.	Hyalina	Mesomphix
kopnodes W. G. Binn.	=	=
friabilis "	=	=
caduca Pfr.	"	Ammonoceras
inornata Binn.	=	Mesomphix
subplana "	=	"
laevigata Raf.	"	"
sculptilis Bld.	=	=
* cellaria Müll.	"	Hyalina
nitida "	"	"
<i>hydrophila</i> Ing.?		
†arborea "	"	"
limatula Ward	"	"
viridula Menke	"	"
<i>electrina</i> Gould		
indentata Say	"	"
* Elliotti Redf.	=	=
* demissa Binn.	"	Mesomphix
capsella Gould	=	"
ligera Say	"	"
intertexta Binn.	"	"
* fulva Drap.	Conulus	Conulus
<i>chersina</i> Say		
<i>egena</i> " ?		
Fabricii Beck	"	"
Gundlachi Pfr.	"	"
* gularis Say	Gastrodonta	Gastrodonta
suppressa Say	"	"

NOTE.—The species marked = in the columns of the above Catalogue are not named by the Authors in the lists quoted.

	PFEIFFER, 1855. <i>Malak. Blatt.</i>	ALBERS, 1860. <i>Die Heliceen.</i>
	GEN. HELIX. <i>Subgenera.</i>	GEN. HYALINA. <i>Subgenera.</i>
lasmodon Phill. *	=	Gastrodonta.
interna Say	Actinaria	"
multidentata Binn.	"	"
lineata Say *	"	"
†polygyrella Bld. & Coop. *	=	=
labyrinthica Say	Mesodon	"
Hubbardi Brown *	=	=
†Vancouverensis Lea var. sportella Gould.	Macrocyclus	Macrocyclus (GEN.)
concava Say *	=	Patula (HELIX)
	"	Macrocyclus (GEN.)
		GENUS HELIX
		<i>Subgenera</i>
minuscule Binn.	Hyalina	Microphysa
miliun Morse	=	=
minutissima Lea	=	=
vortex Pfr.	"	"
incrustedata Poey *	Patula	"
asteriscus Morse	=	=
exigua Stimp.	=	Patula
perspectiva Say	"	"
†striatella Anthon.	"	"
alternata Say	"	"
Cumberlandiana Lea	"	"
" var. mordax Shutt.	"	"
†strigosa Gould	=	"
†Cooperi W. G. Binn.	=	=
†solitaria Say *	"	"
cereolus Mulhf.	Polygyra	Polygyra
Carpenteriana Bld.	=	=
septemvolva Say	"	"
" var. volvoxis Parr. *	"	"
Texasiana Moric.	Daedalocheila	"
triodontoides Bld.	=	=
Hindsi Pfr.	Ulostoma	"
ventrosula Pfr. *	Daedalocheila	"
oppilata Mor.	=	"
auriformis Bld.	=	=

	PFEIFFER, 1855. <i>Malak. Blatt.</i>	ALBERS, 1860. <i>Die Helicen.</i>
	GEN. HELIX. <i>Subgenera.</i>	GEN. HELIX. <i>Subgenera.</i>
avara Say	Daedalocheila	Polygyra
espiloca Rav.	=	=
Postelliana Bld.	=	=
auriculata Say	"	"
uvulifera Shuttl.	"	"
Ariadnæ Pfr.	"	"
*		
hippocrepis Pfr.	"	"
*		
pustula Fér.	Isogonostoma	Stenotrema
tholus W. G. Binn.	=	=
" var. Mooreana W. G. B.	=	=
Dorfeuilliana Lea	Ulostoma	=
Troostiana "	Daedalocheila	Polygyra
fastigans L. W. Say	"	"
*		
Hazardi Bld.	=	=
*		
leporina Gould	=	Stenotrema
pustuloides Bld.	=	=
*		
monodon M. & Rack.	Ulostoma	"
barbigera Redf.	=	"
Edwardsi Bld.	=	=
spinosa Lea	Tridopsis	"
Edgariana Lea	"	"
stenotrema Fér.	=	"
hirsuta Say	"	"
labrosa Bld.	=	=
maxillata Gould.	"	"
*		
vultuosa Gould	Ulostoma	Tridopsis
introferens Bld.	=	=
*		
inflecta Say	Isogonostoma	"
Rugeli Shuttl.	=	"
†Mullani Bld. & Coop.	=	=
Hopetonensis Shuttl.	Ulostoma	"
tridentata Say	"	"
fallax "	"	"
palliata "	"	"
obstricta "	"	"
appressa "	"	"
*		
elevata "	Mesodon	"

	PFEIFFER, 1855. <i>Malak. Blatt.</i>	ALBERS, 1860. <i>Die Heliceen.</i>
	GEN. HELIX. <i>Subgenera.</i>	GEN. HELIX. <i>Subgenera.</i>
Clarkii Lea *	=	=
Christyii Bld. *	=	=
thyroides Say	Mesodon	Mesodon
bucculenta Gould	=	"
Wheatleyi Bld.	=	=
exoleta Binn.	"	"
albolabris Say	"	"
" var. major Binn.	"	"
dentifera Binn.	Ulostoma	"
Roemeri Pfr.	"	"
profunda Say	"	"
Sayii Binn. *	"	"
multilineata Say	Mesodon	"
Pennsylvanica Green	"	"
clausa Say	=	Triodopsis
Mitchelliana Lea	"	Mesodon
Downiciana Bld.	=	=
divesta Gould *	=	Triodopsis
harpa Say *	=	Acanthinula
pulchella Müll.	Vallonia	Vallonia
costata " *	"	"
rufescens Penn.	Hygromia	Fruticicola
hispida L. *	"	"
jejuna Say	=	=
Berlanderiana Moric.	Galaxias	=
griseola Pfr. *	"	=
†Townsendiana Lea *	Arianta	Arianta
hortensis Müll. *	Tachea	Tachea
aspersa Müll. *	Pomatia	Pomatia
varians Menke	Phaedra	Polymita

Species not Identified.

H. bulbina Desh.
 egena Say
 glaphyra Say

H. Ingallsiana Shuttl.
 porcina Say
 tenuistriata Binn.

Descriptions of the principal Genera and Subgenera in which certain North American Species of Helix are arranged by Albers, "Die Heliceen," 2d Ed.

GENUS XI.

HYALINA (Fér.) Gray.

Testa plerumque umbilicata, tenuis, nitens, vitrea vel fusco-cornea; anfr. 5-7 regulariter accrescentes, ultimus non descendens, sæpe antice dilatatus; spira depressa, rarissime orbiculato-conica; apertura rotundato-lunaris; perist. tenue, acutum, rectum.

Animal: maxilla simplex (nec sulcata nec dentata), arcuata, margine inferiori acato, medio rostriformiter prominente. Apertura respiratoria latere dextro supra collare, genitalis ad basin colli. Systema sexuale simplex, sagitta amatoria ejusque bursa et folliculi mucosi omnino desunt; flagellum parvum vel nullum, musculus retractor penis brevissimus. Dentes linguæ (radulæ) laterales elongati, hamiformes, lateribus non denticulati.

1. HYALINA s. str.

Testa umbilicata interdum perforata, depressa, vitrea, nitida; anfr. 5-6 regulariter accrescentes; spira rarissime conico-elevata; apertura rotundato-lunaris; perist. tenue, acutum, rectum.

Flagellum breve (Moq.-Tand.).

2. MESOMPHIX* Raf.

Testa umbilicata vel perforata, globoso-depressa, tenuis, striatula, fusco-cornea, subtus pallidior, nitida; anfr. $4\frac{1}{2}$ -6, apertura lunari-ovata; perist. simplex, rectum, acutum, marginibus conniventibus, columellari reflexiusculo. Flagellum nullum; bursa copulatrix apice angusta, canali brevi. (Moq.-Tand.)

4. AMMONOCERAS Pfr.

Testa late et perspective umbilicata, depresso orbicularis, nitida, pel-lucida, tenuis, radiatim striata; spira planiuscula; anfr. 4-7 parum convexiusculi, ultimus auctus, antice non descendens, ad peripheriam rotundatus; apertura perobliqua, ampla, rotundato-lunaris; perist. simplex, acutum, marginibus conniventibus.

* "Mesomphix umbilicus expanded, exhibiting the volutions." Raf. Vide *Terr. Moll.* I. 49.

6. CONULUS (Fitzinger) Moq.Tand. -

T. imperforata, vel angustissime perforata, turbinata, arctispira; anfr. 5-6, convexiusculi; apertura depresso-lunaris, anfr. penultimo valde excisa, parum obliqua. Perist. marginibus remotis.

Maxilla carina verticali parum expressa, rostro mediano brevi, obtuso. Tentacula inferiora crassa.

7. GASTRODONTA Albers.

1. subperforata vel umbilicata, orbiculato-convexa, corneo-diaphana, vitrea, plus minusve ruguloso-striata; anfr. 5-7; apertura lunaris, basi dentibus pliciformibus, marginem non attingentibus, sæpissime munito; perist. simplex, acutum.

GENUS XII.

MACROCYCLIS Beck.

T. tenuis, late umbilicata, depressa, striata vel rugulosa, concolor, anfr. $4\frac{1}{2}$ -5, ultimus latus, depressus, antice modice descendens; apertura oblique ovata; perist. subincrassatum vix expansiusculum, margines approximati, basalis breviter reflexus.

Maxilla arcuata, medio rostrata, tota costulis confertis marginem non attingentibus exarata.

GENUS XV.

HELIX L.

T. discoidea, globosa vel conoidea, apertura transversa, obliqua, lunaris vel rotundata, marginibus distinctis.

Maxilla arcuata, perpendiculariter costata, margine crenato. Dentes linguales numerosi, medii trifidi, laterales bifidi, breves.

(Sagitta amatoria in plerisque.)

2. MICROPHYSA Albers.

T. umbilicata, depressa, tenuis, striatula, vix nitens; spira applanata; sutura distincta; anfr. 4-5 convexiusculi, lente accrescentes, ultimus non descendens; apertura lunari-rotundata; perist. tenue, simplicissimum, marginibus convergentibus.

5. PATULA Held.

T. aperte umbilicata, depressa, discoidea vel turbinata, cornea, rugosa vel costulato-striata; anfr. 4-6 aequales vel lente accrescentes; apertura lunari-rotundata; perist. simplex, rectum, acutum,

Maxilla costis numerosis, parum prominentibus, margine crenato. Folliculi mucosi, sagitta, capreolus, flagellum desunt.

15. POLYGYRA Say.

T. umbilicata vel perforata, orbiculato-planata, oblique costulato-striata; anfr. 5-7½ lente accrescentes, ultimus antice constrictus, breviter deflexus, basi inflatus, devians, penultimus plane conspicuus, perforationem sæpissime rimatim constringens; apertura subreniformis vel irregulariter sinuata; perist. anguste reflexum, callosum, marginibus interdum dentatis, callo triangulari, dentiformi, in parietem aperturalem oblique intrante junctis.

16. STENOTREMA* Raf.

T. obtecte perforata, lenticularis vel globoso-depressa, pilosula; anfr. 4½-6, ultimus antice gibbus, breviter deflexus, basi tumidus; spira parum elevata; perist. albo-labiatum, margine supero breviter reflexo, basali strictiusculo, saepe sinuoso dentato.

In quarta parte circuitus anfractus ultimi ante aperturam, columella appendice callosa, lamelliformi, cavationem anfractus coarctante, munita est.

17. TRIODOPSIS† Raf.

T. obtecte perforata vel umbilicata, orbiculato-depressa vel subglobosa, plus minus oblique striata; anfr. 5-7, ultimus antice paululum deflexus; apertura sinuoso-coarctata, subtriangularis; perist. albo-callosum, late angulatum reflexum; paries aperturalis dente valido, oblique intrante munitus. Maxilla costis 3-5, prominentibus, margine dentato. Folliculi mucosi 2, simplices. (Moq.-Tand.) Sagitta 1 subconica, parum arcuata, basi biangulata, elongata. (Ad. Schmidt.)

18. MESODON‡ Raf.

T. umbilicata vel obtecte perforata, subglobosa vel orbiculato-depressa, tenuis, subtiliter striata, interdum decussatim sculpta; anfr. 5-6 regulares; apertura rotundato-lunaris, interdum dente parvulo in pariete aperturali

* "CHIMOTREMA.—Aperture transverse, extremely curved, resembling a simple fissure.

"TOXOTREMA.—Differs from the preceding by the emarginate lip.

"STENOTREMA.—Differing from the two preceding by a thick emarginate lip, and a second lip flattened to the spire and uniting with the true lip; a transversal carina above."—Raf. Vide *Terr. Moll. l. c.* 49.

† "TRIODOPSIS.—Umbilicus large, lip thick, aperture narrowed by three teeth, one upon each lip and one upon the columella." Raf. Vide *Terr. Moll. l. c.* 49.

‡ "MESODON.—Differs from Helix by lower lip with a tooth." Raf. Vide *Terr. Moll. l. c.* 49.

coarctata; perist. albo-labiatum, expanso-reflexum, margine basali rare unidentato.

Maxilla costis crassis circa 10, valde prominentibus.

20. ACANTHINULA Beck.

T. perforata, globoso-turbinata, vel epidermide brunnea, costulato-plicata vel aculeata induta; anfr. 4-5; apertura rotundata; perist. tenue, expansiusculum, marginibus approximatis.

Tentacula inferiora et palpi labiales sat magna. (Moquin Tandon.)

21. VALLONIA Risso.

T. umbilicata, depressula, diaphana; anfr. $3\frac{1}{2}$ -4; apertura obliqua, subcircularis; perist. candidum, labiatum, reflexum, marginibus contiguus vel conniventibus.

Maxilla costis numerosis, margine parum crenulato. Folliculi mucosi nulli? Sagitta 1, longa, conica, lævis. (Goldfuss.)

23. FRUTICICOLA Held.

T. umbilicata vel perforata, depresso-globosa, interdum pilosa; anfr. 5-7 convexiusculi; apertura late lunaris vel lunato-rotunda; perist. acutum, brevissime expansum, intus labiatum, margine basali reflexo.

Maxilla costis numerosis (usque 20), margine subtiliter crenulato. Folliculi mucosi plerumque 2, bi-quinquefidi. Sagitta 1-2, conica, arcuata, apicem versus aciebus instructa. Vesicula pedunculata magna, appendice coeca carens. (Paasch.)

37. ARIONTA Leach.

T. umbilicato-perforata, conoideo-vel depresso-globosa, tenuis; anfr. 5-6, ultimus leniter descendens; apertura lunato-rotunda; perist. late labiatum, marginibus parallelis, basali dilatato, umbilicum saepe tegente.

Maxillis costis 4-6, distantibus, prominentibus, inaequalibus, margine dentato. Folliculi mucosi 2, simplices. Sagitta 1 arcuata, apice incrassata, basi biangulata.

52. POLYMITA Beck.

T. aperte vel obtecte perforata, globosa, nitida, spira brevis; anfr. 4-5, ultimus magnus, ad aperturam reflexus; columella basi dilatata; apertura contracta, subverticalis, rotundato-lunaris; perist. simplex, obtusum, intus labiatum, marginibus distantibus.

ADDENDUM.

The foregoing paper relates especially to species of *Helix* which inhabit North America, *exclusive of the Pacific Coast and Mexico*. I used the term "Pacific Coast" as employed by W. G. Binney in his "Check Lists" published by the Smithsonian Institution, in which Lists the species of the "Pacific Coast from the extreme north to Mazatlan" are separated from those of "Eastern North America from the boreal regions to the Rio Grande," the Rocky Mountains being considered as the dividing line of the two faunas. My Catalogue, however, embraces species (indicated by a †) collected by Dr. J. G. Cooper on the *Pacific* side of the Rocky Mountains, several of which species occur also on the *Eastern* side; I refer particularly to *H. arborea*, *striatella*, and *solitaria*. Under these circumstances, and having been requested to do so, I annex the following Catalogue of species arranged in the order adopted by Albers, including those marked = which he does not mention. I add his descriptions of two Subgenera of *Helix* which are not represented in Eastern North America.

Catalogue of the Species of Helix which inhabit North America West of the Rocky Mountains, from the extreme North to the northern limits of Mexico, exclusive of those marked † in the preceding Catalogue.

	ALBERS, 1860. <i>Die Heliceen.</i>	
cultellata Thomson	=	This belongs probably to Zonites.
fulva Drap.	Conulus.	
Newberryana W. G. Binn.	=	
germana Gould	Stenotrema	
loricata " "	Triodopsis	
vultuosa Gould	"	

* A number of new species have been discovered in the prosecution of the Geological Survey of California and otherwise, specimens of some of which I have received. At a late date descriptions of them had not been published.

		ALBERS, 1860. <i>Die Heliceen.</i>	
devia Gould		Mesodon	
<i>Syn. Baskervillei Pfr.</i>			
labiosa Gould		"	
<i>Syn. Columbiana Lea</i>			
fidelis Gray		Aglaja	
infumata Gould		=	
Dupetithouarsi Desh.		Arionta	
Californiensis Lea		"	
<i>Syn. vineta Val.</i>			
Nickliniana Lea		"	
tudiculata Binn.		"	
arrosa Gould		"	
<i>olim aeruginosa Gould</i>			
levis Pfr.		"	
Kelletti Forbes		"	
Pandorae "		"	
exarata Pfr.		"	
reticulata Pfr.		"	
redimita W. G. Binn.		=	
intercisa "		=	
ramentosa Gould		=	
Ayersiana Newc.		=	
Bridgesii "		=	
Carpenteri "		=	
Mormonum Pfr.		=	
Traskii Newc.		=	
areolata Sowb.		Euparypha	

With this and the following species marked = I am almost entirely unacquainted, but they seem to belong to Arionta.

Helix L.

34. AGLAJA Albers.

Type. H. Audouini Orb.

T. umbilicata, orbiculato-convexa, striatula, fasciata; anfr. 4½-6, ultimus antice profunde descendens; apertura lunato-ovata, valde obliqua; perist. incrassatum, expanso-reflexum, album, marginibus conniventibus, columellari dilatato, reflexo, libero, umbilicum partim occultante.

40. EUPARYPHA Hartm.

Type. H. pisana Müll.

T. perforata, depresso globosa, corneo-calcarea, tæniata; anfr. 5, superiores planati, carinati, ultimus inflatus; apertura dilatato-lunaris, intus sæpius labiatum, margine columellari, reflexo. Maxilla costis 2-3 approximatis, validis. Folliculi mucosi 2. Sagitta 1, coronata, aciebus 4 instructa, conica, recta. Capreolus nullus.

A M E R I C A N
JOURNAL OF CONCHOLOGY.

VOL. I.

JULY 1, 1865.

No. 3.

MEMOIR OF CHARLES B. ADAMS, LATE PROFESSOR
OF ZOOLOGY IN AMHERST COLLEGE,
MASSACHUSETTS.

BY THOMAS BLAND.

Charles B. Adams, the subject of this Memoir, was born in Dorchester, Massachusetts, on the 11th of January, 1814. Of a family of six children, he was the only one spared to his parents. When four years old, his father, Mr. Charles J. Adams, established himself in business in Boston, and resided there during the rest of his life.

At a very early age C. B. Adams manifested a decided taste for Chemistry and Natural History, in which he was encouraged by his parents, who gave up a room to him for a laboratory, and furnished the means for procuring apparatus and chemicals. Time usually spent by boys in sports and amusements, was occupied by young Adams in experimenting, and in the study and arrangement of the various specimens in Natural History contributed by his friends and collected by himself in walks with his father.

C. B. Adams was prepared for College in Boston, and at

the Phillips Academy, Andover. In October, 1830, he entered Yale College, but removed to Amherst College, and there joined the Sophomore Class in September, 1831. In 1834 he graduated at Amherst with the highest honors. Shortly afterwards he entered the Theological Seminary at Andover, but in June, 1836, abandoned his Theological studies to assist Professor Hitchcock in a geological survey of the State of New York. The magnitude of the undertaking, and especially imperfect health, soon led Professor Hitchcock to abandon the work, and Adams, although strongly urged to do so, was unwilling to assume the lead in labors given up by one so much older and more experienced in science. Returning to Amherst, he spent several weeks in preparing a course of lectures on Geology, which he delivered in Bradford Academy, in September, 1836. In October of that year he became a Tutor in Amherst College, and in the following Spring delivered another course of lectures on Geology in Bradford Academy.

C. B. Adams was invited, in the Autumn of 1837, to accept the Professorship of Chemistry and Natural History in Marion College, at Marion, Missouri, and went there to learn the condition of the Institution before deciding to accept the proffered appointment. The College was in its infancy, with very few students, and its financial affairs were in an unsettled state. The prospect was discouraging, and after a few months of hard labor, Adams returned to his home in Boston. Subsequent events proved the prudence of his decision,—Marion College was given up, its founders being unable successfully to establish it.

In September, 1838, C. B. Adams accepted the appointment of Professor of Chemistry and Natural History in Middlebury College, Middlebury, Vermont. Indefatigable in his exertions, ever ready to aid and encourage the students, he became a very popular teacher, and was held in the highest estimation by the Trustees and the Faculty, who contributed every thing in their power to render his position happy and desirable.

In February, 1839, Professor Adams married Mary, daughter of the Rev. Sylvester Holmes, of New Bedford. He visited the Island of Jamaica, West Indies, in the Winter of 1843-44. The Professor's health, as well as that of his family, eventually suffered from the severity of the climate of Vermont, and a change becoming absolutely necessary, he, with much regret, resigned his Professorship in August, 1847. He removed from Middlebury to Amherst, and immediately commenced his labors in the College there as Professor of Zoology and Astronomy,—labors which terminated only with his death, in 1853.

While Professor in Middlebury College, C. B. Adams was appointed Geologist of the State of Vermont, entering upon its duties in 1845, and continuing in the office for three years. He presented the results of his labors to the State in four "Annual Reports," (1845-48;) but the funds appropriated became exhausted, and the final report was not made before the Professor's removal to Amherst. Subsequently he was too much absorbed in other scientific pursuits to attend to it, although solicited to finish the work.

Established at Amherst, (1847,) Professor Adams took a deep interest in the College, his *Alma Mater*, and soon substantially proved it by presenting to the Institution his extensive and valuable collections of Natural History, on certain conditions, however, of which the following deserve to be recorded:—

"A fund, not less in value than the above mentioned gift, viz: \$5000 or more, shall be established, to be called 'The Natural History Fund.'

"The income of this fund, and of such additions as may be made to it, shall be used for ever for increasing the collection of books of Natural History and of specimens in Natural History belonging to Amherst College.

"This expenditure shall be made by myself during my official connection with the College, and subsequently by the officer or officers of instruction, who shall have charge of the department of Natural History, and shall be subject to such regulations as the Trustees of the College may deem requisite to secure its faithful appropriation to the objects specified.

"The words 'increase of books and of specimens,' are not intended to include the care and exhibition of the same; but these may be included, in case the general treasury of the College shall be embarrassed with debt. So much of the income as shall not be expended within the year in which it accrues, shall be added to the principal."

To the written conditions referred to is added the following "remark," characteristic of its distinguished author:—

"This gift, with these conditions, is made with a view to contribute in some small degree to the exhibition of the glorious plan of creation, especially of the creation of organic beings, as this plan exists in the mind of the Creator."

The gift in question was accepted by the authorities of Amherst College, and the conditions have, it is hoped, been faithfully performed. The collections, enriched by the unceasing efforts and successful explorations of Professor Adams, remain at Amherst, a monument of his extraordinary labors.

The Professor again visited Jamaica in the winter of 1848-49. In November, 1850, he went to Panama, returning, early in

1851, to the United States, by way of Jamaica, where he was the guest of the late Hon. Edward Chitty.

Between the years 1838 and 1850, a considerable number of Professor Adams' papers relating to Mollusca* were published in the Proceedings of several Scientific Societies and in various Journals. Most of those papers which embraced the results of his explorations in Jamaica were, from time to time, re-published, with much original matter, in the "Contributions to Conchology," (issued in twelve parts, between October, 1849, and November, 1852,) and in Monographs of the genera *Stoastoma* and *Vitrinella*. In the autumn of 1852 his "Catalogue of Shells Collected at Panama" appeared, and also "Elements of Geology," the latter the joint production of himself and the late Professor Alonzo Gray. The last paper by Professor Adams was the "Catalogue of species of *Lucina* which inhabit the West Indian Seas," written in November, 1852, and published in the concluding part of the "Contributions."

Anxious to pursue further investigations in the West Indies, with a view to the completion of a work on the Shells of the Zoological Province, embracing those islands, Professor Adams left for St. Thomas, by way of Bermuda, in December, 1852. He arrived at St. Thomas on the 27th of that month, and on the next day addressed to the writer of this memoir a letter, from which the following extract will be read with interest:—

"Had a storm first night out; got to the east end of Bermuda Saturday evening, and up to town Sunday morning; off Monday noon. At Bermuda got forty to fifty species of shells, mostly in quantities,—one or two new *Pelipes*, two or three new *Auriculæ*, a new *Siphonaria*, any quantity of *Truncatella*, and of the ten or dozen species of land shells, among which is a very small, dirty *Succinea*, but got only one of *Helix Bermudensis*; the large *Succinea* plenty. Got a new *Modulus*, a variety of *Columbella cribraria*, more like the Panama than the West India shell! I forgot about your reply to K.'s letter. That awful nervous headache quite spoiled me in New York. Luckily, I got over it the day before we reached Bermuda.

"I was perfectly enraptured with Bermuda for scenery and shells. I must have taken three or four thousand specimens, not yet assorted. It will be curious to learn the distribution of the land shells on the different islands. Mr. John H. Redfield, you and myself must make a special expedition to Bermuda, have a skiff, and visit them all."

* For a complete list of these papers, consult "List of American Writers on Recent Conchology," by G. W. Tryon, Jr., N. Y., 1861, and "Bibliography of North American Conchology, (Smithsonian Miscellaneous Collections,)" by W. G. Binney, 1863-4.

Professor Adams, as had been previously arranged, was most kindly and hospitably entertained at St. Thomas by Mr. Robert Swift. The Professor's health had been so much impaired by his unceasing labors, (he never allowed himself more time for rest than nature absolutely demanded,) that he easily fell a prey to disease. He contracted fever, and, notwithstanding the most devoted attentions and the best medical care, died on the 18th of January, 1853, at the early age of thirty-nine years,—a martyr, it may with justice be said, to the cause of science. His remains were deposited in the burial ground at St. Thomas, where a tablet was erected by his friends as a memorial of his worth and their esteem.

The Professor's widow, an estimable lady, and five children, four sons and a daughter, survived him; two of the former enlisted in the service of their country in the army, and died in the autumn of 1861, the one at Brooklyn, N. Y., and the other at Annapolis, Md., of diseases contracted in the performance of their military duties.

The published works of Professor Adams and the collections at Amherst College give ample evidence of his great abilities, of his untiring energy, industry and perseverance, of his unselfish devotion to science. Earnest and able in the performance of his duties as Professor, successful and popular as a teacher, of upright and irreproachable character, his loss will long be deplored at Amherst. In his domestic relations he was gentle and affectionate, in his friendships faithful and generous.

The principal conchological works of Professor Adams—the "Contributions to Conchology," and "Catalogue of Shells Collected at Panama, with Notes on their Synonymy, Station and Geographical Distribution"—deserve more than the passing notice which they have received in the foregoing memoir, and we propose shortly to review their contents, so far, at least, as to show the character of the Professor's opinions and the extent of his labors. Our limits do not permit of further reference to his writings on Geology.

Professor Adams found an unexpectedly rich field for research, especially as regards Land Mollusca, in the Island of Jamaica, and to him belongs the merit of especially directing the attention of naturalists to the shell-faunas of the West Indies. At the date of his first visit to Jamaica comparatively few species from those islands were known; since he commenced the publication of the "Contributions to Conchology," an immense number of species have been discovered. In that work, and a paper published in the "Proceedings of the Boston Society of Natural History," (1845,) the

Professor described, of the Jamaica fauna, besides a large number of marine species, upwards of two hundred and fifty species of land and twenty of fresh-water shells, very few of which proved to have been previously known.

The descriptions are framed with the greatest care, the peculiarities of the species nicely distinguished, and their affinities discussed. As a remarkable example of critical investigation, we would refer to the Professor's "Analysis of the Group of Species of *Cyclostoma*, which is represented by *C. Jamaicense*, Chem." ("Contributions," pp. 140—148.)

In "Remarks on the Distribution of the Terrestrial and Fresh-water Mollusca which Inhabit Jamaica," ("Contributions," pp. 45—50, 1849,) the Professor comments on the great profusion of the terrestrial species, and their accumulation in certain districts. He says, that, of the 265 species enumerated in his Catalogue, more than 200 were collected by himself in a hasty exploration of one-tenth of the surface of the island, and that a collector, after becoming acquainted with their stations and localities, might easily obtain eighty or ninety species in one day.

The study of the Jamaica shells directed, at an early period, the attention of Professor Adams to the general questions of the limits, origin and distribution of species. He refers to the perplexities which arise in attempting to ascertain the limits of species from such facts as he observed in the group of *Helices* represented by *Helix sinuata*, several of which facts he thus specifies:—

"In some instances, the peculiarities of a local type, which differs but slightly from the typical species, are quite constant at the given place, but vary geographically, that is, are gradually lost in the more and more distant individuals. I am not aware that these examples are numerous.

"Not only does the amount of difference between the local types vary from that of well marked species to that of scarcely distinguishable varieties, but the individuals of a given locality, while preserving the peculiarities of the type, sometimes differ from each other in characters which appear to be as important, except in the want of constancy, as those which distinguish the local group." ("Contributions," p. 78, Feb., 1850.)

Subsequently the views of the Professor on these questions became more developed, and were published especially in his "Remarks on the Origin of the Terrestrial Mollusca of Jamaica," ("Contributions," pp. 85—87, March, 1850,) and in a paper entitled "On the Nature and Origin of the Species of the Terrestrial Mollusca in the Island of Jamaica," ("Contributions," pp. 189—194, Nov., 1851.)

In the former Professor Adams notices, that since the publication of his previous remarks, he had received an article* on the Geographical Distribution of Animals, by Professor Agassiz, and adds:—"Following so eminent an authority and safe guide, we need no longer hesitate to state the hypothesis, which was prepared with the remarks above referred to, on the *sinuata* group of *Helices*."

The Professor then remarks as follows:—

"The distribution of the terrestrial Molluscs in Jamaica (and probably of all Molluscs in all parts of the world) is most easily accounted for by the following hypothesis: that the introduction of the existing races was effected by the creation of many individuals, and that they were modeled after certain types, which were mostly local, and between which there existed, as at the present day, unequal differences, from those which merely distinguish individuals, to those of varieties, of species, of groups of species, of genera, &c."

... "If these views are correct, we cannot retain the prevalent theory that species are natural groups, but that genera and other groups are artificial. All groups are natural, so far as they are founded on actual types. Any groups are artificial, or, to speak more correctly and intelligibly, are arbitrary, in proportion as the differences between individuals, varieties, species, and the successively more comprehensive groups, present a series of an indefinite number of nearly equal degrees. In proportion to the equality of the degrees are the points at which we mark off species, &c., arbitrary."

... "It is obvious that an illustration of this subject may be found in the different species and varieties of mankind."

With regard to the foregoing hypothesis as to the distribution of the terrestrial Molluscs, Professor Adams, in the latter of the two papers above referred to, adds this additional explanation:—

"The proof of this proposition is found in the geographical distribution of the varieties. In the great majority of species, the varieties are so distributed, that the space which is occupied by one of them coincides with that of other two or more. Now, if the circumstances of locality had produced the local types by modifications of one original type of the species,

* The following extract from the article referred to, states the conclusions of Agassiz:—"And this is the view which we take of the natural distribution of animals, that they originated primitively over the whole extent of their natural distribution; that they originated there, not in pairs, but in large numbers, in such proportions as suits their natural mode of living and the preservation of their species; and that the same species may have originated in different unconnected parts of the more extensive circle of their distribution." ("Christian Examiner," Boston, March, 1850, p. 192.)

then all the varieties which inhabit a locality should have been affected. In that case, all the varieties in any given place would have the same geographical limits. But the contrary more frequently occurs. Each variety has its own limits of distribution. If a few coincide in the boundary of their province, on the other hand one is often found to have an extent of distribution, which is equal to that of two or more other varieties. But such a geographical coincidence of one variety with several other varieties is inconsistent with any other theory than that of an original constitutional peculiarity of character in each variety. This inference is confirmed by the occasional intermingling in one locality of varieties, which differ from each other as much as those which occupy distinct regions. If, then, we assume the original independent creation of all the varieties, each originally represented by at least several individuals, the facts of distribution become explicable with the greatest facility.

"The same statements might be made respecting entire species, and even groups of species and genera. Some are very local, and others, more widely distributed, occupy the ground of several local species."

The very local distribution of the terrestrial Mollusca in the West Indies* did not escape the attention of Professor Adams. In "Hints on the Geographical Distribution of Animals, with especial Reference to the Mollusca," ("Contrib.," pp. 207—215, Oct., 1852,) a paper which contains many original and suggestive remarks, he mentions that the terrestrial faunæ of Cuba, St. Domingo, Porto Rico and Jamaica, are distinct from each other; and that the same is true, to a great extent, of the West India Islands generally; that those of the Bahamas and Bermudas are also distinct. Jamaica, he says, "contains more known species of land Molluscs than the whole of North America, from the Isthmus to Melville Island."

Referring to the relations of the subject discussed in the paper in question, to theories of the origin of species and to geological reasoning, Professor Adams makes the following among other observations:—

"If large groups of such islands as the West Indies should be united in a common area of dry land, then, according to the theory which accounts for the facts of distribution by actual dispersion from centres, there would be zoological provinces containing five to tenfold as many species as any which now exist.

"The geological fact, that continents by submergence be-

* See paper "On the Geographical Distribution of the Genera and Species of Land Shells of the West India Islands, with a Catalogue of the Species of each Island." By T. Bland, Ann. N. Y. Lyceum, vii., 1861.

come islands, and that islands by emergence become continents, does not affect the foregoing reasoning, because such changes require an amount of time exceeding one geological period, during which time there is change of faunæ.

“Such insular faunæ as have been described in § 7 and § 13, prove that the islands which they inhabit have been geographically separate since an era anterior to the introduction of the existing species. But this conclusion does not depend on the assumption that the species would have dispersed themselves over several islands if they had not always been restrained by water; but on the fact that such small zoological provinces exist nowhere on continents.

“The occurrence of a very *few* identical species on different islands, or on islands and the mainland, does not prove the union of such land since the existence of the species, because such a distribution may have been caused by the accidents of dispersion, or by independent creation.

“The occurrence of many species common to different islands, in some parts of Polynesia, renders it probable that such islands have constituted one island since the existence of these species.

“The frequent occurrence of analogues and the prevalence of generic or subgeneric types in some islands do not prove the former union of these islands, but may indicate their greater proximity at a former period.”

Professor Adams, in a paper from which we have already quoted, (“Contrib.,” p. 50, 1849,) remarked:—

“With this extremely local distribution of the terrestrial Mollusca in the West Indies may be associated the great fact of their geological history—that these islands have, since the later Tertiary periods, been in the process of elevation,—that they are the harbingers of a future continent, unlike the groups in the Pacific, which are the remains of ancient continents. Coincident with these two general facts in the West Indies is also a third,—that their coral reefs are all fringing, and that coral lagoon islands are wanting.”

It remains for us to notice the last, and, indeed, the most complete and valuable work published by Professor Adams—his “Catalogue of Shells Collected at Panama.”

Professor Adams sailed from New York on the 13th of November, 1850, arrived at Panama on the 26th, and left it on the 4th of January, 1851, having had scarcely more than five weeks for making his collections; yet they amounted “to 38,920 specimens of 376 species of *Gasteropoda*, 2,860 specimens of 139 species of *Acephala*, and 50 specimens of 1 species of

Brachiopoda; total, 41,830 specimens of 516 species of Mollusks."

The two principal objects of the expedition were, to collect for the Museum in Amherst College, and "to ascertain with the certainty of personal observation, what and how many species of shells exist at Panama." Having formerly, the Professor remarks, in his "Introduction," "collected about 500 marine species in Jamaica, near the centre of the Caribbean Zoological Province, it was thought that a comparison of these authentic materials would not be without interest." A subordinate object was to make observations on the habits of the species, in respect of station.

The results of the expedition were read before the New York Lyceum of Natural History on the 10th of May, 1852, and published in the *Annals of that Institution*, Vol. V., pp. 229—549, and subsequently, but in the same year, as a separate work, under the title already mentioned. Dr. P. P. Carpenter, than whom no one is more competent to review with sagacity and in a just and liberal spirit the labors of other naturalists, comments, in his invaluable "Report on the Present State of our Knowledge with regard to the Mollusca of the West Coast of North America," ("Report of the Brit. Assoc.," 1856,) on the Panama Catalogue, and in terms far more authoritative than any which we could offer, of which the following is a short abstract, his language being, however, scrupulously adopted:—

"Professor Adams had before collected about the same number of marine species at Jamaica; and, holding the theory* that no species could be common to the two oceans, he was well qualified to detect any sources of error which might have militated against his own hypothesis. The very minute discrimination, also, to which he had accustomed himself in his researches among the land shells of Jamaica, would at once prevent him from confounding similar species. And as he visited no other spot than the shores of Panama, and the neighboring Island of Taboga, there is no danger of the admixture of specimens from different localities. In the work under consideration the author gives all his references from personal research: quotes every assigned habitat, with authorities (discriminating original testimony by the mark !); and, in addition to his own remarks, states the number of specimens from which he writes. He was not able to dredge, nor to

* "It is scarcely necessary to consider the question, whether any of the shells on the opposite sides of tropical America could have had a common origin. Although in some points the Caribbean Sea and the Pacific approach within forty or fifty miles in a direct line, it is difficult to imagine any adequate means of the intercommunication of living marine Mollusks." (C. B. Adams, in "Introduction to Panama Catalogue," p. 9.)

make observations on the animals; but for the shore shells, including the minute species, there is scarcely any thing left to be desired. The author describes 157 as new species: of the value of many of these there will be two opinions. Professor Adams, in his work on Jamaica Shells, ('Contributions to Conchology,' pp. 84 *et seq.*,) gives up the common opinion that species are natural groups, while genera, &c., are artificial: and as he believes that there are different *species* as well as varieties of mankind, it is natural that he should distinguish as species of shells what others might consider varieties, and as varieties what may be accidents of growth. To the discerning reader, however, this does not interfere with the extreme value of the work. In a branch of inquiry so overburdened with carelessly observed or recorded facts, the freedom from the usual sources of error is a matter of the first importance. Where a species has originated in a mere theory, as in the case of common types from the two oceans, the student is at once on his guard. Where it arises from deficiency of materials, as in the *Cocca*, additional knowledge will soon set the error right. And in the present state of our ignorance, to designate forms as species which will hereafter have to be united, is much more pardonable than to overlook differences, all of which should be carefully noted before we can obtain a *natural* history of any single species. For the first great requirement in a scientific writer, patient and laborious accuracy, this, the last work of Professor Adams, (for he died in 1853,) stands in the very foremost rank. The new species are described in Latin, and with an accuracy which often makes it safer to identify shells from them alone, than from the showy plates and loose diagnoses of some works of the greatest pretensions."

Mr. Carpenter, several years after the publication of his Report, visited America, and found that no steps had been taken to figure the unique specimens deposited in the Museum at Amherst, or to verify Adams' determinations of old species. Fortunately for the cause of science, Mr. Carpenter went to Amherst, and, with his accustomed care and fidelity, examined Professor Adams' Panama collection. The result, a "Review of Professor C. B. Adams' Catalogue of the Shells of Panama, from the Type Specimens," was published in the "Proceedings of the Zoological Society of London," (June, 1863.) Mr. Carpenter, in pointing out some errors in the diagnoses of small shells, and referring, among other things, to the incessant demands on the Professor's attention, from his multifarious duties at Amherst, precluding much time for original research, justly remarks:—"What he accomplished during his short life is marvellous. Had that life been spared to revise his works,

the necessity for this friendly criticism would not have arisen."

With respect to the views entertained by Professor Adams, that no species could be common to the Atlantic and Pacific Oceans, it may be mentioned as an interesting fact, that he departed from his theory as regards *Crepidula unguiformis*, Lam.* As to this species the Professor observes:—

"This shell is well calculated to confound the popular notion of species. We have now before us many perfect specimens from Sicily, from Massachusetts, from Jamaica, and from Panama, all of which, with the exception of the Mediterranean shells, we collected in person."

"So far, at least, as the shells are concerned, it seems necessary to admit that they all may be comprised in one species; or to maintain that individuals, which cannot be distinguished from each other, belong to different species, because it is probable that they descended from distinct original stocks. But if we admit that each species in the animal kingdom was introduced by the creation of many original stocks, then the fact before us becomes intelligible and very uncommon in only one particular, viz: that the original individuals of a single species were created in very distant zoological provinces."—"Panama Catalogue," p. 231.

After the foregoing brief review of the work of Professor Adams on the Panama Shells, and reference to his opinions as to the origin and distribution of species, it will not be out of place to state the results of study and research devoted since his death to the subject of the Mollusca of the west coast of America.

Carpenter, in his before mentioned "Report" of 1856, enumerates 35 species "regarded as identical between the Pacific and Atlantic," 34 "which may prove to be identical," 41 "really separated, but by slight differences," and 26 species "analogous, but quite distinct," remarking, that probably those lists will hereafter be greatly extended.

The same author, in his "Supplementary Report," ("Report of Brit. Assoc.," 1864,) has some extremely valuable remarks with respect to the marine fauna of the west coast, some of which may thus, but in his own words, be shortly stated:—

"With regard to the tropical fauna, the researches at Cape St. Lucas and in the interior of the Gulf of California, though leaving much to be desired, bear out the general conclusions arrived at in paragraphs 78—87 (of the Report of 1856). The evidence for the identity of specific forms on the Atlantic and Pacific sides of Central America has been greatly confirmed.

* See Carpenter's remarks in "Cat. of Reigen Collection, Brit. Mus.," 1855—7, p. 285, and in his "Review," referred to in the text.

Dr. Gould writes:—‘The doctrine of local limitations meets with so few apparent exceptions, that we admit it as an axiom in zoology that species strongly resembling each other, derived from widely diverse localities, especially if a continent intervenes, and if no known or plausible means of communication can be assigned, should be assumed as different until their identity can be proved. (*Vide* “Expl. Exped. Moll. Intr.,” p. xi.) Much study of living specimens must be made before the apparent exceptions can be brought under the rule.’ It has, however, to be borne in mind that the researches of modern geology clearly point to considerable alterations in the existing configuration of continents, and in the consequent direction of ocean currents during the ascertained period of many species now living. Nor are we warranted in the belief that the existing fauna in any locality has been created at any one time, or has radiated from any single spot. To study the relations of living shells simply in connection with the existing map of the world must lead but to partial results.

“It is interesting to observe, that, notwithstanding the probable connection of the oceans through the Rocky Mountains during the Miocene age, there is extremely little similarity between the special temperate faunas of East and West America. Not a single species has yet been proved identical, and the allied forms are but few in number.

“When, however, we approach the region in which boreal and sub-boreal forms occur, many species are found in common, and between others there is but slight difference. Yet even here there are more British than New England species in the west-coast fauna. As might be expected, the British species are, for the most part, those which are also found fossil, and, therefore, have had time to diffuse themselves widely over the hemisphere. It is, however, remarkable that many Crag species have reached Eastern Asia and West America, which are not found in Grand Manan and New England. It is also extraordinary that certain special generic forms of the Crag reappear in the North Pacific.

“The Vancouver and California districts have so many characteristic species in common, (111 out of 492,) that they must be regarded as constituting one fauna, differing as do the British and Mediterranean regions. One fact must, however, be here specially noted, viz: the great peculiarity of the island-fauna. Although the Sta. Barbara group are so near the mainland, the dredge has not only produced many species not known on the continent, but also many before considered as essentially tropical. Along with these are not only some species of types hitherto regarded as almost exclusively Asiatic, but also some which belong to the sub-boreal district,

—one of the latter belonging to the British, and not to the New England form.

“Of the blending of the temperate and tropical faunas on the peninsula of Lower California, we are still in ignorance. All we know is, that at Margarita Bay the shells are still tropical, and that at Cerros Island they are strangely intermixed. There is peculiar evidence of connection between the faunas of the peninsula and of South America, not only in the land-shells, but in some of the marine forms.”

Mr. F. B. Meek, in his “Check List of the Miocene Invertebrate Fossils of North America,” (“Smithsonian Miscel. Coll.,” 1864,) has the following note regarding Dr. Carpenter’s opinion as to the identity of Miocene shells of the Pacific slope with living species:—

“The extensive and critical knowledge of the living Mollusks of the Western Coast of North America, possessed by this able conchologist, renders his remarks on the relations of Tertiary and existing species of that region unusually interesting to the palæontologist. It is to be regretted, however, that his comparisons were, in most cases, necessarily made with very imperfect figures of the fossil species; the type specimens not being accessible at the time he was in this country. Hence, his suggestions that so large a proportion of the Miocene shells of the Pacific slope are, probably, identical with living species, should not be too hastily accepted. Particularly since the questions involved are of far greater importance than that of the mere specific difference or identity of certain forms, for, if wrongly decided, they may lead to very erroneous conclusions in regard to the age of these tertiary deposits; while they have a direct and important bearing on the discussions respecting the duration of specific types in time. Consequently, I have carefully compared the types of Mr. Conrad’s Western Coast Tertiary species with their living representatives, in all cases where authentic examples of each were at hand, and give the results of these comparisons under each of the species in these notes.

“In most of these cases, it will be observed, I have arrived at the conclusion that the fossil shells are distinct species from the recent. This accords with the conclusions, in many cases, adopted by those who have, of late years, instituted careful comparison of the Miocene species formerly supposed to be identical with living forms.”

DESCRIPTIONS OF TWO NEW SPECIES OF
MONOCONDYLÆA.

BY JOHN G. ANTHONY.

MONOCONDYLÆA PEGUENSIS, Anthony.—t. 18, f. 3.

Description.—Shell smooth, rhombic-ovate, inequilateral, somewhat inflated, sub-biangular behind; substance of the shell thick; beaks rather prominent, eroded, but apparently not undulated; ligament short and thin; epidermis dark brown or nearly black, smooth over the umbones and on the anterior portion of the shell, but having the sub-truncate posterior portion nearly covered with distinct corrugated folds, more prominent near the hinge margin; cardinal teeth prominent, curved and slightly bilobed, particularly in the right valve; anterior cicatrices distinct and deeply impressed; posterior cicatrices confluent; dorsal cicatrices deeply impressed, placed in a curved line under the beaks; nacre light salmon color and very iridescent.

Dimensions.—Length 3·7 inches, breadth 2·4 inches, diam. 1·2 inches.

Habitat.—Pegu.

Museum Comp. Zoology, Cambridge, Mass. Cabinet of Hugh Cuming, London. Cabinet of G. W. Tryon, Jr.

Observations.—This species, recently received from Pegu, seems to differ essentially from all hitherto described species. It is of a somewhat rhombic form, has very distinct but rather distant lines of growth, which, however, become closer near the basal edge. The beaks are considerably eroded, but show no marks of any undulations there. From *M. crebristriata* it differs in being larger, more inflated, more elliptical in form, and the epidermis is smoother and darker in color; the nacre has a rich satiny lustre, which near the edge of the shell becomes of a highly iridescent hue. Four specimens only of this species were received, but they are very constant in character, and cannot well be mistaken for any other species.

MONOCONDYLÆA CREBRISTRIATA, Anthony.—t. 18, f. 1.

Description.—Shell rhombic, strongly striate, very inequilateral, depressed, bi-angular behind; substance of the shell

rather thick; beaks not prominent, eroded, having no indication of any undulations at the tip; epidermis light brown, with occasionally broad green rays on the posterior slope; the umbones, and, indeed, the whole surface is covered with crowded, fine, crenulose striæ, which on the posterior slope are crossed at right angles with prominent, regular folds; cardinal teeth prominent, erect, bilobed in the left valve; anterior cicatrices deeply impressed, distinct; posterior cicatrices confluent and indistinct; dorsal cicatrices small, but distinct, and placed at the base of the prominent tooth in the left valve, while in the right valve they are less distinct and placed a little more posteriorly; nacre light salmon, iridescent.

Dimensions.—Length 2.1 inches, breadth 1.45 inches, diam. .5 inch.

Habitat.—Pegu.

Museum Comp. Zoology, Cambridge, Mass. Cabinet of Hugh Cuming, London. Cabinet of G. W. Tryon, Jr. Cabinet of C. M. Wheatley.

Observations.—With *Monocondylæa Peguensis* herein described, came also several fine specimens of this interesting shell. At first they were supposed to be merely the young of *Peguensis*, but, on examination, were found to differ in many essential particulars; they are uniformly more depressed, lighter colored, more regularly rhombic in form, and of less size; but the most prominent difference consists in the beautiful crenulose striæ of the present species, which are densely crowded over the whole surface of the shell, while *M. Peguensis* is remarkably smooth over all except the posterior slope, and there the rugose folds are broader and less numerous than in *M. crebristriata*; the lines of growth are also more numerous in *M. Peguensis*, generally about 8, while *crebristriata* has rarely more than 3.

Notes on certain TERRESTRIAL MOLLUSCA, with Descriptions of NEW SPECIES.

BY THOMAS BLAND.

Reprinted from the Annals of the Lyceum of Natural History in New York, vol. viii., Nov., 1865.

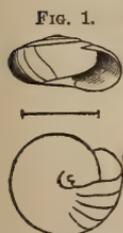
IN a note accompanying my description of *Proserpina Swifti* from Venezuela (*Ann.* viii. 13, 1863), I gave the characters of the Family Proserpinacea from Gray's "*Guide to the Mollusca*," and of the Genera Ceres and Proserpina; indicating also the number of parietal and palatal laminæ in each of the species. I added the following remarks:

"It will be noticed that the existence of one or more parietal or palatal teeth, in addition to the fold or tooth on the columella, is given as a characteristic of the Family.

"The recent discovery, however, of the species described in this paper as *P. Swifti*, having the columellar fold only, shows that it alone, so far as the teeth are concerned, is a constant character.

"*P. Swifti* does not properly belong to Proserpina as defined by authors; but as that genus embraces species with and without palatal teeth, it may fairly be enlarged so as to include those with and without parietal teeth, all having the columellar fold characteristic of the family."

On a late examination of some terrestrial shells collected by Dr. Berendt in Mexico, I was surprised to find a species with a slightly elevated parietal lamina, but *no columellar fold*, and yet having externally the appearance of a Proserpina. On opening several examples, I discovered that the septa of the whorls were destroyed, as in the Family Proserpinacea, to which I concluded that it belongs.



P. Swifti Bland.

P. Swifti, of which figures are annexed, afforded proof that the parietal and palatal laminæ can no longer be regarded as Family characters, and it is now shown that the columellar fold is not constant.

Under these circumstances, I propose to remodel the descriptions of the Family Proserpinacea and Genera hitherto comprised in it, and to place the Mexican shell above referred to, under the specific name *Berendti*, in the new genus *Proserpinella*.

FAM. PROSERPINACEA.

T. imperforata, helicinæformis, basi modo vel etiam superne callo nitido obducta; sepimenta interna ad modum Helicinaceorum sensim et regulariter resorpta. Operculum nullum.

I. CERES Gray.

T. carinata, superne rugosa, epidermide tenui obducta, basi callo nitido munita; columella unidentata; utrinque lamellifera; perist. rectum, subincrassatum.

1. *C. eolina* Duclos.

2. *C. Salleana* Cuming.

II. PROSERPINA Gray.

T. globosa vel depressa, lævigata, utrinque plus minusve callo nitido obducta; columella unidentata; paries aperturalis lamina nulla, vel 1, vel pluribus spiralibus munitus; apertura lunaris, sæpe laminis palatalibus coarctata; perist. simplex, rectum.

A. *Lamellis parietalibus et palatalibus instructæ.*

Globosa.

Depressa.

P. linguifera Jonas.

P. nitida Gray.

B. *Lamellis parietalibus solummodo instructæ.*

Globosa.

Depressa.

P. pisum C. B. Ad.

P. depressa Orb.

P. globulosa Orb.

P. bidentata C. B. Ad.

C. *Lamellis parietalibus et palatalibus carentes.*

Depressa.

P. Swifti Bland.

III. PROSERPINELLA, nov. gen.

T. depressa, lævigata, utrinque callo nitido obducta; paries aperturalis lamina 1 munitus; apertura lunaris; perist. simplex, rectum.

Proserpinella Berendti, nov. sp.

T. depressa, tenuis, nitida, albida; spira brevissime elevata; sutura vix impressa, submarginata; anfr. 4, sensim accrescentes, ultimus latior, convexiusculus, basi convexior, juxta columellam excavatus; apertura parum obliqua, lunaris, unidentata, dente lamelliformi vix prominente intrante in pariete aperturali; perist. simplex, rectum.

FIG. 2.



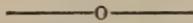
Proserpinella Berendti
Bland.

Shell depressed, thin, shining, white; spire very little elevated; suture scarcely impressed, submarginate; whorls 4, gradually increasing, the last broader, rather convex, more convex at the base, excavated near the columella; aperture oblique, lunate, with 1 little elevated lamelliform tooth on the parietal wall; perist. simple, straight.

Diam. maj. 2-3; min. $2\frac{1}{2}$; alt. $1\frac{1}{2}$ mill.

Habitat.—Mirador, Atlantic slope, 3000 to 4000 feet elevation, Mexico. Dr. Berendt!

Remarks.—This species is most nearly allied in form to *Proserpina depressa* Orb., or a small example of *P. nitida* Sowb., but it is readily distinguished from them by its slightly developed parietal lamina and the absence of the columellar fold.

**Stenopus? Guildingi**, nov. sp.

T. perforata, depressa, tenuis, subtilissime striatula, nitida, diaphana, corneo-succinea; spira planiuscula; anfr. 4 celeriter accrescentes, vix

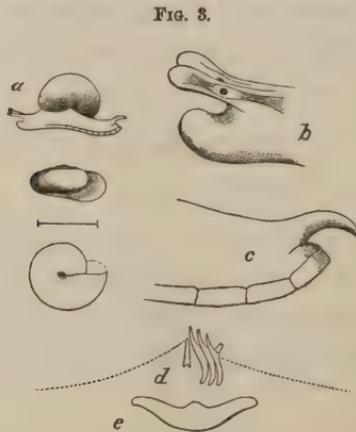
convexusculi, ad suturam leviter impressam breviter striato-marginatæ, ultimus latior, non descendens; apertura fere verticalis, lunato-rotundata; perist. simplex, acutum, margine columellari vix reflexiusculo.

Shell perforate, depressed, thin, minutely striatulate, shining, diaphanous, horny-amber; spire nearly level; whorls 4, rapidly increasing, scarcely convex, with shortly striated margin at the lightly impressed suture, the last wider, not descending; aperture almost vertical, lunate-rounded; peristome simple, acute, the columellar margin scarcely reflexed.

Diam. maj. 8; min. 7; alt. 3 mill.

Habitat.—Porto Cabello, Venezuela. Robert Swift.

Remarks.—I received one specimen of this interesting species, with the animal, from Mr. Robert Swift, and submitted it to Edward S. Morse for microscopic examination, and to him I am indebted for the accompanying figures and the substance of the subjoined notes.



Stenopus? Guldingi Bland.

Fig. a. Shell with animal, about the natural size.

b. Head magnified; superior tentacles partially retracted.

Morse mentions that he could find no trace of the

inferior tentacles; but doubtless they exist, and would be perceptible in the living animal.

- c. Tail magnified, showing the (retractile?) appendage, at the base of which the mucous pore was noticed,—the creeping disk remarkably narrow and long.
- d. Section of lingual membrane; about 85 rows of plates, 44-1-44, central plate long, narrow, with a single pointed denticle, slightly indented at the base; laterals and uncini similar, having a single long recurved denticle. The dentition somewhat similar to that of *H. concava* Say (*Morse Terr. Pul. of Maine*, pl. 5), but the plates longer and narrower.
- e. Buccal plate, arcuate, roundly produced in the centre of the cutting edge, in form like that in Helicellinæ.

The character of the animal induces me to believe that this species belongs to *Stenopus*, of which Guilding (*Zool. Jour.* iii. 527, 1828) describes the pedal disk and tail as follows:—
“*Discus gressorius* distinctus, linearis, musculis transversis, pedis lateribus multo angustior, veluti in genere *Onchidio* (unde nomen). *Cauda* tentaculata, tentaculo subretractali, *glandulâ* ad basin positâ.”

He adds this remark: “A very remarkable and distinct genus allied to the Linnean *Helices*, from all of which it differs in the curious contraction of the pedal disk, and the caudal tentaculum furnished with a gland beneath. They creep slowly and awkwardly, not being able to support the shell, on account of the narrowness of the foot, without proceeding in a meandering line.”

The shell under consideration may in several respects be compared with *Stenopus cruentatus* Guild.; the most marked differences are, that the latter is transversely plicatulate and impressed round the perforation.

In a paper "On the Structure of the Axis of the Shell of *Cylindrella*" (*Annals* vi. 150, 1855), I pointed out the peculiar nature of the axis in several species, and observations have since been made on its singular character in other and especially in Cuban species.

In *C. turris* Pfr. of Mexico, the axis is a highly polished tube, the exterior of which is distantly but strongly ribbed, having a diameter, in the fourth whorl from the last, of 4-5 mill., so that a young shell must have a wide open umbilicus. This tube has a groove or sinus within each whorl, immediately above the septum. The tube gradually increases in size from the apex, but is smaller towards the base; in the penultimate whorl it is 3 mill. in diameter; in the last it rapidly diminishes, and terminates in a point, the umbilicus being imperforate. A similar structure prevails in *C. clava* Pfr., also from Mexico.

The internal structure of *C. Goldfussi* Menke of Texas, belonging to the subgenus *Holospira*, differs essentially from that of any West Indian form which has come under my notice, and I have examined very many.

In the penultimate whorl of *C. Goldfussi* there are four lamellæ: one strongly developed, situated on the under side of the upper septum, and in length about equal to one-half of the circumference of the whorl; another on the upper surface of the lower septum, immediately beneath and opposite to the above-mentioned lamella, and of about equal length, but not so much developed; a third lamella on the middle of the lower half of, and revolving on the axis; the fourth on the inner side of the outer wall of the shell (opposite the axial lamella), and visible from the exterior. I am not aware of the occurrence of lamina on the outer wall or septa of the whorls in any other species, but have not had an opportunity of examining several which are allied to *C. Goldfussi*.

The animal of *Cylindrella* has no buccal plate—at least it has not, so far as I am informed, been detected.

The lingual dentition varies considerably in different species.

The forms of the central plate and laterals of *C. scæva* Gund. of Cuba, obtained from a living example received from Mr. Charles Wright, are shown in the annexed figure, which, with several others illustrating this paper, I use with the kind permission of Professor Henry of the Smithsonian Institution, in anticipation of a forthcoming work prepared for the Institution by W. G. Binney.



Lingual Dentition of
Cylindrella scæva Gund.

The rows are about 130 in number, the formula being 26-1-26. The central plate is small, obtusely pointed, laterals uncinated, joined two by two, upper edge fringed.

C. scæva belongs to the subgenus *Urocoptis*.

The classification by Albers (*Die Heliceen*, 1861) of *Cylindrella* and *Macroceramus*, may here be added for convenient reference, but I do not desire it to be implied that I adopt his views:

CYLINDRELLA.

Urocoptis Beck.	Type C. decollata Nyst.
Mychostoma Albers.	“ C. subula Fer.
Gongylostoma “	“ C. elegans Pfr.
Holospira “	“ C. pilocerei Pfr.
Trachelia Pfr.	“ C. porrecta Gould.
Diaphora Albers.	“ C. Cumingiana Pfr.
Scalatella “	“ C. Greyana C. B. Ad.*
Casta “	“ C. Chemnitziana Fer. (elongata Chem.)

MACROCERAMUS.

Macroceramus Guild.	Type M. signatus Guild.
Anoma Albers.	“ M. tricolor Pfr.
Lia.	“ M. Maugeri Wood.

* C. B. Adams described this originally as a *Cylindrella*, subsequently as a *Geomelania*, finding it to be operculated. Pfeiffer (*Mon.* iii, 1865) has it in *Truncatella*.

The genus *Macroceramus* belongs to the West Indian fauna, and has its greatest development in Cuba and Haiti.

Pfeiffer remarks that *Macroceramus* has affinities with *Bulimus*, *Pupa*, and *Cylindrella*, but especially with the latter; it is, however, noticeable that the buccal plate is not found in the animal of that genus, while it exists in *Macroceramus*.

Mr. Robert Swift lately sent to me (mounted for microscopic examination), the buccal plate and lingual membrane of *Macroceramus signatus* Guild. of Tortola, and of the lingual membrane of the same species from Anguilla, from which I annex figures drawn by Morse.

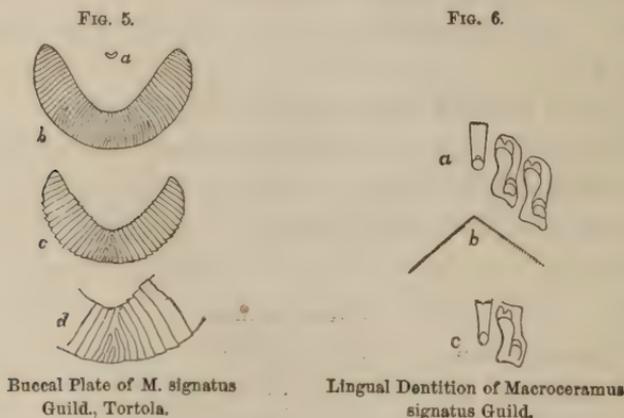


Fig. 5. a. Natural size.

b. c. Taken from different specimens, and showing some variation.

d. The central portion of c highly magnified. Mr. Swift remarks that the plate is flexible and much like, but distinct from, that of *Bulimus elongatus* Bolt.

Fig. 6. a. Central plate and laterals of *M. signatus* Guild. from Tortola; about 100 rows, 27-1-27.

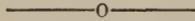
b. Section of lingual membrane.

c. Central plate and laterals of same species from Anguilla.

Central plate narrow, with one small, obtuse tooth. Laterals with one prominent tooth supporting two denticles and a small one at the base.

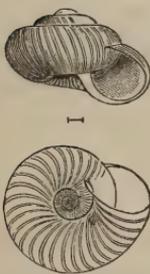
The axis of the shell of *Macroceramus* in all the species which I have examined, with one exception, is simple as in *Bulimus*, or has a scarcely perceptible twist. In *M. amplus* Gund. of Cuba, one well-defined lamella revolves on the axis within the lower whorls, becoming partially obsolete in the last. Pfeiffer (*Mon.* iv. 689) adds to the description of this species the following note: "Habitu *Cylindrellis* nonnullus persimilis, attamen characteribus aperturæ a *M. Kieneri*, *Gossei*, &c., non separandus." In the two species referred to by Pfeiffer there is no internal lamella. Examination of the animal of *M. amplus* may show that it belongs to *Cylindrella*.

Considering their general characters and forms of aperture, may not *Bulimus* (*Pineria*) *Beathinus* and *terebra* Poey of Cuba, and *B. Viequensis* Pfr. of Viéque and Barbados, be placed, as the two former are by H. and A. Adams, in *Macroceramus*?



Helix conspecta, nov. sp.

FIG. 7.



Helix conspecta Bland.

FIG. 8.



H. asteriscus Morse.

T. umbilicata, subdepressa, tenuis, oblique subdistanter costulato-striata, intervallis sub lente striatulis, fusco-cornea; spira convexa, apice obtusa,

levi; sutura profunda; anfr. 4 convexi, lente accrescentes, ultimus latior, rotundatus, antice vix descendens; umbilicus $\frac{2}{3}$ diametri fere æquans; apertura obliqua, rotundato-lunaris; perist. simplex, rectum, marginibus subconniventibus, columellari superne vix dilatato.

FIG. 9.



H. Mazatlanica Pfr.

Shell umbilicate, subdepressed, thin, with oblique, rather distant rib-like striæ, the interspaces microscopically striate, dark horn colored; spire convex, with smooth, obtuse apex; suture deep; whorls 4, convex, gradually increasing, the last broader, rounded, slightly descending above; umbilicus about equal to $\frac{2}{3}$ the diameter of the shell; aperture oblique, roundly lunate; perist. simple, straight, the margins approaching, the columellar margin scarcely dilated.

Diam. maj. 2; min. $1\frac{1}{2}$; alt. 1 mill.

Habitat.—San Francisco, California. Rowell!

Remarks.—This small species is allied to *H. asteriscus* Morse, and *H. Mazatlanica* Pfr., especially to the former; of both, to facilitate comparison, I annex the figures executed for W. G. Binney's work.

H. conspecta differs from the former in having an elevated spire and a smaller umbilicus. The rib-like striæ are more numerous, but scarcely raised above the surface of the shell, which, under the microscope, is very similar to that of *asteriscus*.

The character of the striæ and of the umbilicus sufficiently distinguishes *H. conspecta* from *H. Mazatlanica*. For specimens of *H. conspecta* I am indebted to Dr. Newcomb and Dr. Cooper.

Helix sportella, Gould.

In a paper on land and fresh-water shells collected by Dr. J. G. Cooper in the Rocky Mountains, etc. (*Annals* vii. 366, 1861), it is remarked that this species differs from *H. Vancouverensis* Lea "in having the incremental striæ more or less decussated by revolving lines, giving it a granulated appearance;" also that in some individuals "the decussation is to a great extent obsolete, or confined to the upper whorls only, and it seems to us that the two species cannot be separated."

Since the publication of that paper, I have received from Dr. Newcomb a specimen of *H. sportella* agreeing with Dr. Gould's description, and believe that it should be considered a distinct species.

In the larger specimens of *H. Vancouverensis* from Oregon (as in *H. concava* Say), microscopic spiral lines may be detected, and in the smaller forms found near San Francisco, those lines are sometimes more deeply indented, intersecting the striæ of growth, and giving more or less of a granulated character to parts of the surface of the shell, especially of the upper whorls. Dr. Newcomb observes (*Amer. Jour. of Conch.* i. 235) that the smaller forms referred to "have been distributed under the erroneous name of *H. sportella* Gould."

In *H. sportella*, not only are the incremental striæ more coarsely and regularly developed than in *Vancouverensis*, but the whole surface of the shell, both above, save the apical whorls, and below, even within the umbilicus, is very distinctly decussated by the revolving lines, and consequently granulated. In the former the whorls are more flattened above, and the umbilicus is somewhat smaller.

H. Voyana Newc. of California (*Amer. Jour. of Conch.* l. c.) is an extremely interesting species of the same group. From the general character of the sculpturing, it seems more allied to *H. sportella* than *H. Vancouverensis*.

Achatina Californica, Pfr.

This species, described from specimens in the Cumingian Cabinet, has been attributed to Monterey, California. Some time since I received specimens, through Mr. Akhurst, from

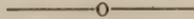
FIG. 10.



Bogota, New Granada, and forwarded one to Dr. P. P. Carpenter, with a request that he would have it compared with the type. After doing so, he reported to me: "Mr. Cuming* says that your shell is *certainly* *A. Californica*, auct."

In future this should be excluded from lists of North American species. As it is little known, I add the figure engraved for the before-mentioned work of W. G. Binney.

A. Californica appears to be viviparous; within one of my specimens I found two young shells, each having 2 to 2½ whorls.

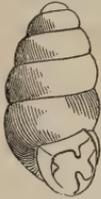
**Pupa Rowellii** Newc.**Pupa Californica** Rowell.

The former species, from the vicinity of Oakland, California, was described by Newcomb in *Ann.* vii. 146; and the latter, from San Francisco, by Rowell in *Ann.* vii. 287. I now present figures of both, from drawings by Morse, with the following remarks, for which I am indebted to him.

* Mr. Cuming died in London on the 10th August last. During many years I experienced from him much kindness and liberality. In 1856, with him, Mr. Robert Swift, and Dr. Wesley Newcomb, I collected shells on Goat Island, Niagara—probably Mr. Cuming's latest experience in collecting.

The general contour of *P. Californica* and *P. Rowellii*, is similar, but the latter has a slightly more tapering spire, and its aperture is smaller in proportion than in the former. The

FIG. 11.



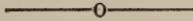
P. Rowellii Newc.

FIG. 12.



P. Californica Rowell.

aperture of *P. Rowellii* is narrower at the base, and the basal tooth is longer and sharper than in *P. Californica*. The latter has elevated rib-like striæ, which are peculiar to it, and is the only prominent character distinguishing it from *P. decora* Gould.



Succinea Sillimani, nov. sp.

T. oblongo-ovata, tenuis, ruguloso-striata, nitidula, albida?; spira brevis, acuta; anfr. 3 convexi; sutura impressa; apertura obliqua, elongato-ovata, superne angulata, basi effusa; columella leviter arcuata, superne filariter incrassata.

Shell oblong-ovate, thin, coarsely striate, shining, whitish? spire short, acute; whorls 3, convex; suture impressed; aperture oblique, elongate-oval, angular above, effuse at the base; columella slightly arcuate, with a thread-like thickening above.

FIG. 13.

Succinea Sillimani,
Bland.

Long. 20, diam. $8\frac{1}{2}$ mill.; Ap. 13 mill. longa, medio 6 lata; anfr. ult. $17\frac{1}{2}$ mill. longus.

Habitat.—Humboldt Lake, Nevada. A single example without epidermis, but fresh in appearance, was found and sent

with fluviatile species to C. M. Wheatley by Professor B. Siliman, of Yale College, New Haven, to whom I dedicate the species.

Remarks.—This shell in general form may be compared with *S. Haydeni* W. G. Binn., to which, indeed it is closely allied,

FIG. 14.

*S. Haydeni* W. G. Binn.

FIG. 15.

*S. Hawkinsi* Baird.

but it is more attenuated, the last whorl less tumid and the aperture more narrow. It is distinguishable from *S. Hawkinsi* Baird, of Brit. Columbia, having one whorl less and a differently formed aperture.

Succinea Stretchiana, nov. sp.

T. globoso-conica, tenuis, pellucida, nitida, striatula, virenti-cornea; spira brevis, obtusiuscula; sutura profunda; anfr. 3 convexi, ultimus inflatus; columella arcuata, leviter incrassata, recedens; apertura obliqua, rotundato-ovalis; perist. simplex, marginibus callo tenui junctis.

Shell globose conic, thin, pellucid, shining, striatulate, greenish horn colored; spire short, rather obtuse; suture deep; whorls 3, convex, the last roundly inflated; columella arcuate, slightly thickened, receding; aperture oblique, roundly oval; perist. simple, with the margins joined by a thin callus.

*S. Stretchiana*
Bland.

Long. $6\frac{1}{4}$, diam. 5 mill; Ap. 5 mill. longa, medio 4 lata; anfr. ult. $5\frac{1}{2}$ mill. longus.

Habitat.—Little Valley, Washoe Co., Nevada, on the Eastern Slope of the Sierra Nevada, 6500 feet above the sea. A number

of specimens were found under dry cowdung, about the edge of a swamp, by Mr. Richard H. Stretch.

Remarks.—This species has some slight affinity with *S. avara* Say, but is, form alone considered, more closely allied to *S. inflata* Lea, and *S. campestris* Say, from both of which, however, it may readily be distinguished by its size, texture, and color. In one of my specimens of *S. Stretchiana* the apex has a reddish tinge.

Succinea Verrilli, nov. sp.

T. ovato-conica, tenuis, striata, subpellucida, aurantiaco-succinea; spira elevata, obtusa, apice globoso, rubello; anfr. 3 perconvexi; sutura profunda; apertura obliqua, rotundato-ovalis, columella arcuata, leviter callosa; perist. simplex, marginibus callo tenuissimo junctis.

Shell ovate-conic, thin, striate, subpellucid, orange-yellow colored; spire elevated, obtuse, with globose apex, of a reddish tinge; whorls 3, very convex; suture deep; aperture oblique, roundly oval; columella arcuate, with a slight callus; perist. simple, the margins



FIG. 17.

S. Verrilli
Bland.

joined with a very thin callus.

Long. 7, diam. $3\frac{1}{2}$ mill.; Ap. 4 mill. longa, medio 3 lata; anfr. ult. fere 6 mill. longus.

Habitat.—Salt Lake, Anticosti Island, Gulf of St. Lawrence, N. Amer. A. E. Verrill, Professor of Zoology, Yale College, New Haven.

Remarks.—This species is closely allied to *S. Groenlandica* Beck, found by Prof. Verrill on Mingan Island, but is smaller, of different color, and has more distinct and regular incremental striæ.

I am indebted for specimens, and also for the following notes on the buccal plate and lingual dentition of *S. Verrilli*, to E. S. Morse.

Buccal plate abruptly arched, with one prominent central projection.

Lingual formula about 80 rows, 31-1-31. Plates notched at their outer posterior edges, longer than wide. Central plate with three minute denticles, the middle one being largest. Lateral plates bidentate, the outer denticle minute. Uncini irregularly dentate or notched.

Animal (in alcohol) black.

Notes on certain TERRESTRIAL MOLLUSCA, with Descriptions
of NEW SPECIES.

BY THOMAS BLAND.

(Continued from Vol. VIII., p. 170.)

Reprinted from the Annals of the Lyceum of Natural History in New York, Vol. IX., April, 1868.

THE genus *Cylindrella* (Pfeiffer, 1840), as generally accepted, embraces a great number of species of very diverse forms, belonging chiefly to the faunas of Mexico and the islands of Cuba, Haiti and Jamaica. With reference to the shell, the animal being little known, the genus has been placed in *Helicidae* between *Pupa* and *Clausilia*.

In 1855, Schmidt (*Stylommatophora*) stated that *Cylindrella* (*Urocoptis*) has no jaw, and that the teeth resemble those of *Glandina* and *Daudebardia*, but differ in having two teeth on a common base.

Mörch in 1859 (*Malak. Blatt.* p. 109) proposed an arrangement of the *Pulmonata*, the divisions characterized by the presence and form, or absence of jaw,—one of such divisions being *Agnatha*, in which the jaw is wanting. This method of classification was subsequently further elaborated by Mörch (*Journ. de Conch.* v. 1865), who, referring to Schmidt's statement, placed *Cylindrella* in *Agnatha*.

Gray (*Ann. & Mag. Nat. Hist.* vi. 267, 1860) suggested a division of the *Pulmonata Geophila* into two sections, viz:

Sect. I. VERMIVORA. Buccal mass very large; elongate, projectile like a proboscis. Jaw none; teeth numerous, slender, conical, distant. Mantle well defined. Subterraneous; carnivorous, or worm-eating.

Sect. II. PHYLLOVORA. The buccal mass small, ovoid, not produced. Jaw distinct, horny; teeth numerous, four-sided, close together on the lingual membrane. Herbivorous.

In the first Section, which seems to be equivalent to Mörch's *Agnatha*, Gray placed the *Oleacinidæ*, *Streptaxidæ* and *Testacellidæ*,—in the second, *Helicidæ*, *Arionidæ*, etc., etc.,—he did not specially refer to *Cylindrella*. Albers and Von Martens (*Die Heliceen*, 2 ed. 1861) have *Cylindrella* in *Testacellea*, giving as generic characters, on the authority of Schmidt, "Maxilla nulla. Dentes radulæ in lineis utrinque obliquis dispositi, bini basi conjuncti." He adopts several subgenera, one of which is *Urocopsis* Beck, comprising *C. Ghiesbreghti* Pfr. and other large Mexican species, as well as the smaller allied forms of the West Indies.

In November, 1865, I published (*Ann. Lyc.* viii. 161) the annexed figure of the lingual dentition of *C. scava* Gund. of Cuba, with the remark "the rows of teeth are about 130 in number, the formula being 26-2-26. The central plate is small, obtusely pointed, laterals uncinated, joined two by two, upper edge fringed." The expression *joined two by two* was inadvertently used, and Morse has since called my attention to it, in fact *each*

FIG. 1.

Lingual Dentition of
Cylindrella scava, Gund.

plate (lateral) has two cusps.

Guppy (*Ann. & Mag. Nat. Hist.* January, 1866) thus described the animal and teeth of *C. Trinitaria* Pfr. of Trinidad :

"The animal is ashy gray, becoming nearly black about the head and tentacles. Foot elongate, narrow; tentacles (4) slender. Lingual ribbon very long and narrow; teeth 3-1-3; medians narrow bicuspid, with two tubercles on the base; first and second laterals with simple round cusps, outer lateral inconspicuous, rather claw-shaped."

Mörch has since observed (*Jour. de Conch.* vii. 257, 1867) that my figure of *C. scava* appears to confirm the accuracy of the observation of Schmidt and of Guppy's description. I agree, however, with Crosse and Fischer (*Jour. de Conch.* vi. 223, 1866), that the similarity of structure of the lingual armature in

Cylindrella and *Testacella*, referred to by Schmidt, is more apparent than real, being confined to the oblique arrangement of the lateral teeth.

An unlooked-for discovery was announced by Crosse and Fischer in a very interesting paper in the January number (1868) of the *Journal de Conchyliologie*. After remarking that authors have repeated the assertion of Schmidt that *Cylindrella* has no jaw, and explaining that an opportunity had recently occurred of examining the animal of *C. Ghiesbreghtii* Pfr., Crosse and Fischer give the result in a passage of which the following is a translation :

“We have proved the presence in this species of a jaw, arcuate, horse-shoe shaped, very finely striated longitudinally, with an obsolete, slightly indicated median projection at the inferior margin, and a rounded plate or support projecting beyond the edge of the superior margin.

“The lingual armature is, moreover, very remarkable. The lingual denticulations are disposed in *rectilinear* transverse series, numerous and all of the same type, with apices scarcely extending beyond their base, the single median or rachidian tooth is a little smaller than the others, and tricuspid. The dental formula is (32-1-32) x 110.

“Considering the nature of its teeth the animal must be herbivorous and not zoophagous. The classifications which have placed the molluscs of this group with the *carnivorous* Pulmonates are then erroneous and altogether defective. The reserve which we have shown in this respect in our Journal was clearly justifiable.

“In the *Cylindrellæ* of the Antilles, on the other hand, the rows of teeth are so oblique that they appear to have a quincuncial arrangement; each row composed of a small number of teeth of peculiar palmated form; the rachidian tooth is of a very different type, extremely narrow and enlarged at one of its extremities. We have not been able to find the jaw in *C. sanguinea* Pfr. of Jamaica, which we have examined, and of which the dental formula is (12-1-12) x 115.

“Considering these important anatomical differences, we think it consistent to separate from the genus *Cylindrella*, the group, very natural, moreover, with reference to zoological geography, of large species from Central America (Mexico and Guatemala), of which *C.*

Ghiesbreghti is the type. We would at the same time observe, with reference to conchological characters, that these species have nearly the same *facies*, they have generally an obsolete, filiform carina on the last whorl, and almost all have a columellar fold more or less developed, situated deeply within the aperture, and continued the whole length of the axis around which it revolves."

After some remarks on different forms of *Cylindrella*, etc., Crosse and Fischer propose the new genus *Eucalodium* for the group of which the following species are mentioned as the principal representatives, viz.: *C. Ghiesbreghti*, *decollata*, *Mexicana*, *grandis*, *splendida*, *turris*, *clava*, *speciosa* and *Boucardi*.

The genus is characterized as follows :

Genus EUCALODIUM, *Crosse and Fischer*. Animal maxilla arcuata, longitudinaliter tenuissime striata, parte marginis inferi media obsolete prominula, margine supero radicem rotundatam emitte, instructum. Radula seriebus transversis, rectilinearibus, numerosis, uniformibus constituta, acie uncinorum basin subquadrata vix superante; dens medianus uncinis paulo minor, acie tricuspide. Animal ceterum ad familiam Helicidarum omnino referendum.

Testa subrimata, turrata, cylindrellaformis (in adultis speciminibus) late truncata: ultimus anfractus breviter solutus, dorso angulatus, plus minusve filo-carinatus: columella intus plerumque unipliata, plica columnam internam ambiente,* in vicinio aperturæ evanida. Typus: *Cylindrella Ghiesbreghti* Pfeiffer.

In February, 1867, a number of shells were collected by Mr. W. M. Gabb, in Lower California, and among them two species described by him as *Cylindrella Newcombiana* and *C. irregularis*, and figured in the American Journal of Conchology, iii. 237-238, pl. 16, figs. 3-4.

Several months ago, Dr. Newcomb sent to me a specimen of the former species; from its general aspect I doubted its being a *Cylindrella*, and suggested to him that the presence or absence

* I have directed the attention of M. Crosse to the fact that in *C. turris* and *C. clava* the axis as described by me (*Ann. Lyc.* viii. 160) is a highly polished tube, the exterior of which is distantly but strongly ribbed, diminishing in diameter towards and terminating at the base in a point, the umbilicus being imperforate. I have since noticed the same structure in *C. filicosta* Shuttl.

of a jaw would determine the question. Recently Mr. Tryon kindly forwarded to me three specimens containing, to my surprise, the living animals. Having perused the paper of Crosse and Fischer on *Eucalodium*, and my attention having been directed to the different characters of the land shell faunas of Lower California and Mexico east of the Gulf, I examined the animal of Gabb's, *C. Newcombiana*, with much interest. I obtained the jaws and lingual ribbons from two of the specimens, and have little hesitation in placing the species in the genus *Eucalodium*. The following is a copy of Gabb's description, and the annexed figure (fig. 2) was drawn by Morse from one of the living specimens :

FIG. 2.



E. Newcombianum, Gabb.

Cylindrella (Urocoptis) Newcombiana Gabb.

“Shell moderately large, not decollate, slender, tapering more rapidly below than near the apex, the first three whorls being of the same size; whorls $11\frac{1}{2}$, flattened on the side, body whorl subangular below, detached from the penultimate whorl for a short distance, and acutely angular above; suture impressed; aperture slightly advanced and surrounded by broadly expanded lips, producing a trumpet-shaped appearance; inner margin straight, and ending in an angle above and below; outer margin curved, wider in advance than behind, lips continuous, broadly expanded, and somewhat thickened; surface light horn color, marked by fine, irregular, undulating and occasionally broken ribs, radiately and obliquely disposed, and with the interspaces crossed by microscopic revolving lines.

“Animal light gray, equalling in length the aperture and penultimate whorl; foot short, and regularly rounded posteriorly.

“*Dimensions*.—Length 1.9 in., length of aperture .45 in., width of aperture .4 in., width of body-whorl .35 in.

“*Locality*.—Hidden under loose volcanic rocks in the high table lands of the interior of Lower California, especially about Moleje. This and its congener (*C. irregularis* Gabb) are essentially mountain species, being only found in the highest regions.

“*Observations*.—This shell resembles *U. costata* Gould, as figured by H. and A. Adams in Gen. Recent. Moll., pl. 76, fig. 7. It

differs, however, in being more regularly tapering, and in being proportionally more slender.”

It is evident from Gabb's comparison of his shell with the little Barbados species *C. costata** Guilding (not Gould), that he did not know the latter, and was misled by the magnified figure given by H. and A. Adams. (*Genera*, pl. lxxvi.)

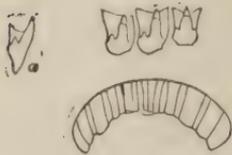
Gabb remarks that *C. irregularis* and *C. Newcombiana* are without doubt congeneric, and that an examination of the animal of the latter shows it to be a true *Urocoptis*,—meaning, I presume, that in general external characters it looked very like H. and A. Adams' figure of the animal of that genus.

From an examination of the shell of *C. irregularis*, I believe it to belong to *Cylindrella*, but the other species must, in my opinion, as already stated, be placed in the genus *Eucalodium*.

A study of the animal of the latter, in which I was aided by my friend Mr. W. G. Binney, enables me to give the following particulars :

Animal with highly developed mantle, foot short, blunt before and pointed behind, with a

FIG. 3.



Jaw and teeth of *E. Newcombianum*,
Gabb.

longitudinal groove along the centre of its base. The dead animal, as removed entire, had 9–10 volutions; when living it occupied the whole shell with the exception of the last, and perhaps the apical, whorl. Jaw (fig. 3) arcuate, with a slight median

projection, distinctly, longitudinally costate, the costæ, 9–10 in number, flattened, their terminations scarcely produced at the anterior or cutting margin, parallel with which are a few fine striæ.

In the jaw of the second specimen examined, the number of costæ was found to be 13, and the cutting margin very perceptibly crenulated by their extension.

* The lingual dentition of *C. costata* is very similar to that of *C. Trinitaria* as described by Guppy. The ribbon is very long, having 180 rows of teeth.

At first sight, under the microscope, the jaw of *E. Newcombianum* appears to consist of a series of plates, the costæ formed by their overlapping edges; and indeed Binney, after carefully examining it, justly remarked that the structure of the jaw of other species may have been incorrectly described. The jaw is, in fact, so thickened in various parts and with such general regularity, as to give the impression that it is composed of separate plates, while portions have additional thickness, producing what I have called flattened costæ.

At or near to the central part of the superior margin of the jaw of *E. Newcombianum* there is an attachment, which I supposed to be similar in character to that mentioned by Crosse and Fischer in their description of the genus, "*marginè supero radicem rotundatam emittente.*" To this appendage I directed the attention of Morse, who wrote as follows: "I noticed at the outset the process to which you refer, and the jaw of *Succinea* immediately occurred to me, but on further examination I satisfied myself that it is only the more dense condition of the buccal muscles. I may be wrong, but do not see any evidence of a process separate from the muscles,—not like that in *Succinea*, which can be cleared as readily from the integuments as the cutting plate itself." Mörch, in the description of his division *Elasmognatha* which embraces *Succinea*, mentions the existence of a membranous attachment to the jaw of *Dryptus Blainvillæanus* (*Jour. de Conch.* v. 391, 1865), but it is of a very different character to that observed in *E. Newcombianum*.

The teeth of *E. Newcombianum* (fig. 3) in arrangement and form agree very closely with those of *Eucalodium*, as described by Crosse and Fischer, and the formula 32-1-32 x 126 is remarkably similar. In my figure the median and adjoining lateral teeth, and also the extreme lateral tooth (fig. 3, a.), are shown. The teeth in general character may be compared with those of *H. alternata* Say (*Morse, Terr. Pulmon. of Maine*, pl. 4, fig. 16).

With respect to the shell of *E. Newcombianum*, I should mention that the axis has not the revolving fold described as generally present in *Eucalodium*,—indeed Gabb's species is, in internal structure, more like *Achatina*.

The genus *Eucalodium*, looking at the form of jaw and teeth, must go into Gray's section *Phyllopora*. Considering the station of the West Indian *Cylindrellæ*, so far as I am acquainted with them, and other circumstances, I believe with Crosse and Fischer, and also Pfeiffer, that the genus *Cylindrella* itself cannot be associated with the *Vermivora*.

It is worthy of notice that Mörch places *H. concava* Say, from the form of jaw (*see Terr. Moll.* I. xii. fig. 11), in his division *Orygonatha*, the teeth of which (laterals subulate) indicate, he says, "que l'animal avale de grands morceaux, et non que c'est un carnivore qui vit de proies vivantes," and adds, "les *Agnathes*, qui avalent leur proie entière et vivante, ont toutes les dents subulées." (*Jour. de Conch.* v. 377, 1865.) The fact is that the animal of *H. concava*, having one median tooth and subulate laterals (*Morse*, l. c. pl. 5), devours the living animals of other species,* while *Cylindrella*, without jaw (*Agnatha*), has no subulate teeth!

After the foregoing pages were in type, I discovered that the shell under consideration was described by Pfeiffer (*Proc. Zool. Soc.* 1861, p. 27, pl. ii. fig. 7), from a specimen in Cum-
 ington's collection, as follows:

CLAUSILIA † (BALEA ?) TAYLORI, Pfr. T. profunde rimata, turrita, solidula, conferte plicato-striata, corneo albida; spira regulariter attenuata, apice acutiuscula; sutura simplex; anfr. 11, convexiusculi, ultimus basi vix attenuatus, infra medium obtuse carinatus; antice solutus, descendens et dorso acute carinatus; apertura

* "The animal is voracious in its appetite, almost always preying upon other species with which it may be kept, and so certainly destroying them that I have been obliged to keep them by themselves." (*Binney, Terr. Moll.* II. 165.)

† The jaws of *Clausilia* and *Balea* are described (*Die Heliceen*) as being very similar,—the former "arcuata, subtiliter striatula, medio sæpius prominula," and of the latter "parum arcuata, subtiliter striatula, medio prominula."

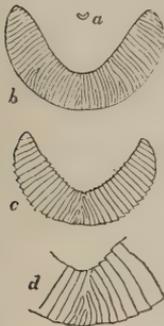
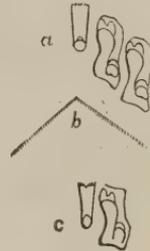
magna, obliqua, intus semicircularis; lamellæ obsoletæ; plicæ nullæ; perist. continuum, undique late expansum. Long. 47, diam. 8½ mill. Localitas ignota.

The species will, therefore, bear the name of *Eucalodium Taylori* Pfr., with that of *Cylindrella Newcombiana* Gabb, in the synonymy.

Von Martens (*Die Heliccen*, 2 ed. p. 268, 1861)* places in *Pupacea* the genus *Macroceramus*, dividing it into three subgenera, *Macroceramus* of which *M. signatus* Guild., is the type, and *Anoma* and *Lia*, embracing species included by Pfeiffer and H. and A. Adams in *Cylindrella*, the type of the former being *C. tricolor* Pfr., and of the latter *C. Maugeri* Wood.

In 1865 (*Ann. Lyc.* viii. 162) I published the annexed figures

FIG. 4.

Buccal Plate of *M. signatus*,
Guild., Tortola.Lingual Dentition of *Macroceramus*
signatus, Guild.

of the jaw and teeth of *M. signatus*, which show that the genus *Macroceramus* Guilding, as Mörch remarks (*Jour. de Conch.* vii. 257, 1867), belongs to his division *Goniognatha*, the jaw being composed, as in *Orthalicea*, of oblique plates. The teeth are arranged in the same manner as those of *Cylindrella*.

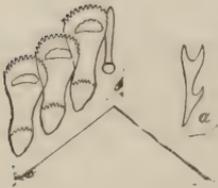
Pfeiffer (*Malak. Blatt.* p. 233, 1867), in his review of the classification in the *Die Heliccen*, expresses his belief that *Anoma* and *Lia* belong rather to *Cylindrella* than *Macroceramus*, but remarks that the animal is unknown.

* Albers (*Die Heliccen*, 1 ed. 207, 1850) placed *Leia* in *Cylindrella*.

During the last two years M. Crosse has repeatedly called my attention to the importance of examining the animal of some species of the group to which *C. Maugeri* belongs. Lately, I obtained from my friend Nath. Wilson, the distinguished Botanist of Jamaica, several specimens of *C. Blandiana* Pfr., placed by Von Martens in the subgenus *Lia* of *Macroceramus*. Although the animals were dead, I secured the lingual ribbons. I found no jaw, and seeing the character of the teeth, believe that none exists.

From the accompanying figure (by Morse), it will be seen that in form and arrangement the teeth are decidedly of *Cylindrella* type. The median tooth is long and narrow, terminating in a single cusp. The laterals are bicuspid; posterior margin of the plates fringed; anterior cusp fringed, posterior cusp bluntly notched. The formula 55-1-55 x 145.

FIG. 5.



Lingual dentition of *C. Blandiana*, Pfr.
a. side view of extreme lateral.

This seems to establish the fact that *Lia*, and I believe *Anoma* also, must be separated from *Macroceramus*, and that, in accordance with the views of Pfeiffer and H. and A. Adams, they belong to *Cylindrella*.

**REMARKS ON THE ORIGIN AND DISTRIBUTION OF
THE OPERCULATED LAND SHELLS WHICH
INHABIT THE CONTINENT OF AMERICA
AND THE WEST INDIES.**

(Continued from p. 58.)

BY THOMAS BLAND.

Before discussing in detail the relations of the West Indian Islands *inter se*, and with the adjacent Continent, as shown by the distribution of operculated and also inoperculated land shells, I desire to explain the difference in the character and extent of the distribution of the two classes.

That difference is not, it appears, peculiar to the region under consideration, inasmuch as fully two-thirds of all the known operculated species are peculiar to Islands, while more than one-half of the inoperculated are peculiar to Continents.

The facts with reference to the distribution of genera and species in America and the West Indies are as follows:—

	American Continent.	West Indies.
Operculated genera,	14	22
" species,	151	603

2 genera (3 species) peculiar to the Continent.

10 " (215 ") " " Islands.

12 " common, with 149 species on the Continent and 388 on the Islands.

	American Continent.	West Indies.
Inoperculated genera,	22	18
" species,	1251*	737

5 genera (15 species) peculiar to the Continent.

1 genus (1† ") " " Islands.

17 genera common, with 1236 species on the Continent and 736 on the Islands.

* The number of inoperculated continental species is rather approximate than absolutely correct. For general purposes, I use the classification of the *Helicea* adopted by Pfeiffer in his Monograph, but in a subsequent part of this paper I shall refer to the sub-genera of *Helix*, *Bulimus*, &c.

† *Ennea bicolor*, Gould, found in St. Thomas and Trinidad; also in the East Indies. The genus belongs to Africa.

The majority of the genera of operculates common to the Continent and Islands have the greater number of species on the Islands, while the reverse is the case with the majority of such genera of inoperculates. It is noticeable, also, that species of such former genera (speaking generally) attain larger size on the Islands—in *Helicinacea*, for example—and of the latter on the Continent, especially in *Helix*, *Bulimus*, *Oleacina*, and *Cylindrella*.

Looking at the distribution of species in America and the West Indies, and considering each genus as having had its origin where the greatest number of its species is found, (on the Continent or Islands), the following is the result:—

OPERCULATES.

Origin of Genera.	N. Am. per cent.	Mex. per cent.	C. Am. per cent.	S. Am. per cent.	Am. Cont. per cent.	W. Ind. per cent.
American,		13½	10	17	13	1¼
West Indian,	100	86½	90	82	87	98¾

INOPERCULATES.

American,	96½	82	87	98½	95	67
West Indian,	3½	18	13	1½	5	33

It would appear that insular conditions have been more favorable to the increase both of genera and species of operculates, or it may be said to variation, and continental conditions to inoperculates.

The species of both classes common to the Continent and Islands (4 operculated and 36 inoperculated) are, with few exceptions, of West Indian rather than American forms. The number of operculated species found in more than one island is 18, but of inoperculates 55, the latter having, on the whole, a wider insular distribution than the former.

Considering the distribution of genera and species both of operculates and inoperculates in the West Indian Islands, the character of the species common to them and the Continent of America, and found in more than one Island, the West Indies, although, in one sense, a single zoological province, may be divided into five sub-provinces, viz:—

1. Cuba, with the Isle of Pines, the Bahamas, and Bermudas.
2. Jamaica.
3. Haiti.
4. Porto Rico, with Viéque and the Virgin Islands, also including Anguilla, St. Martin, and St. Bartholomew.
5. Guadaloupe and Martinique, with Barbuda and the islands between it and them, and to the south, to and inclusive of Trinidad.

In the last number of this Journal (pp. 54-58) I stated the origin of the Families and Sub-families of operculated Shells, showing, from the distribution of species, the extent of African, Asiatic, and West Indian influences in the Islands generally, and in different parts of the Continent.

The following table explains how those influences, estimated from similar data, are manifested in the different West Indian sub-provinces.

Origin.	Cuba, &c. per cent.	Jamaica. per cent.	Haiti. per cent.	Porto Rico, &c. per cent.	Guade- loupe, &c. per cent.
African,	4	13	13	6	8
Asiatic,	6	14	5	11	25
West Indian,	90	73	82	83	67

As might be expected from the result on the Continent, it appears that the Asiatic influence has its maximum, and the West Indian its minimum, in the group of islands (Guadeloupe, &c.) which is nearest to, and, as I shall show, has most relationship with South America.*

There is another view, however, which deserves notice, of the relationship of the operculated shell faunas of the Continent and Islands, derived from the distribution of genera in connection with the question of origin of the Families and Sub-families.

In the analyses in the preceding part of this paper (p. 57), I dealt with the operculated shells *generally*, but the distribution of genera and species belonging to the three Families is, in reality, very different.

Aciculacea. Omitting *Truncatella* (the distribution of which in the Islands is imperfectly known), the other two genera, *Geomelania* and *Chittya*, are not only West Indian, but peculiar to Jamaica.

Cyclostomacea. Of the 66 Continental species, 42 belong to sub-families of Asiatic, 1 of African, and 23 of West Indian origin, which species are distributed as follows:—

Origin.	No. of Sp. in N. Am.	Mexico.	C. Amer.	S. Amer.
African,		1		
Asiatic,		5	9	28
West Indian,	1	4	11	7

The distribution in the insular sub-provinces is as follows:—

Origin.	No. of Sp. in Cuba, &c.	Jamaica.	Haiti.	Porto Rico, &c.	Guade- loupe, &c.
African,	10	31	8	2	3
Asiatic,	15	34	3	3	9
West Indian,	123	29	26	14	3

Helicinacea. This Family is of West Indian origin.

* In connection with the distribution of operculated shells, the term South America refers especially to the intertropical parts of the Southern Continent.

I may here incidentally remark that the animals of *Cyclotus*, *Cyclophorus*, and *Megalomastoma*, three of the five genera of the Family *Cyclostomacea* of Asiatic origin, represented in America and the West Indies, have a buccal plate in addition to the lingual membrane, (as to *Bourciera* and *Hydrocena* I am not informed*), while in *Cyclostomus* and *Tudora* of African, and, I believe, in the genera of West Indian origin, the buccal plate is wanting.†

Before describing the more remarkable features of the distribution of operculated shells in the West Indian sub-provinces, I may observe that a statement of the number alone of genera represented in different parts of the American Continent and in the West Indies is comparatively of little value. The annexed table gives the names of the genera, with the number of species in each sub-province. The mark * indicates that the genus is not represented on the Continent, and † that the continental species do not exceed three in number. *Cyclophorus* and *Schasicheila* are the only genera with more numerous continental than insular species, while *Bourciera* and *Hydrocena* are exclusively continental.

Seeing that four operculated species only are common to the Continent and the Islands, the extraordinary fact appears that the West Indian Islands have nearly 600 peculiar species of operculated land shells.

St. Croix (Porto Rico group) is the only island in which, so far as I have ascertained, evidence has been discovered of extinct operculated species. *Cyclostoma basicarinatum* and *C. chordiferum*, found with other sub-fossil species (*Helix*, *Bulimus*, and *Pupa*), have been described by Pfeiffer.

* Since putting this in the printer's hands, Prof. Theo. Gill has called my attention to the fact, that *Bourciera* has been placed by Troschel among the genera of *Helicinacea*, with which it essentially agrees in dentition, while *Hydrocena* has been taken as the type of a peculiar family also related to *Helicinacea*, in which the buccal plate is absent.

† See my paper "On the Buccal Plate in Certain Genera of the Family *Cyclostomacea*," *Amer. Jour. of Conch.*, i. 45, in which I refer to Troschel, "Gebiss der Schnecken," part i., 1856.

	Cuba, &c.	Jamaica.	Haiti.	Porto Rico, &c.	Guade- loupe, &c.
ACICULACEA.					
* <i>Geomelania</i> ,		21			
* <i>Chittya</i> ,		1			
Truncatella,	10	8		3	5
CYCLOSTOMACEA.					
<i>Cyclotea.</i>					
Cyclotus,	2	34	2		3
<i>Cyclophorea.</i>					
Cyclophorus,					6
<i>Pupinea.</i>					
† <i>Megalomastoma</i> ,	13		1	3	
<i>Licinea.</i>					
* <i>Jamaicea</i> ,		2			
* <i>Licina</i> ,	1		2		
* <i>Choanopoma</i> ,	25	13	8	3	1
* <i>Ctenopoma</i> ,	22	2	1		
* <i>Diplopoma</i> ,	1				
† <i>Adamsiella</i> ,	1	11			
<i>Cyclostomea.</i>					
* <i>Cyclostomus</i> ,	5	14	4	1	1
† <i>Tudora</i> ,	5	17	4	1	2
<i>Cistulea.</i>					
Cistula,	15	4	2	4	1
Chondropoma,	58		13	7	1
HELICINACEA.					
<i>Stoastomea.</i>					
* <i>Stoastoma</i> ,		80	1	1	
<i>Helicinea.</i>					
† <i>Trochatella</i> ,	20	6	4		
* <i>Lucidella</i> ,		4	1		
Helicina,	56	11	15	9	16
† <i>Schasicheila</i> ,	1				
† <i>Alcacia</i> ,	9	14	2	1	
Totals,	244	241	60	33	36

1. *Cuba, the Isle of Pines, the Bahamas, and Bermudas.*—There is no operculated genus peculiar to this group, excepting *Diplopoma*, of which the only species is in Cuba. The single insular representative of the Mexican genus *Schasicheila* is in New Providence. Two Cuban species only are found on the Continent, *Chondropoma dentatum*, Say, and *Helicina subglobulosa*, Poey, both also in Florida or the adjacent keys.

The known species of *Truncatella*, having strictly terrestrial habits, placed by Pfeiffer in the section *Montanæ*, as distinguished from *Littorales*, are peculiar to Cuba and Jamaica.

Exclusive of *Truncatella*, there is no operculated species common to this and any other of the sub-provinces, excepting *Helicina rugosa*, Pf., found also in Haiti. *Megalomastoma procer*, Poey, and *Chondropoma dissolutum*, Pf., are in Cuba and the Isle of Pines.

The absence of *Geomelania* and *Chittya*, and of *Stoastoma* and *Lucidella* (all unrepresented on the Continent), with the great development of *Megalomastoma*, *Choanopoma*, *Ctenopoma*, *Cistula*, *Chondropoma*, *Trochatella*, and *Helicina*, as compared with other sub-provinces, is remarkable.

The foramen in the superior margin of, and within the aperture of many species of *Choanopoma*, *Ctenopoma*, *Tudora*, *Cistula*, and *Chondropoma*, and the tubercle, especially in *Ctenopoma*, belonging to this sub-province, are local peculiarities not found, even in species of the same genera, in any other island. (Poey, *Memorias*, ii. 40.)

2. *Jamaica.*—The operculated genera peculiar to this sub-province are *Geomelania* and *Chittya*, and *Jamaicea*. *Stoastoma*, with 80 species, represented in Haiti and Porto Rico by one species in each, and *Lucidella*, with one only in Haiti, may almost likewise be termed peculiar. There is no species common to Jamaica and the Continent, and one only found in another island, viz., *Cistula lugubris*, Pf., which inhabits Anguilla, in the Porto Rico sub-province. *Megalomastoma* and *Chondropoma*, both having species on the Continent, and *Licina*, three genera represented in Cuba and Haiti, and the two first in Porto Rico, are not found in Jamaica, while of *Cyclotus*, which is South American as regards the Continent, it has 34 of the 41 insular species. In Jamaica there are 5 genera not represented in Cuba, while in the latter there are 4 not in the former. In every point of view, the operculated land shell fauna of Jamaica appears to be the most varied and peculiar.

3. *Haiti.*—This island has no peculiar operculated genus, and no species common to it and the Continent. *Helicina rugosa*, Pf., and *Tudora pupæformis*, Sowb., are alone found in any other sub-province—the one in Cuba and the other in Anguilla. Having representatives of *Megalomastoma*, *Licina*,

and *Chondropoma* (absent in Jamaica), Haiti has more relationship with Cuba than with Jamaica; but alliance with the latter is shown by 1 species of *Stoastoma* and 1 of *Lucidella*, genera not present in Cuba. I should remark that the land shell fauna of Haiti has been investigated less than those of the neighboring islands, and that further research is much to be desired. It is probable that the islands of the Bahamas group, nearer to Haiti than to Cuba, will, on close examination, be found to have as much, if not more, relationship with the former than the latter.*

4. *Porto Rico, with Viéque and the Virgin Islands, including also Anguilla, St. Martin, and St. Bartholomew.*—There is not only no peculiar operculated genus in this group of islands, but several of the genera represented in the three preceding sub-provinces are wanting, viz., *Cyclotus*, *Ctenopoma*, *Trocharella*, and *Lucidella*. This sub-province, having species of *Megalomastoma* and *Chondropoma*, genera not found in Jamaica, has, on the whole, less alliance with that island than with Cuba and Haiti. There is no species common to the Continent and this sub-province, but several species are widely distributed in the islands comprised in it. All the species which inhabit Viéque are found in Porto Rico, excepting *Choanopoma sulculosum*, Fer., belonging also to St. Bartholomew. Several species are common to Porto Rico, St. Thomas, and St. John. The only species found in another sub-province is *Helicina fasciata*, Lam., which is attributed to St. Kitts, Guadeloupe, and one or two other islands of the same group.

5. *Guadeloupe and Martinique, with Barbuda and the Islands between it and them, and also Islands to the south, to and inclusive of Trinidad.* There is no operculated genus absolutely peculiar to this group of Islands, but *Cyclophorus*, not found in the other sub-provinces, has 2 species in Guadeloupe, and 4 in Martinique; on the continent, there are 3 in Mexico, 3 in Central America, and 8 in South America. *Cyclotus*, with 16 of the 22 continental species in South America, and which inhabits Cuba, Jamaica, and Haiti, but not Porto Rico, is represented in Martinique, Grenada, and Trinidad.

In this sub-province, *Megalomastoma* and all the genera of the sub-family *Licinae*, excepting *Choanopoma*, which has 1 species only, are absent. On the Continent, *Adamsiella* alone of that sub-family is represented, and by 2 species, 1 in Central and the other in South America. The family *Cyclostomea*, which has 1 continental species (in Mexico), has 3 species in this group of islands. The family *Helicinacea* is represented

* I learn from my friend, Mr. D. Sargent, of Great Inagua, that several years ago an alligator landed from a log of mahogany, and lived some time on that island—a colonist, it was supposed, from Haiti.

only by species of *Helicina*. There are 2 species common to the Continent and this sub-province—*Cyclotus translucidus*, Sowb., of Venezuela and Trinidad, and *Helicina Dysoni*, Pf., of that island and Honduras. *Helicina fasciata*, Lam., as already mentioned, is common to this and the Porto Rico sub-province.

This group of islands has unquestionably very marked relationship with South America.

In connection with this sub-province, I may observe that the land shell fauna of Curaçao, situated at no great distance from the coast of Venezuela, is somewhat anomalous.

The following 4 species are known from thence: *Tudora megacheila*, P. and M., of a genus belonging especially to Jamaica, and with 1 continental (Mexican) species only, *Helix pentodon*, Menke, more allied to *H. tichostoma*, Pf., of Cuba (judging from description), than to any other insular species.

Bulimus elongatus, Bolt., distributed in several of the islands embraced in the fourth and fifth sub-provinces, and also found on the Continent, in French Guiana.

Pupa uva, Lam., of the sub-genus *Strophia*, which has one continental species only (*incana*, By., of Florida), and whose insulated distribution is confined to the first, third, and fourth sub-provinces.*

(To be continued.)

* Albers (Die Heliceen, 1861) erroneously attributes *S. alvearia*, Dillw., and *S. uva* to Guadeloupe. The former, with the var. *rubicunda*, Menke, belongs, I believe, to the Bahamas.

REMARKS ON THE DISTRIBUTION OF THE INOPER-
CULATED LAND SHELLS WHICH INHABIT
THE CONTINENT OF AMERICA AND
THE WEST INDIES.

[From American Journal of Conchology, Vol. II., No. 4.]

BY THOMAS BLAND.

In previous Papers my remarks were confined chiefly to the operculated land shells of the American Continent and the West Indies, but I propose now briefly to discuss the subject of the distribution of the inoperculates.

Pfeiffer (*Mon. Hel. Viv.*) divides them (exclusive of *Proserpinacea*) into 31 genera, and describes over 5000 species,—to the present date the number known and described may be estimated at, but probably exceeds, 5500. Without assuming absolute correctness, it may be stated, that while the American Continent has 10 per cent. and the West Indies 39 per cent. of the operculates, the former has about 23 per cent. and the latter about 14 per cent. of the inoperculates.

According to Pfeiffer's classification, the following genera are represented, both on the Continent and Islands, viz: *Helix*, *Streptaxis*, *Bulimus*, *Spiraxis*, *Orthalicus*, *Achatina*, *Oleacina*, *Tornatellina*, *Pupa*, *Macroceramus*, *Cylindrella*, *Balea*, *Clausilia*, *Vitrina*, *Simpulopsis* and *Succinea*. Considering, however, the great number of different forms embraced in several of those genera, it is not possible, with the use of such generic terms alone, to give a satisfactory view of the special relations of the continental and insular faunas.

Looking, however, at the relative extent to which each of the above-mentioned genera are specifically represented in different portions of the Continent, as well as in each of the West Indian sub-provinces, evidence is afforded of the general relationship of the faunas of the sub-provinces *inter se*, and with the Continent.

Taking, for instance, the number of inoperculated species in the subprovinces and sections of the Continent, the following are approximately the proportions (per cent.) in which *Helix*, *Bulimus* and *Cylindrella* are represented in each:—

	N. America.	Mexico.	Cent. Amer.	Cuba.	Jamaica.	Haiti.	Porto Rico, &c.	Guadeloupe, &c.	S. America.
<i>Helix</i> ,	64	21	22	32	42	35	36	36	19
<i>Bulimus</i> ,	10	21	31	9	8	10	31	28	64
<i>Cylindrella</i> ,	3	13	7	26	20	25	5	6 fraction.	

Thus it appears that *Helix* predominates in North America, *Bulimus* in South America, and *Cylindrella* in the West Indies. The closer relations of the subprovinces, embracing Cuba, Jamaica and Haiti with North America, and of the Porto Rico and Guadeloupe subprovinces with South America, are shown by the greater numerical representation of *Helix* in the former, and of *Bulimus* in the latter. *Bulimus* has comparatively few species in North and *Helix* in South America, while the specific development of those two genera are more nearly balanced on the Continent, in Mexico and Central America, and in the Islands, in the Porto Rico and Guadeloupe subprovinces. The distribution of *Cylindrella* (and it is the same with *Oleacina* and *Spiraxis*) shows that Cuba, Jamaica and Haiti are more closely allied to Mexico and Central America than the Porto Rico and Guadeloupe subprovinces, in which, as well as in South America, those three genera are comparatively feebly represented.

In previous pages I referred the "origin" of genera to the country in which there is the maximum specific representation, and presented a statement showing the genera, both operculated and inoperculated, the origin of which might, on such data, be assigned to the American Continent or the West Indian Islands. I remarked that the majority of the genera of operculates common to the Continent and Islands have the greater number of species on the Islands, but that the reverse is the case with the majority of such genera of inoperculates.

Of the before-mentioned genera, represented both on the Continent and Islands, those which appear to have a majority of species in the latter are *Achatina*, *Pupa*, *Macroceramus* and *Cylindrella*, but in no sense can the two former be said to be of West Indian origin.

The generalizations to which I have referred are at least interesting, but less satisfactory as to the inoperculates than the operculates, if Pfeiffer's classification be used, because, as already observed, some at least of his generic terms embrace very various forms, the geographical distribution of which should be considered.

Pfeiffer includes in *Bulimus* and *Achatina* many species now better known as of the genus *Stenogyra*, and in *Bulimus*

the genus *Bulimulus*, the latter represented in the West Indies generally, but the former only in the Guadeloupe subprovince. *Liguus*, now with much reason separated from *Achatina*, belongs to the West Indies, in which *Achatina* proper is not represented. *Tornatellina* embraces *Leptinaria*, a few species of which inhabit tropical America and the West Indies. *Pupa*, in its wide signification, is not West Indian, but the subgenus *Strophia* may be so termed.

It is worthy of notice, that of the genera common to the Continent and Islands, the largest species of each genus, speaking generally, is found where the genus has the greater number of representatives, *Cylindrella* being the most striking exception; and I believe that this will be found to be the case with a majority, at least, of the well established subgenera.

I stated (p. 137) that species of operculates and inoperculates common to the Continent and Islands are, with few exceptions, of West Indian rather than American forms,—this, however, is not entirely correct as regards the inoperculated species. Of such species about one-half of the whole number are found in North America (including Mexico), and the Cuba subprovince,—they are of West Indian and Mexican forms, and about one-fourth of them are distributed in the other insular subprovinces. The remainder of such species inhabit the Southern Continent and chiefly the Guadeloupe subprovince, and are of West Indian and South American forms. The species of *Helix* common principally to the French Islands and French Guiana (with *Liguus virgineus* of Haiti), I am disposed to consider West Indian.

With respect to the occurrence of identical species in more than one of the subprovinces, the greater number are in Cuba and Jamaica, and Cuba and Porto Rico,—they are, at least, numerous in Haiti and Jamaica, and Haiti and the Guadeloupe subprovinces.

The annexed Table, (illustrative and explanatory of the foregoing remarks,) in which Pfeiffer's classification is used, gives the names of the genera represented both on the American Continent and in the West Indies, with the number (approximate, rather than positively correct) of species in each province or subprovince:—

Inoperculates,	North America.	Mexico.	Central America.	South America.	Cuba, sp.	Jamaica, sp.	Haiti, sp.	Porto Rico, sp.	Guadeloupe, sp.
<i>Helix</i> ,	150	38	23	141	101	94	36	29	27
<i>Streptaxis</i> ,				19					1
<i>Bulimus</i> ,	23	39	32	473	30	18	11	25	21
<i>Spiraxis</i> ,		24	7	6	5	7	3		
<i>Orthalicus</i> ,	1	4	2	18	1	1			2
<i>Achatina</i> ,	2	7	3	7	16	19	3	3	3
<i>Oleacina</i> ,	8	32	19	5	13	22	5	5	1
<i>Tornatellina</i> ,			1	5		1		3	2
<i>Pupa</i> ,	19	3	3	12	27	9	3	6	3
<i>Macroceramus</i> ,	2	1	3		28	1	11	1	
<i>Cylindrella</i> ,	4	25	7	3	83	46	26	4	4
<i>Balea</i> ,				2	1				
<i>Clausilia</i> ,				8				1	
<i>Vitrina</i> ,	3						1		
<i>Simpulopsis</i> ,		5		9			1	1	1
<i>Succinea</i> ,	22	3	3	12	11	4	2	4	10

In order to elucidate the facts as to the distribution of the inoperculated land shells on the American Continent and in the West Indies, more completely than can be done by the use of Pfeiffer's classification, I prepared the subjoined Catalogue from the last edition of the "Die Heliceen" of Albers.

The Catalogue gives, with the name of a typical species of each, the names of all the genera and subgenera, from the work referred to, which are known to be represented either on the Continent or Islands, distinguishing as distinct faunas those of Eastern North America, the West Coast of North America, Mexico, Central America, South America, and of the five subprovinces into which, in my former papers, I divided the West Indian Islands. A single asterisk (*) indicates the occurrence of species (of the genus or subgenus mentioned in the first column) in the province named at the head of the column,—two asterisks (**) that in such province the genus or subgenus has its greatest specific development.

I do not, by any means, accept or adopt, as a whole, the classification of Albers, but I use it as the most convenient for my present purpose, considering that it enables me to present a very interesting and approximately correct view of the relations of the faunas in question.

HELICEA.	East. N. Amer.	W. Coast N. Am.	Mexico.	Central America.	* Cuba, subpro.	* Jamaica, subpro.	* Haiti, subpro.	* P. Rico, subpro.	* Guadeloupe, s. p.	* South America.
Pinaria, Poey.										
<i>Beathina</i> , Poey.										
Leucochila *			*		*	*	*	*	*	
<i>fallax</i> , Say.										
Strophia, Alb. *					**		*	*	*?	*
<i>mumia</i> , Brug.										
Ennea, H. & A. Ad.								*	*	
<i>bicolor</i> , Gould.										
STREPTAXIS, Gray.									*	**
<i>contusus</i> , Fer.										
F. SUCCINEA.										
SIMPULOPSIS, Beck.			*				*	*	*	*
<i>sulculosa</i> , Fer.										
SUCCINEA, Drap.										
Amphibulima, (Lam.) Blainv.									*	
<i>patula</i> , Brug.										
Succinea, s. str. *	*	*	*	*	*	*	*	*	*	*
<i>obliqua</i> , Say.										
Brachyspira, Pfr. *									*	
<i>tigrina</i> , Lesueur.										
Omalonyx, Orb.									*	*
<i>unguis</i> , Fer.										

In the following pages I offer a more detailed description of the peculiar features of the distribution of the inoperculates, in the different West Indian subprovinces.

1. *Cuba, the Isle of Pines, the Bahamas and Bermudas.* In this subprovince there are very many peculiarly West Indian forms. The subgenera of *Helix* most characteristic of Cuba are: *Eurycampta* (*H. Bonplandi*, Lam.), *Coryda* (*H. alauda*, Fer.), *Thelidomus* (*H. auricoma*, Fer.), *Polymita* (*H. muscarum*, Lea), *Polydontes* (*H. imperator*, Montf.), and *Caracolus* (*H. Sagemon*, Beck). In the Bahamas, *Plagioptycha*, which belongs rather to Haiti, is represented by *H. Bahamensis*, Pfr., and other species.

Liguus (*L. fasciatus*, Müll.), found also in Florida and the adjacent Keys, confined in the Islands to Cuba and Haiti, has most species in the former. Several of the subgenera of

Stenogyra are represented by peculiar species,—*Obeliscus* by *S. gigas*, Poey, *Melaniella* by *S. acuticostata*, Orb., *Pseudobalea* by *S. hasta*, Pfr., found also in Haiti and Porto Rico.

Strophia, (*P. mumia*, Brug.,) subgenus of *Pupa*, has its chief development in Cuba and the Bahamas, and is found in the Haiti and Porto Rico subprovinces, but not in Jamaica.

Macroceramus has the greatest number and most varied forms (*M. Pazi*, Gund., *M. claudens*, Gund., *M. turricula*, Pfr.,) in Cuba. Albers places *Cylindrella torquata*, Morel., with other species in *Anoma*, subgenus of *Macroceramus*, but with doubtful propriety. Whether the buccal plate is present as in *Macroceramus*, or wanting as in *Cylindrella*, I am not informed; but *C. torquata* and its immediate allies have revolving laminæ on the axis, as is common in the latter genus, but only known in *M. amplus*, Gund., which, however, may be a *Cylindrella*, as I have elsewhere suggested (Ann. Lyc. N. Y., VIII., p. 163.) *Macroceramus* is also found in the Bahamas, but not in the Bermudas.

Pineria, established by Poey for two species found in the Isle of Pines, allied to *Macroceramus*, but placed by Pfeiffer in *Bulimus*, is adopted by Albers as a subgenus of *Pupa*. A Guadeloupe species is described as *Helix Schrammi* by Fischer. *B. Viéquensis*, Pfr., of Viéque in the Porto Rico subprovince, and of Barbadoes in the Guadeloupe subprovince, belong to *Pineria*.

In the Cuban subprovince, indeed in the Islands generally, there is a marked absence of Eastern North American forms of *Helix*. Albers has two in *Polygyra*, (a subgenus characteristic of Mexico and the Southern United States;) of one *H. auriculata*, Say, is the type, and *H. septemvolva*, Say, of the other. The only insular representatives are of the former, *H. notata*, Poey, of Cuba; of the latter, *H. paludosa*, Pfr., of that Island and Jamaica, and *H. microdonta*, Desh., of the Bahamas and Bermuda.

The inoperculated land-shell faunas of Cuba, Jamaica and Haiti have special generic relations with that of Mexico and Central America, as shown by the distribution of species of *Glandina*, *Spiraxis* and *Cylindrella*, but different subgenera are developed on the Continent and Islands. Of the first, the subgenus *Glandina* (*G. Sowerbyana*, Pfr.) prevails on the former, but *Oleacina* (*G. oleacea*, Fer.) in Cuba, and *Varicella* (*G. leucozonias*, Walch) in Jamaica. *Streptostyla* (*S. Nicoleti*, Shutt.), subgenus of *Spiraxis*, is continental, while *Che. somitra?* is represented in Cuba, and *Euspiraxis* (*S. costulosa*, C. B. Ad.) in Jamaica. I should remark that *S. Cubaniana*, Orb., and *S. episcopalis*, Morel., of Cuba, appear to me to be improperly placed by Albers in *Oleacina*.

Cylindrella has an extraordinary number of species in Cuba, and of very varied forms, both externally, and internally as regards the characters of the axis. The subgenera *Urocoptis* (*C. Ghiesbreghti*, Pfr.) and *Holospira* (*C. Pilocerei*, Pfr.) are rather continental, while *Gongylostoma* (*C. elegans*, Pfr.) and *Trachelia* (*C. porrecta*, Gould) may be especially referred to Cuba.

The occurrence in Cuba of both operculated and inoperculated species with well developed spinous processes is curious,—I allude to *Choanopoma hystrix* and *echinus*, Wright, to *Melaniella acuticostata*, Orb., and *Cylindrella Elliotti*, Poey.

The family *Proserpinacea* belongs to Mexico,—the subgenus *Proserpina* (*P. depressa*, Orb.) has insular representatives only in Cuba, the Isle of Pines and Jamaica.

Strictly South American forms are rare in the West Indies, excepting in the Guadeloupe subprovince. In Cuba there are a few species of *Bulimulus*, but of subgenera which are rather of Mexican and Central, than South American form, viz: *Liostracus Marielinus*, Poey, found also on the Florida Keys, and *Leptomerus sepulchralis*, Poey, which, as well as *Mesembrinus Bahamensis*, Pfr., inhabits New Providence.

Orthalicus is most numerously represented in South America. It has one species (*O. undatus*, Brug.) in Cuba, found also in Jamaica and in the Guadeloupe subprovince.

In South America there are two species of *Balea*, and it is remarkable that one (*B. Canteroiana*, Gund.) is found in Cuba, the only West Indian species, referred, indeed, to the genus *Balea* by Pfeiffer, with some doubt.

There are several species in the Cuban subprovince, which have most probably been introduced from Europe,—*Stenogyra decollata*, L., found at Havana, also at Charleston, S. Carolina, *Helix ventrosa*, Fer., and *Cionella acicula*, Müll., at Bermuda,—the latter also inhabiting Florida, and lately discovered at Princeton, N. J., by Mr. A. D. Brown.

2. *Jamaica*. Many West Indian forms belong to, and, as is the case with Cuba, are peculiar to this subprovince. The most characteristic subgenera of *Helix* are: *Cysticopsis* (*H. tenerrima*, (C. B. Ad.), *Pleurodonta* (*H. lucerna*, Müll., *H. soror*, Fer., and *H. sinuata*, Müll.), and *Leptoloma* (*H. fuscocincta*, C. B. Ad.) *Coryda* and *Thelidomus*, more particularly Cuban, are represented, the former by several species, of which *H. Gossei*, Pfr., may be called the type, and the latter by *H. cognata*, Fer., and *H. aspera*, Fer.

The genus *Sagda* (*S. Cookiana*, Gmel.) is peculiar to Jamaica, with the exception of the subgenus *Odontosagda*, which belongs to Haiti.

Liguus and *Strophia*, found both in Cuba and Haiti, are not present in Jamaica.

Macroceramus, most numerous represented in Cuba and Haiti, has 1 species only in this subprovince, *M. Gossei*, Pfr., found also in Cuba and New Providence. Albers places in *Anoma*, *Cylindrella tricolor*, Pfr., and other Jamaica species, and in *Lia* (both subgenera of *Macroceramus*), *C. Maugeri*, Wood, and its allies, an arrangement which I am not, as at present informed, prepared to accept.

Stenogyra has representatives of *Opeas* and *Subulina*, but not of *Pseudobalea* or *Melaniella*.

Of genera characteristic of Mexico and Central America, *Glandina*, *Spiraxis* and *Cylindrella* are represented in Jamaica. *Varicella* (*C. leucozonias*, Walch), subgenus of *Glandina*, has its principal development in Jamaica. The species of *Spiraxis*, unlike those of the Continent, are small, and belong to the subgenus *Euspiraxis*. Of *Cylindrella*, the subgenera *Urocoptis*, (*C. nobilior*, C. B. Ad.) and *Mychostoma* (*C. subula*, Fer.) are numerous represented. *Casta* (*C. elongata*, Chem.) is peculiar to this subprovince.

The genus *Proserpina* (*P. nitida*, Sowb., *P. pisum*, C. B. Ad.) has a greater number of species in Jamaica than in Cuba.

In this subprovince, as in Cuba, *Bulimulus* is feebly represented, — *Liostracus* by *B. erubescens*, Pfr., and *Leptomeres* by *B. immaculatus*, C. B. Ad.

Leptinaria, subgenus of *Cionella*, has two or three species in South America; and *C. monodon*, C. B. Ad., of Jamaica, is, I believe, properly placed in it.

Orthalicus, as in Cuba, is represented solely by *O. undatus*, Brug.

There are no species in this subprovince which can be spoken of as European or introduced from Europe.

3. *Haiti*. The peculiar forms of *Helix* in this subprovince belong to the subgenera *Plagioptycha* (*H. loxodon*, Pfr.), *Eurycratera* (*H. Dominicensis*, Pfr.), *Cepolis* (*H. cepa*, Müll.) and *Caracolus* (*H. caracolla*, L.)

H. Audebardi, Pfr., with its ally *H. Luguillensis*, Shuttl., of Porto Rico, seem to be very inconsistently placed by Albers in the subgenus *Polydotes*, of which *H. imperator* is the type. *Odontosagla* (*S. polyodon*, W. and M.), subgenus of *Sagla*, is peculiar to Haiti.

Liguus is represented by *L. virgineus*, L., which occurs also in French Guiana, and *Strophia* (*S. glans*, Kust.) has several species in this subprovince.

Of *Stenogyra*, the subgenus *Obeliscus* has *S. tereb aster*, Lam., *Pseudobalea*, *S. hasta*, Pfr., both found also in Cuba, and *Opeas*

has *S. Caraccasensis*, Rv., which inhabits the Guadeloupe subprovince and South America.

Melaniella is not represented.

Macroceramus (*M. formosus*, Wood), with the exception of Cuba, has the largest number of species in Haiti. *Anoma tricolor*, Pfr., is found in this as well as in the Jamaica subprovince. The occurrence in Haiti of *Vitrina* (Malak. Blatt., 1858, p. 146), which belongs rather to Eastern North America, is somewhat remarkable.

The genus *Hyalina* is widely distributed, but the subgenus *Mesomphix* (*H. fuliginosa*, Griff.) likewise more especially of Eastern North America, is represented in the West Indies by one species only, *H. ptycoraphe*, W. and M., of Haiti, where *Hyalina indentata*, Say, common in the United States, also occurs.

Glandina, *Spiraxis* and *Cylindrella*, to which I have referred as characteristic of the faunas of Mexico and Central America, are represented in Haiti,—the two first by comparatively few species. Those of *Glandina* belong to the subgenera *Vari-cella* (*G. bicipitata*, Wein.), and *Oleacina* (*G. o'eacea*, Fer., found also in Cuba.) *Oleacina Paivana*, Pfr., a sinistral species, is a remarkable form. Of *Spiraxis*, the subgenus *Euspiraxis* (*S. Dunkeri*, Pfr.) is alone represented. *Cylindrella* has a considerable number of species, chiefly of the subgenus *Urocoptis* (*C. Menkeana*, Pfr.)

In this subprovince *Orthalicus* and *Leptinaria* (South American) are wanting. Of *Bulimulus*, the subgenus *Thaumastus* is represented by *B. exilis*, Gmel., widely distributed in the Porto Rico and Guadeloupe subprovinces; *Liostracus*? by *B. Dominicanus*, Rv., referred also to Mexico, and *Mesembrinus* by *B. Moussoni*, Pfr.

The genus *Simpulopsis* has species in Mexico, but is more especially South American. It is not found in Cuba or Jamaica, but there is one representative in each of the Islands of Haiti (*S. Dominicanensis*, Pfr.), Porto Rico (*S. Portoricensis*, Shuttl.), and Trinidad (*S. corrugatus*, Guppy.)

Haiti, as remarked with reference to the operculates, has, the inoperculates also considered, more relationship with Cuba than with Jamaica, as evidenced especially by the occurrence of *Liguus* and *Strophia*, and the many species of *Macroceramus*.

Seeing that *Vitrina* and *Mesomphix*, as well as *Hyalina indentata*, Say, are found in this subprovince, it may be said to have a greater connection than Jamaica with Eastern North America.

4. *Porto Rico, with Viéque and the Virgin Islands, including also Anguilla, St. Martin and St. Bartholomew.* This sub-

province, compared with the preceding, has fewer peculiar forms of *Helix*. *Caracolus* is represented by *H. caracolla*, L., and *H. marginella*, Gmel.; the former found also in Haiti, the latter of the same type as *H. Sagemon*, Beck, of Cuba. *Eury-cratera* (*H. angulata*, Fer.) and *Plagiptycha* (*H. Riisei*, Pfr.) are represented in Porto Rico and Viéque, and the last by *H. nemoralina*, Pet., in the Virgin Islands. *Thelidomus*, especially Cuban, has in this subprovince, according to Albers, several species, of which *H. lima*, Fer., is the type, but he has *H. castrensis*, Pfr., its very near ally, in *Dentellaria*, to which it scarcely belongs. *Mörchia*, subgenus of *Hyalina*, is represented in Porto Rico by *H. concolor*, Fer.

Strophia has *P. microstoma*, Pfr., and *P. striatella*, Fer., in Porto Rico, and the latter, I believe, also in Anegada,—both are found in Haiti.

Stenogyra has *Obeliscus terebraster*, Lam., and *Pseudobalea hasta*, Pfr. in Porto Rico, and *Melaniella gracillima*, Pfr., (found also in Cuba and Florida) in St. Thomas.

Macroceramus has two species, *M. microdon*, Pfr., in Porto Rico, St. Thomas, St. John and Tortola, *M. signatus*, Guild, in the latter Island and Anguilla. *Anoma* and *Lia* are absent.

In this subprovince there are no strictly North American forms.

Oleacina (*G. glabra*, Pfr.) and *Varicella* (*G. terebræformis*, Shuttl.) are represented in Porto Rico alone, and by few species. *Spiraxis* does not occur. *Cylindrella* has a small number of species, chiefly of the subgenus *Mychostoma*, one of which, *C. pallida*, Guild., is widely distributed.

There is in this subprovince, as compared especially with Cuba and Jamaica, a marked diminution of Mexican and Central American forms. It may, in fact, be said that eastward from Cuba to the eastern limit of the Porto Rico subprovince, those, as well as strictly West Indian forms, diminish gradually in number, being at their minimum in the Guadeloupe subprovince.

Orthalicus does not occur, but more subgenera of *Bulimulus* are represented than in the Islands to the westward. Besides *Mesembrinus* (*B. elongatus*, Bolt.), *Thaumastus* (*B. exilis*, Gmel.), *Leptomerus* (*B. fraterculus*, Fer.), and *Liostracus*? (*B. Hjalmarsoni*, Pfr.), *Drymaeus* has *B. liliaceus*, Fer.

Leptinaria (*C. Antillarum*, Shuttl.) has three species, and *Simpulopsis* one, as already mentioned.

The only West Indian species of *Clausilia*, *C. tridens*, Schweig., of the subgenus *Nenia*, inhabits Porto Rico. The genus is not represented on the Northern, but there are several species on the Southern Continent.

Ennea (subgenus of *Pupa*), which is more especially devel-

oped in Africa, has a single species (*P. bicolor*, Gould), probably introduced from the East Indies where it is widely distributed, in St. Thomas, and in Trinidad embraced in the Guadeloupe subprovince.

Several subfossil species are found in St. Croix, and among them *H. caracolla* and *H. marginella*, Gmel.,—also two species of *Strophia*, none of which are now living on the Island. Impressions of an undetermined species of *Strophia* occur also in the fossil guano of Sombrero.*

The fauna of the Porto Rico subprovince has closer relations with that of Haiti, than of Jamaica or Cuba.

5. *Guadeloupe and Martinique, with Bar'uda and the Islands between it and them, and also Islands to the South, to and inclusive of Trinidad.* There is, as before observed, a very marked decline in this subprovince of genera especially characteristic of the West Indian fauna. Of *Helix*, the subgenus *Thelidomus*, belonging to Cuba and Jamaica, and *Cepolis* of Haiti, are represented in Martinique, the former by *H. discolor*, Fer., and the latter by *H. auridens*, Rang. *Mörchia*, (subgenus of *Hyalina*) has *H. Baudoni*, Pet. (closely allied to *H. concolor*, Fer., of Porto Rico) in Guadeloupe.

With very few exceptions, the rest of the *Helices* in this subprovince belong to the subgenus *Dentellaria*. That subgenus is represented in most of the Islands, and is, indeed, the characteristic form of this subprovince, but it is not found in St. Vincent or Trinidad.

Albers places *H. lychnuchus*, Müll., (erroneously attributing it to Porto Rico) in *Dentellaria*; but St. Simon (Jour. de Conch., 1853), with reference to some anatomical peculiarity and the form of the buccal plate, refers it to *Zonites*. He suggests that *H. acuta*, Lam., the shell of which is somewhat analogous to that of *lychnuchus*, may have a similar organization, and also belong to *Zonites*,—the buccal plate of the former is, however, strongly ribbed, and has marginal denticles.

It is remarkable that *Thelidomus discolor* and the following species of *Dentellaria*, as well as various species of other genera, found in the Guadeloupe subprovince, also inhabit French Guiana, viz: *orbiculata*, *Isabella*, *dentiens*, *nux denticulata*, and *badia*.

Dorcasia (Helix) similis, Fer., found in South America and other parts of the world, also occurs in Barbados.

The existence of *Stenopus (S. lividus*, Guild., and *S. cruentus*, Guild.) in the Island of St. Vincent is a very marked feature of the fauna of the Guadeloupe subprovince. This genus is allied to *Nanina* (an Asiatic form), in which the

* A very interesting paper on the Geology of the Key of Sombrero, by Alexis A. Julien, will be found in the Ann. of the Lyceum, VIII., 1866.

above named species were placed by Pfeiffer (Vers. p. 113, 119, 1855), and *H. zomites*, Pfr., of Mexico, by Gray (Pulm., p. 140, 1855.) In 1865 I described (Ann. Lyc., VIII., 157) *Stenopus Guildingi*, from Porto Cabello, Venezuela, and, from information given by Dr. Berendt, there is some reason to believe that at least one species inhabits Mexico. The occurrence of *Stenopus* in the Guadeloupe subprovince alone, affords additional evidence of the close alliance of the faunas of that subprovince and of South America.

Liguus and *Macroceramus*, mentioned as West Indian forms, are not represented in this subprovince, and *Strophia* only by *Strophia uva*, L., in Curaçao.*

Stenogyra has no peculiar species; *Opeas Caraccasensis*, Rv., occurs in several of the Islands, and also inhabits South America. *Pineria Schrammi*, to which I have already referred, is found in Guadeloupe, and *P. Viéquensis*, Pfr., in Barbadoes, as well as in Viéque of the Porto Rico subprovince.

There is a diminished number of representatives of Mexican and Central American, as well as West Indian forms in the subprovince under consideration. *Glandina* has only *Varicella Guadeloupensis*, Pfr., (Guadeloupe), and *V. semitarum*, Rang. (Martinique.)

Spiraxis is wanting and *Cylindrella* has 3 species, the subgenus *Mychostoma* being represented by *C. costata*, Guild., in Barbados, *Gongylostoma* by *C. collaris*, Fer., in Guadeloupe and Martinique, and *Trachelia?* by *C. Trinitaria*, Pfr., in Trinidad.

Proserpina, as before mentioned, is confined to the Cuba and Jamaica subprovinces.

The Guadeloupe subprovince is peculiarly rich in South American forms. *Bulimus*, which belongs to the Southern Continent, has of the subgenus *Pelecychilus*, *B. auris Sileni*, Born., in St. Vincent, *B. auris-sciuri*, Guppy, in Trinidad, and an allied, possibly the same species, (both enumerated in my Catalogue, Ann. Lyc., VII., as *B. glaber*, Gmel.) in Grenada; of *Borus*, *B. oblongus*, Müll., in St. Vincent, Tobago, Trinidad, and Barbados, introduced in the latter, from St. Vincent, by the late Rev. J. Parkinson; of *Eurytus*, *B. aulacostylus*, Pfr., in St. Lucia. *B. auris Sileni* and *oblongus* also inhabit French Guiana.

Several subgenera of *Bulimulus* are represented, viz.: *Drymaeus*, *Liostracus*, *Mesembrinus*, *Thaumastus* and *Leptomerus*.

* In my former paper (p. 143) I noticed *H. pentodon*, Menke, of Curaçao, overlooking the remarks of v. Martens (Malak. Blatt., 1859, p. 209), who, with much apparent reason, refers to it as a young example of *S. uva* *Strophia Antonii*, Kust., of Berbice, is the only known South American species.

No less than four of the species, *B. multifasciatus*, *elongatus*, *exilis* and *fraterculus* are also found in French Guiana.

Orthalicus, confined in the other subprovinces to Cuba and Jamaica, has *O. undatus*, Brug., in Trinidad, and *O. undulatus*, Guild., in the Grenadines.

Leptinaria has *L. Antillarum*, Shuttl., in several of the Islands, *L. Funcki*, Pfr. in Grenada (also in British Guiana), and *L. lamellata*, P. and M., in Guadeloupe, as well as on the Southern Continent.

Streptaxis has one species only in the West Indies, viz: *S. deformis*, Fer., also in Trinidad, where *Simpulopsis corrugatus*, Guppy, occurs.

Several of the forms of *Succinea* in this subprovince are peculiar. The subgenus *Amphibulima* is represented by *S. patula*, Brug., in St. Christopher and Guadeloupe?, *Succinea* by *S. rubescens*, Desh., in Guadeloupe and Martinique (also in French Guiana). *Brachyspira* by *S. tigrina*, Lesueur, in St. Vincent, and *Omalonyx* by *S. unguis*, Fer. (found also in Brazil), and *S. appendiculata*, Pfr., in Guadeloupe.

The distribution of the land shells in the West Indies seems to warrant the division of the islands into the five above-mentioned subprovinces, but it is very interesting to notice that the distribution of plants renders a different division necessary, especially of the islands comprised in my Porto Rico and Guadeloupe subprovinces.

Grisebach, in the Preface to his "Flora of the British West Indian Islands" (London, 1864), remarks, that the Islands, though reaching beyond the tropics, "present a tropical character in their vegetable productions, and the Northern Bahamas in this respect are quite distinct from the opposite continental shore of Florida, from which it is separated by the Gulf Stream; while Trinidad, lying almost contiguous to the delta of the Orinoco, partakes of the flora of Venezuela and Guiana. Jamaica, again, from its mountainous character and more distant position,—most of the Leeward islands from being wooded volcanoes,—and a majority of the Windward ones, with a dry climate, and a low, calcareous soil, form three divisions of this tropical archipelago, which show as many peculiarities."

The author adds, that the whole of the British West Indies, as comprised in his "Flora," may be divided into five natural sections, each with a distinct botanical character, and including the following islands, viz.:—

- I. Bahamas and Turk Islands.
- II. Jamaica.

- III. Western Caribbean Islands (most Leeward, and including some of the Windward islands), viz.: Virgin Islands, St. Kitts, Nevis, Montserrat, Dominica, St. Lucia, St. Vincent, Grenada and Grenadillos.
- IV. Eastern Caribbean Islands (most Windward, and some Leeward islands), viz.: Anguilla, Barbuda, Antigua, Barbados and Tobago.
- V. Trinidad.

It will be noticed that the Virgin Islands and Anguilla, embraced, with islands to which by their land-shell faunas they are closely allied, in my Porto Rico subprovince, are placed by Grisebach, the former in his third, and the latter in his fourth section, and both with islands, to which they are not so allied, comprised in my Guadeloupe subprovince.

The boundaries (shown by the distribution of the land shells) of the Porto Rico and Guadeloupe subprovinces are somewhat sharply defined, and, in connection with an explanation as to their limits, there are some facts (for which I am indebted to Mr. Julien) relating to the geological position of part of the former subprovince, which deserve consideration.

The Eastern portion of the Porto Rico subprovince consists of the Virgin and St. Martin banks and the Key of Sombrero, the latter dividing the channel between the banks into two passages,—the Anegada on the west, and the Sombrero passage on the east of the Key. The Virgin bank, the nearest point of which is forty miles from the Key, encircles St. Thomas, St. John, Tortola, Anegada and the other islets of the Virgin group,—deep water soundings off the edge of this bank vary from 140 to 160 fathoms. The Key of Sombrero is also surrounded by a submarine bank, the dimensions of which are about three and a half by five miles,—soundings off the outer edge give from 105 to 150 fathoms. The St. Martin bank, south-east of and about twenty miles from the Key, comprises the islands of Anguilla, St. Martin and St. Bartholomew; soundings off the edge of the bank vary from 102 to 190 fathoms.

The northern part of the Guadeloupe subprovince consists of the islands immediately south and east of the St. Martin bank, viz.: St. Kitts, Barbuda and Antigua, with the smaller islands of St. Eustatius and Nevis.

The following are the principal differences in the distribution of genera and species of land shells, on which I rely as authority for separating the last mentioned islands from the Porto Rico subprovince, and placing them, with the islands to the south, in the Guadeloupe subprovince:—

Megalomastoma and *Alcacia* are found in Porto Rico, also

in St. Thomas and St. John. *Macroceramus* (*M. microdon*, Pfr.) inhabits Porto Rico, St. Thomas, St. John and Tortola, and *M. signatus*, Guild., Tortola and Anguilla, the latter on the St. Martin bank. *Strophia* occurs in Porto Rico, St. Croix (subfossil), Anegada and subfossil remains only of a species on Sombrero. *Megalomastoma*, *Alcacia*, *Macroceramus*, excluding *Pineria*, treated as subgenus of it by H. and A. Adams, and *Strophia*, *S. uva*, L., of Curacao alone excepted, are not represented in the Guadeloupe subprovince.*

Helix notabilis, Shuttl., is found in St. Thomas (subfossil), St. John, Tortola and Anegada of the Virgin bank, and in St. Bartholomew of the St. Martin bank, but not in the Guadeloupe subprovince.

Dentellaria (subgenus of *Helix*), of which *H. nux denticulata*, Chem., and *H. formosa*, Fer., are types, is especially characteristic of the Guadeloupe subprovince. It is represented in Barbuda and Antigua by *H. formosa*, in St. Kitts by *H. Josephinæ*, Fer., subfossil†, and occurs also in Guadeloupe, Dominica, Martinique, Barbados, &c., but not in the Porto Rico subprovince. *H. castrensis*, Pfr., of Porto Rico, placed by Albers in *Dentellaria*, and by Pfeiffer with species of that type, is a questionable exception,—it appears to me to belong to the same group as *H. notabilis*, and *H. lima*, Fer.,—of the latter, indeed, I have considered it a variety.

The species common to the Porto Rico and Guadeloupe subprovinces, of which a list is annexed, are few, and of a character, their general distribution also considered, favorable to my views as to the separation of the two faunas.

(Those marked * occur also in one or more of the other subprovinces, ** also in North America, † also in South America.)

	<i>Helicina fasciata</i> ,	Lam.
**	<i>Helix vortex</i> ,	Pfr.
†*	<i>Bulimulus exilis</i> ,	Gmel.
†	“ <i>elongatus</i> ,	Bolt.
†	“ <i>fraterculus</i> ,	Fer.
	<i>Pineria Viéquensis</i> ,	Pfr.
	<i>Leptinaria Antillarum</i> ,	Shuttl.
*	<i>Stenogyra Goodalli</i> ,	Mil.
†*	“ <i>octona</i> ,	Chem.
*	“ <i>octonoides</i> ,	C. B. Ad.
**	“ <i>subula</i> ,	Pfr.

* I have already noticed that *Megalomastoma* and *Strophia* do not occur in Jamaica, the most southerly of the larger islands, and that *Macroceramus* is there represented by *M. Gossei*, Pfr, only,—a species found also in Cuba and Florida.

† The occurrence in St. Croix, St. Thomas, Sombrero and St. Kitts, of subfossil, or at least of species not now living on those islands, is a subject of much geological interest.

** <i>Pupa pellucida,</i>	Pfr.
<i>Succinea approximans,</i>	Shuttl.
<i>Ennea bicolor,</i>	Gould.

I may add, that, both generically and specifically, there are more intimate relations between the subprovinces of Haiti and Porto Rico, than between those of the latter and Guadeloupe.

DESCRIPTIONS OF NEW SPECIES OF NORTH
AMERICAN LAND SHELLS.

BY THOMAS BLAND.

HELIX JACKSONII, nov. sp.—Plate 21, fig. 8.

T. anguste umbilicata, depressa, nitida, fusco vel pallide cornea, superne vix elevata, striata subtus convexa, striis exilioribus; anfr. 6, convexiusculi, lente accrescentes, ultimus antice subito deflexus, pone aperturam constrictus, superne gibboso-inflatus; sutura impressa; apertura obliqua, lunato-circularis, tridentata; perist. callosum, fusco-roseum, breviter reflexum, marginibus vix conniventibus, dente, albo, linguiformi, bicuri, profunde intrante junctis, basali plica valida, obliqua, sinuosa, dextro dente profundo immerso munito.

Shell narrowly umbilicate, depressed, shining, dark or pale horn-colored, little elevated above, striated, convex beneath, with finer almost obsolete striæ; whorls 6, slightly convex, gradually increasing, the last suddenly deflected, contracted and above gibbously inflated behind the aperture; suture impressed; aperture oblique, lunate-circular, with three teeth; peristome thickened, brownish-red, shortly reflected, with the scarcely approaching margins joined by a white, linguiform, bicural, deeply entering tooth, the basal margin with a strong oblique, sinuous fold, the right with a deeply seated tooth.

Dimensions.—Diam. maj. 7, min. 6, alt. 4 mill.

Large dead specimens, brought down from the upper country by the streams flowing into the Arkansas River, measure: Diam. maj. 9, min. 8, alt. 4 mill.

Habitat.—Fort Gibson, Indian (Cherokee) Territory, (V. B. Hubbard!)

Remarks.—This species belongs to the same group as, and is most nearly allied to *H. Hazardi*, Bland, (*H. plicata*, Say,) from which, however, it may be readily distinguished by the very different character of the parietal and basal teeth. This species has no internal tubercle.

I am indebted for specimens of this interesting shell to Dr. Hubbard, of Tottenville, Staten Island. They were collected by his son, Mr. V. B. Hubbard, Assistant Surgeon U. S. Army, at whose wish I dedicate the species to his late friend and fellow-Surgeon, R. M. S. Jackson, Corr. Memb. Acad. Nat. Sci., Philadelphia. Dr. Jackson, at the time of his death, a year since, at Chattanooga, was diligently engaged in studying the fauna of that part of Tennessee.

HELIX SIGNIFICANS, nov. sp.—Plate 21, fig. 9.

T. umbilicata, depressa, discoidea, tenuis, irregulariter et leviter striatula, striis subtus subobsoletis, nitens, pallide cornea; spira parum elevata; sutura vix impressa; anfr. 6, subplanulati, ultimus rotundato-inflatus, basi subplanus, circa umbilicum excavatus; umbilicus pervius, fere $\frac{1}{2}$ diametri æquans; apertura obliqua, depressa, lunaris; perist. simplex, acutum.

Shell umbilicate, depressed, discoidal, thin, with fine irregular striæ, which are almost obsolete at the base, shining, pale horn-colored; spire little elevated; suture slightly impressed; whorls 6, sublanulate, the last roundly inflated, rather flat at the base, excavated around the umbilicus, which is pervious, and equal almost to $\frac{1}{2}$ of the diameter of the shell; aperture oblique, depressed, lunate; peristome simple, acute.

Dimensions.—Diam. maj. $4\frac{1}{2}$, min. 4, alt. 2 mill.

Habitat.—Fort Gibson, Indian Territory, (V. B. Hubbard!)

Three specimens were found,—one apparently adult, the others having respectively 4 and 5 whorls only.

Remarks.—This species belongs to the group of peculiarly North American type, embraced by Albers in *Gastrodonta*, subgenus of *Hyalina*. It is especially allied to *H. multidentata*, Binney, from which it differs in being of larger size, with wider umbilicus, and in the absence in the last whorl of the series of numerous small teeth which characterize Binney's species.

In a young specimen of *H. significans*, having four whorls only, there, however, three small teeth, one by itself, and at some distance from it, two others, situated as the teeth are in *H. multidentata*. Whether these teeth are or not constant in the antepenultimate whorl of *H. significans*, I am unable to determine.

H. FEBIGERI, nov. sp.—Plate 21, fig. 10.

T. umbilicata, orbiculato-plana, tenuis, nitida pallide vel rufo-cornea, superne subdistanter costulato-striata, subtus substriata; spira planata; sutura profunda; anfr. $5\frac{1}{2}$ –6, convexiusculi, regulariter accrescentes, ultimus ad peripheriam angulatus, infra angulum inflatus; umbilicus infundibuliformis; apertura obliqua, subreniformis; perist. incrassatum, breviter reflexum, sinuosum, marginibus callo valido triangulari junctis.

Shell umbilicate, orbicular, flat, thin, shining, pale or reddish horn-colored, with rather distant rib-like striæ above, finely striated beneath; spire almost level; suture deep; whorls $5\frac{1}{2}$ –6, rather convex, regularly increasing, the last angular at the periphery, inflated below; umbilicus funnel-shaped; aperture oblique, kidney-shaped; peristome thickened, little reflected, the margins joined by a strong triangular callus.

Dimensions.—Diam. maj. $8\frac{1}{2}$, min. $7\frac{1}{2}$, alt. $3\frac{1}{2}$ mill. A small specimen measures: Diam. maj. $7\frac{1}{2}$, min. $6\frac{1}{2}$, alt. 3 mill.

Habitat.—New Orleans, (Major G. L. Febiger, U. S. A.!)

Remarks.—This species certainly differs from *H. cereolus*, Muhl., *H. septemvolva*, Say, *H. volvoxis*, Parr., and *H. Carpenteriana*, Bld., the four species of the same group hitherto found on the North American Continent.

Compared with *H. paludosa*, Pfr., of Cuba, the rib-like striæ are more regular and prominent, it is more decidedly angular at the periphery, and the form and armature of the aperture are different. In *H. Febigeri* there is no such excavation below the angle of the periphery as prevails, more or less, in the other above-named continental species. In this respect, and in the form of the aperture, *H. Febigeri* appears to be most nearly allied to *H. microdonta*, Desh., of Bermuda and New Providence, but it is more coarsely striated, and the last whorl is more inflated below.

I am indebted for specimens of *H. Febigeri* to Mr. Isaac Lea, who sent them, believing the species to be new. Many examples were collected and forwarded to Mr. Lea by his nephew, Major Febiger, who has long been interested in the land shells of the United States, and to whom I dedicate the species.

SUCCINEA HIGGINSI, nov. sp.—Plate 17, fig. 24.

T. depresso-ovata, tenuis, oblique striata, pellucida, nitidula, pallide cornea; spira brevis, obtusa; sutura profunda; anfr. 3, convexi, ultimus depressiusculus; columella vix arcuata, superne conspicue plicata; apertura angulato-ovalis, dente parvo, obliquo, albo, in pariete aperturali sæpe armata; perist. simplex, regulariter arcuatum.

Shell depressed-oval, thin, obliquely striated, pellucid, somewhat shining, pale horn-colored; spire short, obtuse; suture deep; whorls 3, convex, the last rather depressed; the columella scarcely arched, above conspicuously plicate; aperture angularly oval, frequently armed with a small, oblique, white tooth on the parietal wall; peristome simple, regularly arcuate.

Dimensions.—Long. 15, diam. 7 mill.; aper. 11 mill. longa, medio 5 lata; anfr. ult. fere 14 mill. longus.

Habitat.—Put in Bay Island, Lake Erie, (Frank Higgins!)

Remarks.—This species is allied to *S. Salleana*, Pfr., *S. Haydeni*, W. G. Binn., and especially to *S. ovalis*, Gould, non Say. Compared with the latter, the last whorl is less convex, the aperture is more angular above, the columella less arcuate, and more distinctly plicate.

The measurements given are of one of the largest specimens. This is the only North American species in which I have noticed the parietal tooth mentioned in the description. Three of my specimens have this tooth,—it is lamelliform, about 1 mill. in length at the base, the pointed apex having an elevation of about $\frac{1}{2}$ mill.

TV, No 4. 1868.

NOTES ON THE LAND-SHELLS OF TRINIDAD, GRENADA
AND DOMINICA, AND ALSO OF CURAÇAO AND BUEN
AYRE, W. I.

BY THOMAS BLAND.

Since the publication of my Catalogue of Land-Shells of the West Indies, (Ann. Lyc., vii, 1861) our knowledge of the faunas of Trinidad, Grenada and Dominica has been greatly extended by Mr. R. J. Lechmere Guppy, with whom I have the pleasure of corresponding, and to whose liberality I am indebted for numerous specimens.

Guppy made known the results of his labors in the Annals and Magazine of Natural History (1864, 1866 and 1868), and in the Proceedings of the Scientific Association of Trinidad, (1866, 1867). Considering some of his determinations erroneous, it seems to me desirable that my notes should be published, especially as correct conclusions regarding the species have an important bearing on the question of geographical distribution. I am moreover glad to make more generally known the very valuable data which Mr. Guppy has collected.

In former papers on the geographical distribution of species in America and the West Indies (Annals of the Lyceum, l. c., and American Journal of Conchology, ii, 1866), I remarked on the connection of those continental and insular faunas, and showed conclusively the closer relations of the sub-provinces embracing Cuba, Jamaica and Hayti with North America, and of the Porto Rico and Guadeloupe sub-provinces (Trinidad, Grenada and Dominica being included in the last), the latter especially, with South America, and the discoveries of Guppy give further evidence in support of my views.

Guppy justly remarks with respect to the molluscan fauna of Dominica, that its general aspect "is precisely what we might have expected from its position between the islands of Guadeloupe and Martinique."

The occurrence of a species of *Cyclophorus* in Dominica is very

interesting, considering that two species belong to Guadeloupe and four to Martinique, but none to the other islands. Several species inhabit Mexico, Central and South America, but the genus has its greatest development in India. The discovery of a species of *Diplommatina*, also of Asiatic type, in Trinidad, and of an Indian species of *Ennea* in that island, Grenada, and St. Thomas, is remarkable, but they have, in my opinion, most probably been introduced.*

The relations of the faunas of Grenada and Trinidad are very striking,—indeed, from St. Kitts and Antigua to Trinidad, the same fauna unquestionably prevails.

Guppy's writings† contain much new information on the lingual dentition of West Indian species, to which, on the present occasion, I can only incidentally refer. His papers on the Tertiary Formations of the West Indies (Quar. Jour. Geo. Soc., 1866-7) should also be mentioned as extremely valuable contributions to science.

TRINIDAD.

1. DIPLOMMATINA HUTTONI, Pfeiffer.

Near the Maracas Waterfall.‡ Gill, Guppy. Also India.

I sent one of Gill's specimens to Pfeiffer, who returned it with label,—“It seems, indeed, to be a *Diplommatina*, very like *D. Huttoni*.” As Guppy remarks, there is scarcely yet absolute certainty that the Trinidad and Indian shells are identical, but I believe them to be so.

2. CYCLOTUS TRANSLUCIDUS, Sowerby.

Among dead leaves in forests, on calcareous soils. Abundant on one of the Cotoras Islets, and near Savana Grande, more sparingly in many other districts. Gill, Guppy. Also Venezuela.

* For an interesting account of the curious affinities of certain fossil Helices found in Algeria, with species now living in Guadeloupe and Martinique. I refer to a paper by M. Crosse, in the Jour. de Conch. 3 ser. ii, 153, 1862.

† See “On the Lingual Dentition of some West Indian Gasteropoda,” by R. J. Lechmere Guppy and Jabez Hogg. Linn. Trans., xxvi. Some of the figures illustrating this paper appear to me quite unsatisfactory. In justice to Mr. Guppy, I should mention that he tells me,—“I regret to say that the artist has altogether misinterpreted the structure of some of the dental bands, and the paper should have had twice as many figures to render it of any value. I hope that I may be able to rectify this at a future time.”

‡ All the information as to the station and particular habitats of the species are given on the authority of Guppy. Prof. Theodore Gill collected in Trinidad in 1858.

Guppy described this (Ann. and Mag., 1864,) as *Trinitensis*, but corrected the error in 1866.

3. *CYCLOTUS RUGATUS*, Guppy. Ann. and Mag., xiv, 1864.

Northern range of hills, where it is found up to 2,000 feet. Guppy. One dead and imperfect specimen was collected by Gill.

4. *CISTULA (ADAMSIELLA) ARIPENSIS*, Guppy. Ann. and Mag., xiv, 1864.

On the Cerros of Aripo, at a height of 2,000—2,500 feet, where it lives amongst the dead leaves in the forest. Guppy. Guppy described this as an *Adamsiella*, but the operculum is decidedly calcareous, and I refer it to *Cistula*. In form, size and general aspect, this species is allied to the Mexican *Chondropoma Cordovanum*, Pfeiffer. Guppy remarks:—"It differs very considerably from any other *Adamsiella* that I have seen, and approaches *Cyclostomus* in many of its characters."

5. *HELICINA NEMORALIS*, Guppy. Ann. and Mag., xvii, 1866.

On the leaves of trees in the forests. Guppy.

Guppy originally described this as *H. zonata* (Ann. and Mag., xiv, 1864), but finding the name pre-occupied, adopted that of *nemoralis*. The species belongs to the globose-turbinata group of the Mexican fauna.

6. *HELICINA DYSONI*, Pfeiffer.

Found on all parts of the island where the ground is somewhat open; it rarely occurs in the forest. Gill, Guppy. Also Honduras.

Guppy described this (Ann. and Mag., xiv, 1864) as *H. barbata*, and subsequently referred to its close relation with *H. Dysoni*, with which Pfeiffer pronounced specimens, collected by Gill, to be identical.

7. *HELICINA LAMELLOSA*, Guppy. Ann. and Mag., xix.

Found at the Cotoras Islets. Guppy.

This pretty species is allied to *H. lirata*, Pfr., of Mexico. Guppy provisionally constitutes the new subgenus *Perenna* for this shell.

8. *HELICINA IGNICOMA*, Guppy. Ann. and Mag., June, 1868.

Mountains of Aripo, Guppy.

9. *STENOPUS LIVIDUS?* Guilding. (Zool. Jour., iii, p. 528, t., suppl. 27, f. 1-3.)

Trinidad. Gill.

Pfeiffer refers to this species as from Trinidad, on the authority of Gill, in Mon., v, 86, (1868.) See my remarks on the species following.

10. *CONULUS VACANS*, Guppy. Ann. and Mag., xvii, 1866.

Lives on epiphytal orchids, and also on the roots and stems of ferns. It is not a common species; occurred near Port-of-Spain and at San Fernando; also in the island of Grenada. Guppy.

The following is the author's description:

"Shell small, trochiform, depressed, sub-perforate, thin, fragile, pellucid, shining, brownish horn-colored; whorls 5, carinate, flattened and obliquely striate above, closely covered with fine, longitudinal, rather wavy striæ, visible under a lens, and most distinct on the polished under surface; spire conoidal; aperture lunate; peristome simple, acute; columellar margin slightly reflected; greatest diameter, 0.18 inch; height, 0.12 inch. (Height, $2\frac{1}{2}$ mill; diam., 4 mill. Guppy.)

The *animal* has four stout tentacles. Mantle filling the aperture and projecting, but not reflected over any part of the shell. Foot narrow, truncate, with a small retractile appendage on the truncate tail. ♂ organ stout, on the right side, below and a little behind the upper part of tentacles. The foot has a median band separated by a fine line or groove from the lateral portions on each side. Lingual teeth about 30, 5, 0, 5, 30, broad, subequal; central obsolete; first five laterals symmetrical, with a larger rounded cusp having a smaller cusp of similar shape on each side; outer laterals bicuspid, resembling the teeth of *Testacellus*."

Guppy adds that the animal is viviparous; in the wet seasons individuals are found containing ten or twelve young in different stages.

I received specimens from Guppy under the name *C. vacans*, none of which are adult; the largest with four whorls, not carinated, and very like *H. Gundlachi*, Pfr. In reply to my remark to that effect, Guppy writes, "I am quite sure that the shells sent to you as *Conulus vacans* were that species; when young they very much resemble *C. Gundlachi*."

Gill collected several dead specimens of a small carinated shell which may possibly be of Guppy's species. I sent an adult to Pfeiffer, who returned it with label "*Stenopus lividus*, Guild.?" It agrees rather closely with Guppy's description and Guilding's figure; has five whorls, being a dead shell, is not "pellucid shining," but has a deciduous epidermis, on which are microscopic spiral lines; the periphery is sharply carinated, sensibly modify-

ing the form of the aperture. In his last paper (Ann. and Mag. June, 1868), Guppy observes as follows:

“It has been suggested to me that *Conulus vacans*, which I described as occurring in Trinidad, is possibly the same as *Stenopus lividus* of Guilding. I had, however, made a careful comparison of Guilding’s figure, and it seemed to me that the two were distinct, although there can be little doubt that both mollusks belong to the same group. I venture to think, however, that, in view of their affinities, the name *Conulus* is the proper one for the group. The name *Stenopus* cannot be allowed to stand, having been preoccupied for a crustacean. Such shells as *Conulus semen-lini* and *C. Gundlachi* are evidently not separable from the present group. The mucus-pore and retractile appendage on the truncate tail are found in the genus *Nanina*, and also in *Zonites* (as described in ‘Die Heliceen’ of Albers); and *Conulus vacans* has also the median part of the foot defined as in *Nanina* (e. g. *Helicarion Freycineti*). I think, therefore, that the best classification will be to refer to *Zonites* all those species (of the group now under consideration) in which a caudal appendage exists. *Conulus* will thus form a section of *Zonites*, comprising the minutely perforated trochiform species. To the group *Ægopsis* will be assigned those species having shells like *Stenopus cruentatus*, Guild., *S. Guildingi*, Bland, and *Helix nitensoides*, D’Orb. The genus *Hyalina* will then consist of the species such as *H. cellaria* and *H. nitens*, which have no caudal appendage.”

I do not concur with the above suggestions as to classification; but time and space do not permit me to discuss them. I must, however, remark that there is no evidence, so far as I know, of the existence of a caudal appendage in *C. Gundlachi*. In the allied shell *C. fulva* it does not occur.

Mörch (Jour. de Conch. 3 ser. vii, 256 (1867), with reference to the resemblance of the teeth of *Conulus vacans*, as represented by Guppy, to those of *Testacella*, proposes to establish the genus *Guppya*.

11. STENOPUS GUILDINGI, Bland. Ann. Lyc. viii, 1865.

Heights of Aripo, 2000 to 2700 feet.—Guppy. Also Porto Cabello, Venezuela, R. Swift.

Guppy refers shells found in Trinidad (at the above locality only) to this species, which he puts in the genus *Zonites*, but he admits having had no opportunity to examine the animal. He remarks, “this shell is so like *Hyalina cellaria*, Müll., that, were a dozen examples of each mixed together, it would be difficult to assort them.” This comparison is so much at variance with my

views that I doubt the determination of the Trinidad shell, specimens of which I have not seen. In *S. Guildingi* the perforation is much smaller than in *H. cellaria*, the shell is more depressed, its color and texture different, the number of whorls fewer, and the aperture more rounded.

12. ZONITES IMPLICANS, Guppy. Ann. and Mag. June, 1868.

13. ZONITES UMBRATILIS, Guppy. Ann. and Mag. June, 1868.

Guppy observes that this and *Z. implicans* may, upon examination of the soft parts, prove not to have caudal appendages, and will then be referrible to *Hyalina*, not to *Zonites*.

14. HELIX BACTRICOLA, Guppy. Ann. and Mag. June, 1868.

Mountains of Aripo.—Guppy.

15. STREPTAXIS DEFORMIS, Férussac.

On trees and on the ground in the woods. Not very abundant, but may be found on the Laventille Hills, especially on limestone ridges. It also occurs on the Cotoras and other islands in the Gulf of Paria.—Gill, Guppy. Also in Venezuela and Guiana.

16. ENNEA BICOLOR, Hutton.

In the crevices of rocks near streams, in the neighbourhood of Port-of-Spain.—Gill, Guppy. Occurs also in the islands of Grenada and St. Thomas, and in India.

17. BULIMUS (PLEKOCHEILUS) AURIS-SCIURI, Guppy. Ann. and Mag. Jan., 1866.

Found on trees in many parts of the island.—Gill, Guppy.

In the Proceedings of the Scientific Association of Trinidad, Dec., 1866, Guppy observes that having seen specimens of *B. glaber* from Brazil closely approaching the Trinidad species, he found difficulty in separating them, and left the question of identity open. I am disposed to consider the species distinct.

18. BULIMUS OBLONGUS, Müller.

Found in many parts of the island; abundantly on pieces of land allowed to run into bush in the town of Port-of-Spain.—Gill, Guppy. It occurs also in St. Vincent and Barbados, and is widely distributed in South America.

19. BULIMUS VINCENTINUS, Pfeiffer.

Synonymy.

- Bulimus Vincentinus*, Pf., Proc. Zool. Soc. 1846. Mon. ii, 103.
 “ *multifasciatus*, Guppy, Ann. and Mag. N. H. Jan.,
 1866. Proc. Sci. Ass. Trinidad, Dec., 1866 (not of
 Lamarck).
 “ *immaculatus*, Guppy, Ann. and Mag. l. c. Proc. Sci.
 Ass. l. c. (not of C. B. Adams.)

The banded form (*B. multifasciatus*, Guppy) lives on trees, and is found throughout the colony, being perhaps more common at Monos Island.—Gill, Guppy. The yellowish-white bandless variety, Pfeiffer's var. β (*B. immaculatus*, Guppy), is found on the tops of trees in the forests, over a great part of the island. It is very abundant in some localities, particularly in some gardens at Port-of-Spain.—Gill, Guppy.

Guppy entirely misapprehends this and the species to which he refers the two forms. Specimens of both, collected in Trinidad by Gill, were submitted by me to Pfeiffer in 1865, labelled “*B. Vincentinus* ? Pfr. ;” he returned them with the following note: “I cannot compare the type, but think it is the same species.” The specimens collected both by Gill and Guppy agree in every respect with Pfeiffer's description, and are certainly entirely distinct from *B. multifasciatus*, Lam., and *B. immaculatus*, C. B. Adams,—the latter, so far as I know, peculiar to Jamaica. Pfeiffer gives St. Vincent as habitat of the type, and Venezuela of var. β .

Guppy (Ann. and Mag. June, 1868) says, “the shell identified by me with *B. immaculatus*, Reeve,* seems probably not to be that species, but an uncolored variety of the Trinidad form of *B. multifasciatus* determined to be *B. Vincentinus*, Pfr. ;” but, as I have already stated, the two last named species are distinct.

Reeve's figures (Conch. Icon., pl. lv, No. 366), especially of the typical banded form, faithfully represent the species. He remarks that the locality assigned to it in the name given by Pfeiffer is somewhat doubtful. I do not believe that the species occurs in St. Vincent.

20. *BULIMUS MULTIFASCIATUS*, Lamarck.

Gill brought one specimen (var. β , Pfr. Mon. ii, 168) from Trinidad, and I have lately received one, with two young shells of *B. Vincentinus*, from Guppy, the three labelled with Lamarck's name. The young shells of the effuse-lipped *Bulimi* (such as *B.*

* Reeve first published a description of this species. Adams had previously distributed specimens under the name which Reeve adopted.

Vincentinus) can readily be distinguished by the greater length and proportionate narrowness of the aperture.

B. multifasciatus occurs in Martinique, and also in St. Kitts. Mr. Rawson, Governor of the Bahamas, recently sent to me two specimens attributed to Crooked Island, and among shells collected by the late Dr. Bryant at Inagua, I found one broken example. In St. Kitts there is a yellow variety, with scarcely a perceptible trace of bands. The species is also found in South America. Reeve's figure (Conch. Icon., pl. xlvi, No. 295) of this species is a good one of the typical (banded) form.

21. BULIMUS. Sp. undet.

Guppy (Ann. and Mag., Jan'y, 1866) thus described this as *B. multifasciatus*, Lam., var. *imperfectus*:—

Shell subperforate, oblong conic, thin, fragile, subpellucid, shining, striated by fine longitudinal lines of growth, and zoned with five chestnut bands, of which the fourth is the broadest, and the second the smallest; whorls 5-6, scarcely convex; peristome simple, acute. Height, 0.6 inch; breadth, 0.3 inch; height of aperture, 0.25 inch.

He remarks, "this variety is much like the young of the typical form. Its peristome is more complete than in the young shell of the type, but never expanded as in the adult. In the Southern parts of the island, where this variety occurs, I have never met with a single example of the type form." Guppy, in using the expressions "typical form" and "type," refers to the species which I consider to be *B. Vincentinus*, Pfr.

This shell, with nearly six whorls, and little more than half the size of *B. multifasciatus*, Lam., can scarcely be considered as a variety of that species. It is totally distinct from *H. Vincentinus*.

In general form it is like, but less ventricose than *B. nigri-lineatus*, Reeve, (Conch. Icon. No. 567), of which no habitat is given.

22. BULIMUS AUREOLUS, Guppy. Ann. and Mag., Jan'y, 1866.

A rare species, of which a few examples had been found on trees at Savana Grande only. Guppy.

I have not seen any specimen of this shell.

23. BULIMUS TENUISSIMUS, Férussac.

Found amongst decaying wood and leaves. Gill, Guppy. Occurs also in South America.

Guppy (Ann. and Mag., l. c.) refers this, as I did in my Catalogue, (Ann. Lyc., vii, 1861), to *B. fraterculus*, Fér. Speci-

mens collected by Gill were submitted by me to Pfeiffer, who determined them to be *B. tenuissimus*.

24. SPIRAXIS SIMPLEX, Guppy. Ann. and Mag., June, 1868.

I have not seen this species.

25. ORTHALICUS UNDATUS, Brug.

Widely distributed in Trinidad. Gill, Guppy. Also in Jamaica, Florida, &c.

Guppy (Ann. and Mag., l. c.) calls this shell *B. zebra*, Müll., considering that species and *O. undatus* to be the same, the former name having priority. Shuttleworth (Notit. Malac. i, 1856) separates them, and his views have been adopted by Pfeiffer, (Mon. iv, 1859.) The apical whorl in the Trinidad shells (and also in the Florida specimens) is of a dark purplish brown color. Shuttleworth describes the apex of *O. zebra* as immaculate.

26. STENOGYRA OCTONA, Chemnitz.

Commonly found in the cultivated ground, and among decaying wood and leaves. Gill, Guppy.

Widely distributed in the West Indies and South America.

27. STENOGYRA PLICATELLA, Guppy. Ann. and Mag., June, 1868.

In the same situations as *S. octona*, but not so common. Guppy. Also in Grenada. Guppy.

Under this name Guppy describes three forms, which in his previous publications he referred to *S. octonoides*, C. B. Ad. There appear to me to be two species—*S. subula*, Pfr., and *S. octonoides*, ? C. B. Ad.

28. STENOGYRA CARACCASENSIS, Reeve.

Found with the two preceding species. Gill, Guppy.

Occurs also in Barbados, Grenada, Guadeloupe and Haiti, and in Mexico and South America.

29. STENOGYRA CORONATA, Guppy. Ann. and Mag., June, 1868.

“Allied to *Melaniella gracillima*, Pfr.” I have not seen this species.

30. LEPTINARIA (TORNATELLINA) BLANDIANA, Pfr., Mal. Blatt., 1867.

Viviparous. Found chiefly among decaying wood and vegetable matter, particularly in some gardens at Port-of-Spain; also on the tops of trees in the forests over a great part of the island. Gill, Guppy.

Guppy considered this (Ann. and Mag., 1866) to be *T. lamellata*, Pot. and Mich., considering that species to be identical with *L. antillarum*, Shuttl. Shuttleworth (Diagn. n. Moll. No. 6) referred var. β , *Gracilior*, *lamella validiore* of his species, with doubt, to that of Pot. and Mich. I sent specimens collected by Gill to Pfeiffer, who described the species under the above name.

31. VERTIGO (PUPA) EYRIESI, Drouet, Moll. Guy. Franc. p. 71, pl. 2. f. 16-17 (1859).

Two examples found on ferns at San Fernando. Guppy. Also in French Guiana.

A single broken specimen, apparently of this species, was collected by Gill.

32. PUPA UVULIFERA, Guppy. Ann. and Mag., June, 1868.

33. PUPA AURIFORMIS, Guppy. Ann. and Mag., l. c.

34. CYLINDRELLA TRINITARIA, Pfr. Mal. Blatt. 1860, p. 213, plate ii, fig. 4-7.

The steep and overhanging sides of the small rocks of rugged limestone in the woods on the Laventille Hills, near Port-of-Spain, are frequently decorated with dozens of these little shells, attached by their apertures to the rock. Gill, Guppy.

Specimens collected by Gill, sent by me to Poey, were forwarded by him to Pfeiffer, who described the species.

I lately published some notes (Annals, viii, 170, 1868) on the lingual dentition of *Cylindrella*, and repeated the frequently made statement that it has no jaw. The discovery of a jaw in the large Mexican forms induced Crosse & Fischer (Jour. de Conch., January, 1868) to establish the genus *Eucalodium*. Having very recently received, from my valued correspondents Vendryes and Gloyne, specimens of several species of *Cylindrella* from Jamaica, with the animals preserved in glycerine, I examined them with great care, and to my extreme surprise found a jaw, allied in structure to that of *Macroceramus* (Annals, viii, 162, fig. 5; ix, 84, fig. 4), in *C. rosea*, *sanguinea*, *brevis*, *Maugeri*, *gracilis*, and *elongata*. I have detected the jaw, of similar character, also in *C. Bahamensis* of New Providence, *C. scava*, *Ellioti* and *Brooksiana* of Cuba, and in *C. Trinitaria*.

The jaw of *C. Trinitaria* is—and the same may be said of those of the other species—of a texture so extremely thin and delicate that it may almost be described as membranaceous rather than horny. It is transparent, pale yellow, arcuate, composed of numerous plates disposed in the same manner as in

the jaw of *Macroceramus*, the overlapping edges of the plates having the appearance of costæ, between which are a few fine longitudinal striæ. The terminations of the plates produce irregular, ill-defined denticulations at the cutting margin.



The annexed figures, for which I am indebted to Edward S. Morse, represent the jaw and teeth of *C. Trinitaria*. The formula of the lingual dentition is 5—2—1—2—5 × 110. The figure given by Guppy and Hogg (Trans. Linn. Soc. xxvi, tab. 11, fig. 12) is quite unintelligible.

35. *SIMPULOPSIS CORRUGATUS*, Gup. Ann. and Mag., Jan., 1866.

Jaw and lingual dentition of *C. Trinitaria*, Pfr.
a. Side view of lateral.

Occurs in the forest near Savana Grande. Guppy.

This species is described as being nearest to, but less Succinea-shaped than *S. Brasiliensis*. The aperture more nearly orbicular, and the ribs larger than in *S. rufovirens*.

36. *SUCCINEA MARGARITA*, Pfeiffer.

Trinidad. Gill. Also, (fide Pfeiffer) in Haiti and Bermuda.

I sent specimens collected by Gill to Pfeiffer, who determined them to be *S. margarita*, var. *major*.

37. *SUCCINEA CUVIERI*, ? Guilding.

One specimen collected by Gill was thus labelled by Pfeiffer.

38. *SUCCINEA APPROXIMANS*, Shuttleworth. Diagn., n. Moll., No. 6.

Found on the ground in damp places in most parts of the island. Guppy.

As to this determination I am not certain. Some specimens received from Guppy, as he admits, are not distinguishable from *S. margarita*.

• GRENADA.

1. *CYCLOTUS GRANADENSIS*, Shuttleworth.

Grenada. Newcomb, Guppy.

I received specimens of this from Dr. Wesley Newcomb in 1855, and forwarded one to Shuttleworth. It is allied to *C. ru-*

gatus, Guppy. Shuttleworth remarks: "differt a *C. asperulo* Sow., cui sculptura persimilis, testa magis elevata, anfr. convexioribus et colore."

2. *HELICINA HEATEI*, Pfr.

Guppy did not collect this species, which is allied to *H. occidentalis*, Guild., of St. Vincent.

3. *HELICINA MINUTISSIMA*, Newcomb, M. S.

I received one specimen in 1855, from Newcomb, and sent it to Shuttleworth, who did not return it and expressed no opinion about it.

4. *CONULUS VACANS*, Guppy.

I refer to my remarks on this species in the list of Trinidad shells.

5. *HELIX DIMINUTA*, C. B. Adams.

Jamaica.—C. B. Adams. Grenada.—Guppy.

6. *HELIX PERPLEXA*, Férussac.

This was not found by Guppy. It occurs also in the Grenadines. Pfeiffer (Mon. v, 319) erroneously refers this species to Trinidad.

7. *ENNEA BICOLOR*, Hutton.

Grenada.—Guppy.

8. *BULIMUS GLABER*, Gmelin.

Grenada.—Newcomb, Guppy.

Guppy remarks (Ann. and Mag. June, 1868), "this differs from the Trinidad shell described by me as *P. auris-sciuri* in its greater solidity and more ventricose figure, and in being less impressed in the middle of the last whorl. Its lip is thicker, and its columellar tooth more prominent. In all these respects, except the compression of the last whorl, it agrees better with the Brazilian *P. glaber* than the Trinidad form."

9. *BULIMULUS INDISTINCTUS*, Guppy. Ann. and Mag., l. c.

Guppy describes this as probably nearest to *B. tenuissimus*, Fér., and *B. sepulcralis*, Poey. It is larger, he says, than either of those species, and approaches *B. liliaceus* in some respects.

10. *STENOGYRA OCTONA*, Chem.

11. STENOGYRA PLICATELLA, Guppy.

Guppy refers to his description in the Trinidad list, adding that the Grenada specimens are intermediate between the Trinidad vars. *a* and *γ*. He adds that they were probably included in my Catalogue as *St. subula*, Pfr. Gill collected in Grenada shells which I considered to be *S. subula* and *octonoides*.

12. STENOGYRA CARACCASENSIS, Reeve.

Grenada.—Gill, Guppy.

13. LEPTINARIA FUNCKI, Pfeiffer.

Grenada.—Newcomb, Guppy.

Guppy (Ann. and Mag. l. c.) remarks: "The Grenada shell to which the name *Tornatellina Funcki* is applied in Bland's list (1861) is identical with the form from Trinidad, which has recently been described by Dr. Pfeiffer as *T. Blandiana*, and which I refer to the *P. lamellata* of Pot. and Mich."

I sent the specimens received from Newcomb to Shuttleworth, who considered it to be *L. Funcki*, and remarked that it is less acuminate and the striæ stronger than in *L. Antillarum*.

14. SUCCINEA APPROXIMANS, Shuttleworth.

This is the same species as is enumerated by Guppy under this name in his Trinidad list. I have specimens collected by Gill.

DOMINICA.

Guppy (Ann. and Mag., June, 1868) gives the following interesting introductory remarks to the list of terrestrial mollusks collected by him in this island:

"Dominica is, I believe, the only island in the Antilles of which no list of terrestrial mollusca has yet been published. In Mr. Bland's Catalogue, in the 'Annals of the New York Lyceum,' still the most complete list we possess of the land shells of the West Indies, it is stated that no species from Dominica were known to the author. To remedy this defect, I took advantage of a vacation to visit and explore that island, which I found to consist chiefly of mountains composed of volcanic rocks, and ranging from 2000 to 5000 feet high. This is perhaps the highest land in the chain of the West Indian Islands between Jamaica and South America.

"There is but little which may be properly called lowlands in Dominica; but on the lower slopes near the sea I found a few mollusca, chiefly *B. exilis*, *St. octona*, *Succ. approximans*, and

Helicina humilis. Ascending higher, we find *H. dentiens*, *H. badia*, *H. Josephinae*, *H. nigrescens*, *Amphibulina patula*, *B. latincinctus*, and *Helicina epistilia*. Excepting the last one, these species are found everywhere above 300 or 400 feet of elevation. The dense and excessively humid forests which cover all the higher parts of the island afford a congenial habitat to the land-snails. An ascent of Mount Kuliabon, 3000 feet high, furnished me with examples of the four *Helices* already mentioned,—*Hyalina Baudoni*, *Amphibulina pardalina*, *Cyclotus amethystinus*, and *Glandina perlucens*. On Morne Diablotin, at the north end of the island, I found *Hyalina Baudoni*, the four *Helices*, *Helicina rhodostoma*, *H. conuloides*, *H. plicatula*, *H. velutina*, *Amphibulina pardalina*, *Cyclotus amethystinus*, and *Glandina perlucens*. On the very summit of this mountain, stated to be 5314 feet high, I collected *Helix badia*, *H. Josephinae*, and *Helicina conuloides*. *Amphibulina pardalina* is another species fond of the thickly wooded heights; but several of the mollusca (e. g. *Helicina rhodostoma* and *Cyclotus amethystinus*) appeared to cease at about 3300 feet.”

1. CYCLOPHORUS (CYCLOTUS) AMETHYSTINUS, Guppy. Ann. and Mag., 1868.

Guppy describes this as a *Cyclotus*, but unquestionably it must be referred to *Cyclophorus*, considering the character of the operculum, which he says is “horny, diaphanous.” He remarks: “This is a notable species, owing to its operculum, which departs widely from that usual in this genus (*Cyclotus*). In no specimen did it present the least approach to the shelly consistency of the opercula of most *Cycloti*.”

2. HELICINA PLICATULA, Pfeiffer.

Also in Martinique.

3. HELICINA EPISTILIA, Guppy. Ann. and Mag., l. c.
4. HELICINA HUMILIS, Guppy. Ann. and Mag., l. c.

The pubescence in this is much the same as in *H. velutina*, and both are allied to *H. Antillarum* rather than to *H. subfusca*.

5. HELICINA VELUTINA, Guppy. Ann. and Mag., l. c.
6. HELICINA RHODOSTOMA, Gray.

Also in Guadeloupe.

7. HELICINA CONULOIDES, Guppy. Ann. and Mag., l. c.
8. HYALINA BAUDONI, Petit.

Also in Guadeloupe.

This species is very closely allied to, if not identical with the *H. concolor*, Fér., of Porto Rico.

9. *HELIX JOSEPHINÆ*, Férussac.

Also in Guadeloupe; is semi-fossil in Antigua.—Rev. A. Hamilton.

10. *HELIX DENTIENS*, Férussac.

Also in Guadeloupe, Martinique, and Cayenne.

11. *HELIX BADIA*, Férussac.

Also in Guadeloupe, Martinique, and Cayenne.

12. *HELIX NIGRESCENS*, Wood.

Also in Martinique.

13. *BULIMUS VIRGINALIS*, Pfeiffer.

I received specimens from Dominica from the Rev. A. Hamilton, which were determined by Pfeiffer. It occurs also in Venezuela, near Caraccas.

14. *BULIMULUS LATICINCTUS*, Guppy, Ann. and Mag. l. c.

15. *BULIMULUS EXILIS*, Gmelin.

Widely distributed in the West Indies, but does not occur in Cuba or Jamaica.

16. *BULIMULUS STENOGRŌIDES*, Guppy, Ann. and Mag. l. c.

17. *STENOGYRA OCTONA*, Chemnitz.

18. *GLANDINA PERLUCENS*, Guppy, Ann. and Mag. l. c.

19. *AMPHIBULINA PATULA*, Brug.

Also in St. Kitts, and Guadeloupe.

The Dominica specimens are more distinctly corrugated than those from St. Kitts.

20. *AMPHIBULINA PARDALINA*, Guppy, Ann. and Mag. l. c.

This beautiful species is evidently allied to if not, as Guppy suspects, identical with *A. tigrina*, Lesueur, which is said to inhabit St. Vincent.

21. *SUCCINEA APPROXIMANS*, Shuttleworth.

CURACAO.

1. *TUDORA MEGACHEILA*, Pot. and Mich.

2. *BULIMUS ELONGATUS*, Bolton.

3. *BULIMUS TORALLYI*, D'Orb., var. *B. sisalensis*, Morelet.

In the summer of 1867 I noticed, in the cabinet of Mr. Robert Swift, (then of Philadelphia, but now of St. Thomas, W. I.), a number of shells somewhat closely allied to, but certainly distinct from, *B. elongatus*. I sent specimens to M. Crosse, who submitted them to Dr. Pfeiffer, by whom they were considered to be *B. sisalensis*, Mor., treated by Pfeiffer as var. of *B. Torallyi*. The determination appears to me somewhat doubtful, but I here record it.

4. *STROPHIA* (PUPA) UVA, L.

I have opened several specimens, and in one nearly adult example found several lamelliform teeth, one on the floor of the tenth whorl (reckoning from the apex,) with another immediately above. In the preceding whorl, four of such teeth, two below and two above. The young shell is not umbilicated.

Helix pentodon, Menke, has been referred to Curaçao on the authority of Cuming, (Pfr. Mon. iv.) but it is apprehended without sufficient evidence. Dr. v. Martens (Malak. Blat. vi. p. 209, 1859), suggested that Menke's shell is in fact the young of some species of *Pupa*. Sometime since I forwarded a number of shells from the Bahamas to Dr. Pfeiffer, and among them young and adult specimens of a species from Duck Key, described by him as *P. Milleri*, (Malak. Blat., 1867, p. 129, and Novitates, iii. 365, No. 491, tab. lxxxiv, fig. 6-13). Dr. Pfeiffer writes me, "An object of great interest were the young specimens of *Pupa Milleri*; I believe that *Helix pentodon*, Menke, already designated by v. Martens as a young *Pupa*, belongs to this species, although I cannot compare with the types of that species." See also Pfeiffer in Mon. v, 219, 1868.

BUEN-AYRE (BONAIRE).

1. *TUDORA VERSICOLOR*, Pfr.

The habitat of this pretty and variable species has not been hitherto published. I have lately received a great number of living specimens from Mr. R. Swift, which came from this island. In my catalogue (1861) I referred it doubtfully to Jamaica, on the authority of the late Mr. McMurray.

2. *BULIMUS ELONGATUS*, Bolton.

*Additional Notes on the Geographical Distribution of Land Shells
in the West Indies.*

BY THOMAS BLAND.

Reprinted from the Annals of the Lyceum of Natural History, Vol. IX., June, 1869.

IN various papers (Annals VII., 1861, with Catalogue of Species and Amer. Jour. of Conch, II., 1866, and IV., 1868) I have discussed the subject of the Geographical Distribution of the West Indian terrestrial Mollusca, and shown that the Islands, considering the facts of such distribution, may be divided into five sub-provinces, the whole group, in a general sense, being treated as one zoological province. For the sake of brevity, I may refer to the sub-provinces as those of Cuba, Jamaica, Haiti, Porto Rico, and Guadeloupe; with respect to several of which I now offer some additional information.

CUBA.—This sub-province includes the Isle of Pines, the Bahamas, Turk's Island and Bermudas. An amazing number of species have been discovered in Cuba since 1861, and also in the Bahamas. From the latter, including Turk's Island, 22 species only were enumerated in my Catalogue (1861), while between 70 and 80 are now known. The Bahamas species will be the subject of a separate paper, but I may mention that the islands on the Little and Great Bahama Banks are closely connected by their land shell faunas with Cuba, but those to windward of the latter Bank, Inagua especially, have evident relations with Haiti, to which geographically they are nearer.

HAITI.—The Island of Navassa, situate 33 miles S.W. from Haiti and 72 E. from Jamaica, belongs to this sub-province. We are indebted to Mr. Eugene Gaussoin for three species described by Tryon (Amer. Jour. Conch. II., 1866) viz. :—*Helix Gaussoini*, *Chondropoma Navassense*, and *Helicina circumlineata*.

PORTO RICO.—In this section Viéque and small islands adjacent are included, and also the Virgin Islands, with Anguilla, St. Martin, and St. Bartholomew. I am now enabled to enlarge and correct the lists of species from several of the islands. The

Anegada and St. Bartholomew lists are from facts communicated by Mr. R. Swift, on the authority of Dr. P. T. Cleve of the University of Upsala, Sweden, who lately visited those islands.

ANEGADA.

Succinea. sp. indet.

Helix euclasta Shuttl. : also in Cuba.

— *notabilis* Shuttl. : not found by Dr. Cleve.

Bulimus elongatus Bolt.

— *tenuissimus* Fer. : also in Trinidad.

Pupa striatella Fer. : very abundant.

Macroceramus microdon Pfr.

— *signatus* Guild. : var. in Haiti.

Chondropoma Tortolense Pfr.

ANGUILLA.

Bulimus Anguillensis Pfr.

— *elongatus* Bolt.

— *Lehmanni* Pfr.

Pineria Schrammi Fisch. : also in Guadeloupe.

Macroceramus signatus Guild.

Cylindrella costata Guild. : also in Barbados.

Tudora pupæformis Sowb. : referred by Pfeiffer, I think erroneously, to Haiti.

Cistula lugubris Pfr. : attributed to Jamaica, from which it is not known, by Pfeiffer, who mentions the Anguilla shell, with doubt, as a variety.

ST. BARTHOLOMEW.

Succinea. sp. indet.

Helix subaquila Shuttl.

— *notabilis* Shuttl. : not found by Dr. Cleve.

Bulimus elongatus Bolt.

— *exilis* Gmel.

— *fraterculus* Fer.

— *marginatus* Say.

Stenogyra octona Chem.

Pineria Schrammi Fisch.

Choanopoma sulculosum Fer. : also sub-fossil.

The following, not in my Catalogue, belong to the different Islands named.

Helix castrensis Pfr. Porto Rico. (var. ? of *H. lima*.)

Chondropoma terebra Pfr. “

Macroceramus microdon Pfr. Viéque, Lillienkjold !

Helix marginella Gmel. Culabre, “

Bulimus elongatus Bolt. “ “ unusually fine specimens ; color of interior of aperture and columella very dark.

Choanopoma senticosum ? Shuttl. “ “

Oleacina subtilis Shuttl. in litt., St. Thomas ; allied to

O. sulculosa Pfr. of Porto Rico.

Bulimus marginatus Say, St. Croix.

Pupa pellucida Pfr., “ also Cuba and Jamaica.

Bulimus elongatus Bolt. Tortola.

Megalomastoma Antillarum Sowb. “

Chondropoma Julieni Pfr. Sombrero.

It may be remarked that the land shell fauna of the Porto Rico sub-province is distinct and its limits well defined, so much so, indeed, as to warrant the inference, that the islands comprised in it were, at a former period, more closely connected, if not united.

In connection with the Geology of Anguilla, the remarks of Professor Cope (Proc. Acad. Nat. Sci. Phila. 1868, p. 313), on the bones and teeth of a large Rodent from the cave deposits of that island, are very interesting. He thinks, “That its discovery on so small an island, with others of like character, indicated that the Caribbean continent had not been submerged prior to the close of the Post-pleiocene, and that its connection was with the other Antilles, while a wide strait separated it from the then comparatively remote shores of North America.”

Mr. Julien (Annals VIII., 251, 1866) mentions the occurrence at Sombrero of the fossil remains of land-turtles, which were referred by Prof. Jeffries Wyman to three new extinct and gigantic species similar to those of the Gallapagos Islands. (See Cope in Proc. Acad. N. S. Phila., 1868, p. 180.)

Notes on Lingual Dentition of Mollusca.

BY W. G. BINNEY AND THOMAS BLAND.

NO. I.

Reprinted from the Annals of the Lyceum of Natural History, Vol. IX., February, 1870.

THE illustrations given in this paper are from figures obtained by the use of photographic negatives in a magic lantern, and reduced by photography. The negatives were taken by our friend Mr. Sam. Powel, of Newport, R. I., to whom we are indebted for valuable aid in the study of lingual dentition.

Succinea Nuttalliana, Lea.

The specimen from which was taken the lingual membrane here figured was labelled by Mr. Lea. It was received from the Smithsonian Institution. No locality is given for the specimen,

but it was preserved in the same bottle as *Ancylus Newberryi*, *Pompholyx effusa*, *Fluminicola Nuttalliana*, and other species of the Pacific coast.

FIG. 1. *

Lingual dentition of *Succinea Nuttalliana*, Lea.

Lingual membrane broad. Teeth 19.1.19, in almost straight transverse rows. Centrals short, stout, obtusely tricuspid, the central cusp with a long acute point, attached to a quadrate plate, the upper edge of which has a central quadrangular spot of thinner texture, easily mistaken for a complete cutting away of a portion of the plate. Laterals on somewhat oblong plates which bear on their outer upper corner a small quadrangular expansion, stoutly and obtusely bicuspid, the larger cusp surmounted by a long acute point; base rounded. Uncini on plates with rounded bases and attenuated and serrated apices, irregularly denticulated.

Fig. 1, *a* shows two centrals and two laterals, with a third lateral detached; *b* and *c* show uncini from the left of the median line; *d* the eighth lateral, partly in profile.

The jaw of *Succinea Nuttalliana* has a perfectly smooth anterior surface.

Bulimulus pallidior, Sowerby.

Lingual membrane broad, with numerous nearly straight transverse rows of 40.1.40. teeth. Centrals with one long blunt

FIG. 2.

Lingual dentition of *Bulimulus pallidior*, Sowb.

median, and two obsolete, small side cusps; plate subquadrate, rounded at base, excavated at its upper margin, and with small

square, lateral expansions. Laterals much like centrals in shape, unsymmetrical, the inner side cusp being still more obsolete; base and inner side of plate forming one regular outward curve; upper edge of plate horizontal, with one lateral expansion only at its outer corner. Uncini on long, narrow, low, subquadrate plates, with one long, curving, blunt denticle, and one short blunt denticle at its outer side.

Fig. 2, *a* shows two incomplete rows of centrals and laterals; *b* one of the uncini, near the extreme lateral edge of the membrane.

The jaw has already been described (Land and Fresh-water Shells of North America, Part I., p. 196).

This species is from Lower California.

Helix tumida, Pfeiffer.

The specimen which furnished the lingual membrane here described was received from Messrs. Gloyne and Vendryes, of Kingston, Jamaica, to which Island the species belongs.

H. tumida is placed by v. Martens (Die Heliceen, 2d ed., 145) with several other Jamaica species, and *H. pemphigodes*, Pfr., of Cuba, in the subgenus *Cysticopsis* of Morch.

FIG. 3.



Lingual dentition of *Helix tumida*, Pfr.

Lingual membrane with numerous straight rows of 22.1.22 teeth. Centrals with three stout cusps, the middle one very large, on a subquadrate plate which has square lateral expansions above. Laterals of same form as centrals, but lacking the inner side cusp and inner lateral expansion. Uncini with one large and several smaller blunt cusps, attached to a long, subquadrate plate.

The figure presents one-half of one central, the first lateral, and

several uncini (the fourth, fifth, and twelfth) to show variations in their form; also the thirteenth tooth in profile.

The jaw is long, narrow, slightly arched, blunt at ends, with a slight, broad, median projection. There is a long, narrow, conical projection springing upwards from about the centre of the anterior surface of the jaw, of the same color, material, and consistency as the jaw itself. This is not the muscular attachment which often adheres to the jaw after it has been extracted. Jaw with delicate distant longitudinal striæ.

Zonites lævigata, Pfr.

(See Land and Fresh-water Shells of North America, Part I., p. 287.) The wood-cut here given was engraved from a drawing

FIG. 4.



Lingual dentition of *Zonites lævigata*, Pfr.

by Dr. Leidy, prepared for, but not published in, the "Terrestrial Mollusks of the United States." The drawing was at once recognized on our recently obtaining the lingual membrane of the species.

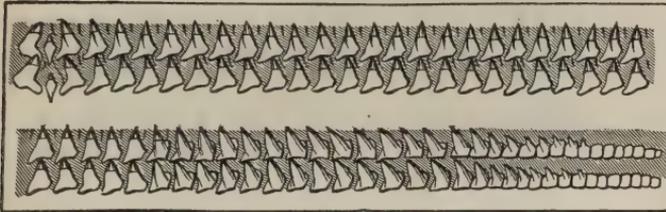
Teeth 17.1.17, arranged in curving transverse rows. Centrals short, stout, rounded at sides, square at base, apex with three short and pointed cusps, the middle one longest. Laterals long, narrow, tricuspid, the outer cusp very short and sharp, the central cusp extremely long, bulging at sides, tapering to an acute point; inner cusp almost as long as central cusp, narrow, pointed; third and fourth laterals merging into the uncini, which are aculeate, as common to the genera *Zonites* and *Hyalina*. The centrals are on a long, narrow plate, whose four sides curve rapidly inwards. The laterals are on plates long, narrow, curving outwards in an arcuate manner.

An extremely instructive lingual, showing the merging of laterals into uncini more completely than in any we have previously examined.

Veronicella Floridaana, Binney.

(Terr. Moll. U. S., II., p. 17.) On p. 306 of Land and Fresh-water Shells of North America, Part I., we figured the lingual

FIG. 5.



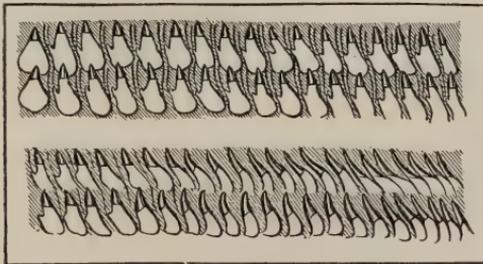
Lingual dentition of *Veronicella Floridaana*, Bin.

dentition of this species, as drawn by Mr. Morse. We now give a figure drawn by Dr. Leidy for the "Terrestrial Mollusks of the United States," but not included in that work. The details of the separate teeth are much more accurately shown in the new figure. It will be noticed that Dr. Leidy gives 58.1.58 teeth, Mr. Morse 41.1.41, and our text (p. 304) 48.1.48.

Limax flavus, Linn.

A figure of the lingual dentition of this species, drawn by Dr. Leidy, is also given, for comparison with that of Mr. Morse, on

FIG. 6.



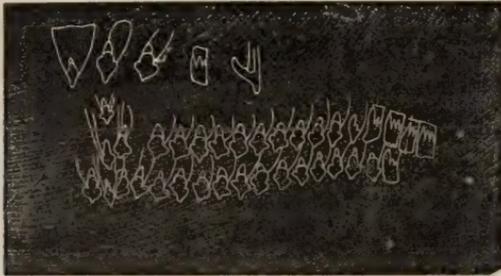
Lingual dentition of *Limax flavus*, L.

p. 63 of Land and Fresh-water Shells, Part I. Here also the number of teeth varies, as in *Veronicella Floridaana*, described above.

Melampus bidentatus, Say.

The specimen which furnished the lingual membrane figured was collected at Newport, R. I., by Mr. Sam. Powel.

FIG. 7.

Lingual dentition of *Melampus bidentatus*, Say.

Lingual membrane broad. Teeth 33.1.33. Centrals small, upright, with rounding base and bulging sides, reminding one somewhat of the ace of clubs, its apex elongated, terminating in a distinct, acute denticle; this central is attached to a very large triangular plate, greatly expanded above. Laterals uniform, larger than the centrals, of the same shape, but less symmetrical, and with a much more extended and narrower basal projection; these laterals are perpendicular, but are attached to obliquely curving plates, long and narrow, each plate being detached. There are about thirteen of these laterals, in almost straight horizontal lines, on both sides of the median line. The uncini change abruptly from the laterals, are in oblique rows, are attached to upright, oblong plates, square at top and base, diminishing as they pass off laterally; the uncini are rather square, their broad, simple apices are armed with three strong denticles, the inner denticle being the largest.

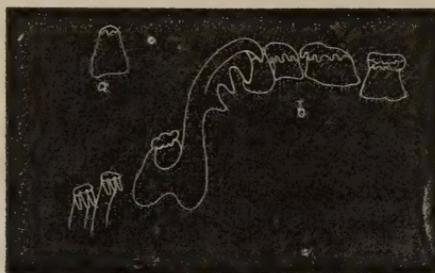
The figure represents two rows of centrals with the laterals to the right of the median line and a few uncini. The upper line of figures gives the central, the first two laterals, one of the uncini, and one of the laterals in profile, all detached.

The teeth of this membrane are so nearly on a plane as to allow one photograph to bring out all the details.

***Helicina occulta*, Say.**

Lingual membrane long and narrow. Teeth 00.5.1.5.00, in transverse, arching rows. Centrals upright, longer than wide, widest at the horizontal base, slightly narrowing towards the apex, which is nearly as wide as the base, broadly recurved and

FIG. 8.



Lingual dentition of *Helicina occulta*, Say.

denticulated at its cutting edge. First lateral oblong, shorter than the central, rounded at base, narrowed towards the apex, which is broadly recurved and denticulated; this lateral is inclined obliquely from the central, its apex being reflexed in the same direction. The second lateral resembles the first lateral in every particular, but is much less wide. Third lateral perpendicular, longer than broad, triangular, its apex small, reflexed and denticulated. Fourth lateral very long, irregular, jaw shaped, its lower edge for one-half its length furnished with four strong, large, acute, beak-like denticles; the left end of this lateral is produced in a horizontal direction, at right angles to the direction of the balance of the tooth, is excavated above and below, and in some instances appeared to have a wing-like expansion behind the uncini. Fifth lateral quite small, subcircular, its apex broadly reflected and denticulated, the whole tooth fitting into the upper excavation of the horizontal portion of the fourth tooth. The uncini, more than twenty-five in number, are long, slender, crowded, the apex reflexed and continued in three fringe-like denticles.

There seems to be great uniformity in the teeth of the different

transverse rows, but there are in some instances five beak-like denticles on the fourth lateral. It is difficult to follow this tooth behind the crowded uncini, but we are confident that in some instances it is very much more expanded than shown in the figure, resembling a gull's wing. The first beak-like denticle seems to be on the same plane as the upper portion of the tooth; the other three are on the same plane as the lower portion; this is shown in the figure by the line running parallel to the upper edge of the tooth. The apex of the first denticle seems often to be recurved.

The fifth lateral is with much difficulty found under the microscope. It is on a different plane from the other teeth, and is crowded into the excavation in the fourth lateral. It seems often wholly filled up with foreign matter, not being as readily cleaned as the other teeth, even in a solution of potash.

The whole lingual is a very difficult study, and requires numerous views to bring out the details of its structure by photography. It is owing only to the untiring perseverance of Mr. Powel that we are able to illustrate it satisfactorily.

Fig. 8, *b*, shows the central and one-half of one transverse row of the laterals, with two uncini only. The balance of the uncini curve rapidly outwards and downwards, giving to the entire transverse section of the lingual membrane the usual strongly arched outline. (See *Land and Fresh-water Shells of North America*, Part III., fig. 216.)

Fig. 8, *a*, represents the third lateral, which is not well shown in its crowded position, as in *b*.

On p. 108 of *Land and Fresh-water Shells of North America*, Part III., a fac-simile is given of Troschel's figure of the lingual dentition of the other species of the United States, *Helicina orbiculata*. A comparison of the two figures will show that the species differ in their lingual dentition as widely as in their shells.

The specimen from which the membrane was extracted was found living by Mr. E. R. Leland, who gives the following notes of its station:—

“The locality in which I found the *Helicina occulta* is a fishing station known as Whitefish Bay, six miles north of this city (Milwaukee, Wisconsin), on the slope of the lake bluff, which at that point is somewhat wet and boggy, with a growth of pines, tamaracks, juniper, and some deciduous trees. They were under dead leaves beside logs; on the 30th of May and 6th of June, 1869, they were in considerable numbers, though they could hardly be said to be abundant. I have not visited that place since the latter date. On the 19th inst., however, I found a few specimens in a ravine near the lake, about two miles and a half north of the city—making in all some twenty-five specimens found, among which are two young ones with an acute carina.”

The locality is an interesting one, showing the possibility of a tropical genus existing in a cold latitude. The discovery of Mr. Leland is of far greater importance, however, in proving beyond doubt the fact of *Helicina occulta* actually existing at the present time. The species is found very plentifully in a fossil state in the post-pleiocene of the Western States, and is generally supposed to be extinct. Dr. Binney has (Terr. Moll. I., 183, 184) argued at length against this opinion, and figured specimens apparently recent (Ibid. III., pl. lxxiv., fig. 1); he also referred to this species the shell found living in Western Pennsylvania by Dr. Green, and described by him as *Helicina rubella*. Specimens in an apparently recent state have also been received by us from Sheboygan, Wisconsin, and through the Smithsonian Institute from Lexington, Virginia, collected in the latter locality by Mr. McDonald. Fresh specimens were, however, so rare that belief in the extinction of the species prevailed generally. Dr. Gould referred (Terr. Moll. U. S., II., 352) *Helicina rubella* to *Helicina orbiculata*, a recent species found as far north as Tennessee, and finally in the Land and Fresh-water Shells of North America, Part III., *Helicina occulta* is removed from the catalogue of recent species and quoted only among the fossils.

Mr. Leland has now reversed this decision by finding the animal actually living. It is in consequence fair to presume that

the Sheboygan specimens are also recent, as well as those from Lexington, Virginia, and that the species, though, perhaps, rarer than formerly, is still to be found in the Western States.

Those persons not having access to Doughty's Cabinet of Natural History will be interested to know that *Helicina rubella* was found on hills not far from Pittsburg, Pa., on the old post road from that place to Wheeling. Dr. Green received it from a friend, and immediately questioned its origin, but was assured that it had been actually found living on more than one occasion.

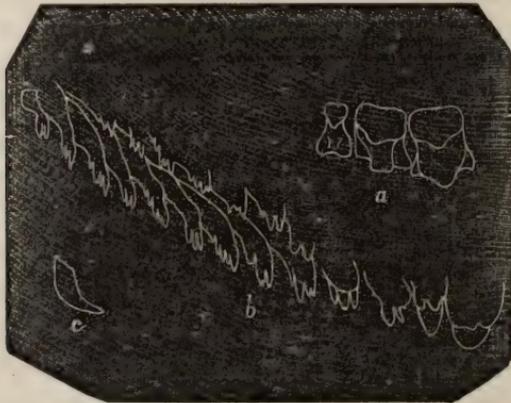
We presume that Prof. Kirtland (Ohio Report) refers to the same individuals as received by Dr. Green, when he speaks of a species of *Helicina* being found on the hills adjacent to the Ohio river.

Mr. Say described *Helicina occulta* from fossil specimens from a bluff near New Harmony, Ind. He did not notice it living, nor has any author done so. The name occurs, indeed, in several catalogues of Recent Species, but we have never known it to be found with the living animal until now.

Pompholyx effusa, Lea.

The shell from which was extracted the lingual membrane

FIG. 9.



Lingual dentition of *Pompholyx effusa*, Lea.

here described is one of the original lot received from California, from which the species was described. It was labelled by Mr. Lea.

A figure of the shell, with descriptions of the external characters of the animal, will be found in *Land and Fresh-water Shells of North America*, Part II., p. 73-74. As there has been some discussion in regard to this species having two pairs of eyes, we will here repeat that the eyes are situated in the place usual in the *Limnæidæ*.

Lingual membrane broad, with 22.1.22 teeth. Central teeth upright, narrow, widening and knobby at the base; apex recurved, and produced into an obtuse beak. Laterals nine on each side of the central line, in a straight transverse row, wide, quadrate, apex recurved, prolonged beyond the base of the tooth in a more or less broad blunt beak. Uncini about thirteen on each side of the median line, in oblique transverse rows, not attached to a plate, simple and not recurved; the first eight from the extreme lateral edge of the membrane long, narrow, arm-shaped, terminating in a wrist-like contraction and hand-like expansion, strongly digitate. The remaining uncini gradually changing into the shape of the laterals, but still not merging into them, the line of demarcation being strongly marked.

There is great variation in the beak-like projection of the recurved apex of the laterals, and still more in the digitation of the uncini.

The jaw is long, narrow, slightly arcuate, with blunt ends; anterior surface smooth.

By the characters of its lingual dentition, and its horny jaw, *Pompholyx* appears nearly related to *Planorbis*.

Fig. 9, *a*, represents the central and two laterals to the right of the median line; *b* gives one full series of uncini to the left of the median line; and *c* one of the uncini in profile.

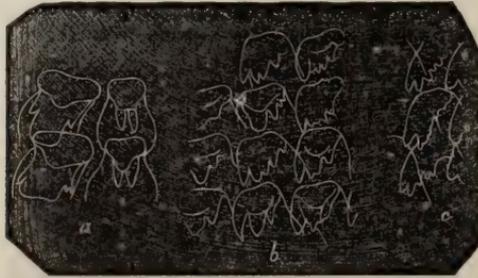
***Planorbis trivolvis*, Say.**

The specimen from which was extracted the lingual membrane here figured was collected at Newport, Rhode Island, by Mr. Sam. Powel.

Lingual membrane broad, with slightly curving rows of teeth.

Teeth 19.1.19. Centrals sub-oval, rounded at base, narrowing toward the top, which is squarely truncated; apex broadly recurved into an obtuse beak, beyond which are two long, narrow, tusk-like projections. First seven laterals uniform, in an almost straight transverse series, detached, inclining obliquely toward the median line, large, square, broadly reflexed, extending beyond the base in a wide, blunt beak, at each side of which are

FIG. 10.

Lingual dentition of *Planorbis trivolvis*, Say.

usually one or more small denticles. These laterals pass gradually into the uncini, which are in curving rows, long, narrow, widely recurved, with variable, strong, beak-like digitations on their apices and outer sides.

There is great variation in the digitations on the uncini, no two of which appear alike. The laterals also vary somewhat in the breadth of their recurved beaks.

Fig. 10, *a*, represents two central teeth with two of the first laterals on the left of the median line; *b* the merging of the laterals into the uncini; and *c* extreme uncini. *b* and *c* are taken from the right of the median line.

***Tulotoma magnifica*, Conrad.**

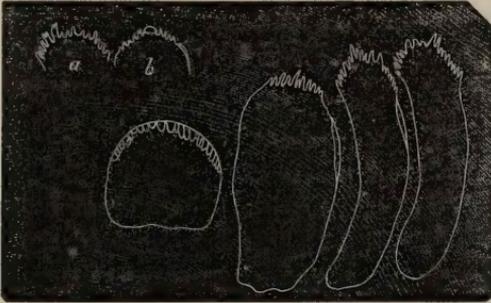
Through the kindness of Dr. E. R. Schowalter, of Uniontown, Alabama, we are able to describe the lingual dentition of *Tulotoma magnifica*, Conrad. The specimens received from Dr. Schowalter were taken in the Coosa river, Alabama.

It will be seen that in its lingual dentition *Tulotoma* is more closely allied to *Vivipura* (as suggested by Gill, Proc. Acad. N.

Sc., Phila., 1863) than to *Melantho* and *Lioplax*. (See Land and Fresh-water Shells of North America, Part III., pp. 16, 35, 55, etc.)

Lingual membrane long, with the arrangement of teeth usual to the family. Teeth 3.1.3. The centrals are subcircular, with a truncated, irregularly horizontal base; the apex recurved, channelled, and obtusely knobbed or denticulated. The first lateral is about as wide as the central, oblong, bulging at the sides, truncated and horizontal at base, its apex deeply digitated or fringed, some of the denticles being recurved at their apices. The second

FIG. 11.

Lingual dentition of *Tulotoma magnifica*, Conrad.

lateral is laminar, narrowing slightly towards the truncated base, curving outward from the central tooth, its apex with long fringe-like denticles, some of which are recurved, others obtusely knobby. The third lateral resembles in shape and size the second, but is somewhat less curved, and has shorter, less delicate denticles.

There is considerable variation in the number, length, delicacy and arrangement of the denticles on the different teeth. In some cases they are very broad, with simple recurved edges. In others they are long, narrow, and bifurcate. Again on many teeth the denticles are not absolutely separated one from the other, but the end of the tooth is rather deeply channelled.

The variations occur in the laterals, the centrals being more uniform. The side edge of the laterals is sometimes recurved for a considerable length.

In figure 11 outlines are given of one central tooth and the three laterals of one side of the lingual membrane, with (*a* and *b*) the apices of two separate laterals, to show variation in the denticulations.

The generic characters of the animal of *Tulotoma* never having been given, we add them here. Foot moderate, not produced beyond the snout. Color dark blue. Head and snout small. Lingual teeth as described above. Right tentacle broad. Left cervical lappet small; right larger, trough-shaped. Branchial laminae numerous, long, narrow, crowded in a double row.

Mesodon leucodon of Rafinesque.

The name *Mesodon leucodon*, Raf., has found its way into the books as a synonym of *Helix thyroides*. As no description of any

FIG. 12.



such species was ever published by Rafinesque, we have expressed the opinion that it was originally a manuscript name sent by Rafinesque to Ferussac. (Terr. Moll. U. S., IV., 54.) Since that time we have seen a manuscript work by Rafinesque, entitled "Conchologia Ohioensis," given by Prof. Haldeman to the Smithsonian Institution. In this there occurs not only a description, but a figure of *Mesodon leucodon*. These are here copied as conchological curiosities. They have, of course, no scientific value.

Mesodon leucodon thyroide.

"*Mesodon Leucodon.* Roussâtre, varié de petites taches brunes, irrégulières, provenantes de l'animal; très finement strié entravers; levre bordi aigu, réfléchi; dent blanche, oblique au milieu de la bouche; forme bombée, convexe, obtuse; opercule collé, membraneux."

The operculum referred to is no doubt the epiphragm.

In the same manuscript are other figures scarcely recognizable, but one of *Mesodon labiatum*, a species not described in any

printed work, seems to represent the carinated form of *Helix pal-*

FIG. 13.



Mesodon labiatum.

liata. A copy of this figure is here given.

Note on **Vivipara lineata**, Valenciennes.

By W. G. BINNEY.

WHEN studying the Viviparidæ of North America in preparing the Smithsonian "Land and Fresh-water Shells of North America, Part III.," I found in use, both in published works and in collections, the name *Paludina lineata* of Valenciennes for a species of *Vivipara* of the United States. From the work of Humboldt and Bonpland I obtained the description of Valenciennes, of which an English translation is here given:—

Paludina lineata.—This species resembles that of the Seine. It is equally ventricose, but has a thinner shell. Shell ventricose-ovate, thin, diaphanous, with delicate transverse striæ; greenish horn-color, with numerous transverse greener vittæ. Whirls five, last one large, ventricose, and equalling in height one-half the entire length of the shell. Besides the striæ of growth, there are numerous transverse, very fine lines. The whirls are not flattened towards the moderate suture. Apex acute. Color green, sometimes somewhat corneous ground, on which are a large number of bands of a deeper green and variable width, sometimes merely linear. On the upper whirls the bands are obsolete. Apex not eroded in any of a large number of individuals.

Operculum brown, thin, horny, covered with numerous concentric, not spiral lines. Found in Lake Erie by M. A. Michaud, who found one shell full of young, as in the case of our species, which proves the species to be viviparous. There is reason to believe the other species also are so, though in the most natural genera species vary in being both oviparous and viviparous. The genera of colubers and vipers among the reptiles are an example of this, while the Mollusca furnish more numerous ones.

Length 1 inch 3 lines.

It needed but a glance at this description to convince me that it was never drawn from a specimen of the species to which the name *lineata* has been applied by American authors. It was equally clear to me that the description was not applicable to any species known to inhabit the region indicated by Valenciennes. I was obliged, therefore, in the work referred to (p. 31), to leave it a doubtful species, with the hope of its eventually being rediscovered.

Here the matter rested, until an opportunity occurred of clearing up all doubt regarding the identity of *Paludina lineata*, Valenciennes. While in Paris, in 1867, it occurred to me to look among the shells at the Garden of Plants for the original specimen of Valenciennes. Through the kindness of Prof. Lacaze-Duthiers every facility for the search was given me. I very soon found the desired type, glued to a card tablet and labelled, in the handwriting of Valenciennes, "*Paludina lineata*, Val., dans Humboldt et Bonpland, tome II. Du lac Erie, l'Amérique du Nord, par M. Michaud;" but below was written in the same hand "C'est faux, elle vient de l'Inde."* Here then was a simple solution of the difficulty. The species is not American. It is the well-known Eastern shell figured by Küster as *Paludina Bengalensis* (Chemn., ed. 2, figs. 15, 16). Other specimens from Delhi, Bengal, &c., are labelled *P. lineata*, also in Valenciennes' handwriting; on one tablet *Pal. fasciata*, Gray, is given as a synonym.

A few days after this interesting discovery at the Garden of Plants I was looking at a copy of Humboldt and Bonpland's "Recueil d'Observations, &c." at the house of M. Crosse. Turning to the description of *Paludina lineata*, I found a marginal note referring the species to Bengal instead of Lake Erie. Recognizing the handwriting of Valenciennes, I called the attention of M. Crosse to it, and learnt that the book had actually belonged to Valenciennes, at the sale of whose library it was bought by M.

* *Paludina lineata*, Val., in Humboldt and Bonpland, vol. 2. From Lake Erie, North America, by Mr. Michaud. This is a mistake, the shell comes from India.

Crosse. Here, then, was an additional proof of the erroneous habitat originally given by Valenciennes.

I should add that the shell found by me labelled as the type of *Paludina lineata* in the Garden of Plants answers well to the description of Valenciennes.

The facts given above remove *Paludina lineata* from the catalogue of American *Viviparidae*. Unfortunately, however, the name *lineata* remains to burden and confuse our synonymy. Haldeman, surely without critical examination, referred Valenciennes' description of *Pal. lineata* to the North American species described by Say as *Paludina vivipara*. Haldeman has been blindly followed by most American authors, and by Küster, who further adds to the confusion by a typographical error, using *linearis* instead of *lineata* in a single instance, a name which some have tried to perpetuate.

This confusion would have been avoided by a reference to the original description of Valenciennes, instead of accepting the name from correspondents or books. It is one of the greatest faults of American writers on Conchology thus to accept names, without reference to original descriptions.* Until this fault is corrected, the disgraceful confusion of our synonymy will be worse confounded.

* An instance of the mistakes thus arising is to be found in reference to this very species of Valenciennes. A writer in the Proc. Ac. Nat. Sc., Phila. (1862), 451, notes the fact of a certain species of North American *Vivipara* being characterized by *four* spiral red bands, and further insists on the permanency (invariability?) of the characteristic as a guide in distinguishing it from an allied European form which has but *three* bands. Yet this author refers this strictly four-banded species to *Paludina lineata*, Valenciennes, a species described not as having *four* red spiral bands, but as having a *large number* of bands of a deeper *green* and variable width, sometimes merely linear. Surely, if the species invariably has four bands, such a description as the last cannot apply to it.

Notes relating to the Physical Geography and Geology of, and the Distribution of Terrestrial Mollusca in certain of the West India Islands.

BY THOMAS BLAND.

(Read before the American Philosophical Society, March 3, 1871.)

In 1861 I published (*Ann. Lyc. Nat. Hist., N. Y. VII.*) a paper on the Geographical distribution of the genera and species of land shells of the West India Islands, and in 1866 (*American Jour. of Conchology, I.*) further papers on the same subject. From a study of such distribution, without reference to the Physical Geography or Geology of the Islands, I arrived at the conclusion that they may be divided into the five following provinces or sections, each having a distinct faunal character, viz.:

I. Cuba with the Isle of Pines, Bahamas, and Bermudas.

II. Jamaica.

III. Haiti.

IV. Puerto Rico with Vieque, the Virgin Islands, Sombrero, Anguilla, St. Martin, St. Bartholomew, and St. Croix.

V. The Islands to the south of those last mentioned, to and inclusive of Trinidad.

I remarked that the Islands to the West of Puerto Rico have the greater generic, as well as specific alliance with the North American Continent (Mexico and Central America, of course, included), and those to the East and South, with tropical South America.

Within the last year I have endeavored to learn, if any and what evidence may be gathered from the depth of the sea around, and in the vicinity of the Islands, of their former greater proximity to each other and the adjacent continents, sufficient to account for or throw light on the observed facts of land shell distribution. The result is extremely interesting, and in the main confirmatory of the views above expressed.

The British Admiralty Charts have afforded data, chiefly to the 100 fathom line of soundings only, while recently, through the kindness of Mr. Rawson W. Rawson, Governor in Chief of Barbados and the Windward Islands, I have obtained particulars of the deep sea soundings, taken in the Caribbean sea, especially for Telegraph Cable purposes, by United States and British Naval Officers, which supply information of great value, as I propose in this paper to show. I am also indebted for much information to "The West India Pilot," published by the British Admiralty.

I reserve, for another opportunity, observations on the faunas of the first three of the above mentioned sections, now confining myself to the fourth and fifth, with incidental reference to that of the second. Since the date of my former papers, my knowledge of the species inhabiting the Islands embraced in the latter sections has been largely increased, for which my acknowledgments are due principally to Mr. Robert Swift, of St. Thomas, Dr. Cleve, of the University of Upsala, Governor Rawson, and Mr. R. J. Lechmere Guppy, of Trinidad.

SECTION IV. *Puerto Rico with Vieque, the Virgin Islands, Sombrero, Anguilla, St. Martin, St. Bartholomew, and St. Croix.*

Puerto Rico, Vieque and the Virgin Islands, of which Anegada is the most eastern, stand on one and the same bank, an elevation of which to the extent of somewhat less than 40 fathoms (240 feet) would unite the whole, converting them into one Island. Sombrero is on another bank, about 40 miles from the Virgin bank, and 23 miles from the north end of the Anguilla bank. The depth of the channels which separate the Sombrero bank from the Virgin bank on the west, and the northern end of the Anguilla bank to the east, is not known, but soundings are recorded, at their margins, of 160 fathoms (960 feet) and 190 fathoms (1,140 feet), without bottom.

Anguilla, St. Martin and St. Bartholomew stand on the western edge of another bank of considerable extent. Its southeastern end is 14 miles only from the Antigua bank, and the depth of water between the two is upwards of 122 fathoms (732 feet). An elevation of the Anguilla bank of about 40 fathoms (240 feet) would unite the Islands upon it.

The land shell fauna of the above named Islands is unquestionably the same; it has some alliance with that of Haiti, but very little with that of the Islands to the south of the Anguilla bank. Not only is the absence of certain genera prevailing in Sections I., II., and III. noticeable, but the diminished number of representatives of others is equally so, for example :

	in § I.	§ III.	§ IV.
Megalomastoma.....	13 species,	1	3
Alcacia.....	9	“ 2	1
Strophia.....	27	“ 2	2
Macroceramus.....	35	“ 10	2
Cylindrella.....	93	“ 28	6

The fact that *Megalomastoma*, *Alcacia*, *Strophia*, and *Macroceramus* are not represented in the Islands south of the Anguilla bank (§ V.) and that in those Islands there are 4 species only of *Cylindrella*, affords striking proof of the difference of their faunas.

St. Croix is not unfrequently classed with the Virgin Islands, from which it is 35 miles distant, but it stands on a bank disconnected from any others and with very deep water around it. Soundings are on record (taken, I believe, by Capt. Parsons, R. N.), between it and the Virgin bank, about the mid-channel, of 1,550 fathoms (9,300 feet), and not far from its northern shore of 2,000 fathoms (12,000 feet), without bottom being found.

The following soundings to the eastward were obtained by the U. S. S. Yantic, in 1870, between St. Thomas and Saba :

		fathoms.	feet.
N. Lat. 18° 01' 50".	W. Long. 64° 10' 20".	—1,825	= 10,950
“ 17° 55' 00".	“ 63° 50' 30".	—1,240	= 7,440

Considering the facts of distribution already given, and the above mentioned soundings, it seems highly probable that very deep water will be found between the Anguilla and Antigua banks.

In this connection it is interesting to notice that the depth of the sea is 1,376 fathoms (8,256 feet) between Cuba and Jamaica, in N. Lat. $18^{\circ} 36'$, W. Long. $76^{\circ} 03'$, a somewhat near approximation to the Latitude of the great depth between the Virgin bank (St. Thomas) and Saba.

The fauna of St. Croix is closely allied to that of Puerto Rico, and seeing the depth of water between them, it is a significant fact that *Caracolla* (*Helix*), *caracolla* L. one of the characteristic species of the latter, is found subfossil only, with other extinct species, and among them a *Strophia*, in the former. *Megalomastoma*, *Alcadia*, and *Macroceramus* do not exist in St. Croix, while there is one species of *Cylindrella*. With further reference to the soundings, the Latitude of Jamaica, and the nature of the fauna of St. Croix, I should mention that *Megalomastoma* and *Strophia* have none, and *Macroceramus* one representative (a Cuban species) in Jamaica, in which Island there are, however, 14 species of *Alcadia* and 51 of *Cylindrella*. Sombrero has one living species (*Chondropoma Julieni* Pf.) which is also found, with a *Strophia*, embedded in the phosphatic limestones of that Island.

Professor Cope lately referred to me, for determination, shells from the matrix between the femoral condyles of *Loxomytus latidens*, Cope, one of the great extinct Rodents, the bones of which have been found in the caves of Anguilla. The shells are closely allied to *Tudora pupaeformis*, Sow, now living on Anguilla, and apparently identical with an undetermined species which inhabits St. Martin.

SECTION V.—*Subdivision 1. Islands on the St. Christopher and Antigua banks, Montserrat, Guadeloupe, Dominica, Martinique, and Barbados**.

Subdivision 2. St. Lucia, St. Vincent, Grenada and the Grenadines, Tobago, and Trinidad.

In former papers I did not treat the fauna of the Islands in this section as capable of subdivision, but with my present increased knowledge must necessarily do so.

Immediately to the south of the Anguilla bank there is, to the eastward, a bank on which stand Barbuda and Antigua, and to the westward, another (separated from the adjacent Islands by channels of a greater depth than 200 fathoms, 1,200 feet), which constitutes the base of St. Eustatius, St. Christopher, and Nevis. At a short distance from the northern end of the latter bank stands Saba (about $2\frac{1}{2}$ miles in diameter,) rising perpendicularly from the sea to the height of 2,820 feet, with the 100 fathoms (600 feet) line of soundings about half a mile from its western, and a little more than half that distance from its eastern side. Late soundings between St. Eustatius and Saba (Lat. $17^{\circ} 31' 10''$, Long. $63^{\circ} 08' 30''$) give a depth of 343 fathoms (2,058 feet).

* I omit mention of several small Islands geographically belonging to those enumerated in both subdivisions.

Within 3 miles S. W. from Saba is the Saba bank, which forms nearly a parallelogram, its longest sides about 32 miles and its shortest about 20 miles in extent, the eastern edge fringed with a narrow ledge of living coral, sand and rock, nearly 30 miles in length and varying in depth from $6\frac{1}{2}$ to 10 fathoms.

It is remarkable that an elevation similar to that mentioned with reference to the Virgin and Anguilla banks (less than 40 fathoms,) would unite Barbuda and Antigua, also St. Eustatius, St. Christopher and Nevis, and convert the Saba bank into an Island.

With respect to Guadeloupe, Dominica, Martinique, &c., the following particulars of soundings lately taken by the U. S. S. "Yantic," Commander Irwin, are extremely interesting :

Between	Lat.	Long.	fathoms.	feet.
Antigua and Guadeloupe,	16° 40'.	61° 48'.	348	= 2,088
Guadeloupe and Dominica,	" 15° 45'.	" 61° 37'.	850	= 2,700
Dominica and Martinique,	" 15° 06'.	" 61° 20'.	1,078	= 6,468
Martinique and St. Lucia,	" 14° 17'.	" 61° 04'.	1,232	= 7,392
St. Lucia and St. Vincent,	" 13° 33'.	" 61° 20'.	1,346	= 8,076

Capt. Parsons, R. N., found on a line of soundings from St. Vincent to Barbados, depths of 350, 956, 1,218 in (about) Lat. 13° 05', Long. 60° 25', 1,211, and 147 fathoms, the greatest ascertained depth being equal to 7,308 feet.

The same officer obtained the following results from soundings between Barbados and Tobago, viz. :

N. Lat.	W. Long.	fathoms.	feet.
13° 00'.	59° 40'.	300	= 1,800
" 12° 40'.	" "	570	= 3,420
" 12° 30'.	" 59° 50'.	780	= 4,680
" 12° 10'.	" 60° 05'.	1,030	= 6,180
" 11° 40'.	" 60° 10'.	1,060	= 6,360
" 11° 27'.	" 60° 25'.	500	= 3,000 without bottom.

I have already given the depths between Martinique and St. Lucia, that Island and St. Vincent and the latter and Barbados. St. Vincent is separated from the northern end of the Grenada bank, on which Grenada and the Grenadines are situated, by a narrow channel, not over, Capt. Parsons remarks, 300 fathoms (1,800 feet) deep. The Grenadines consist of a chain of Islands and rocks extending for 60 miles between Grenada and St. Vincent. The depth found on soundings taken by the "Yantic," gave on and near to the west side of St. Vincent, in about the Latitude of its northern end, 1,080 fathoms (6,480 feet), opposite the channel to the south of St. Vincent 594 fathoms (3,564 feet), and along the West side, in close proximity to the Grenada bank, from North to South, 880 fathoms (5,280 feet), 801 fathoms (4,806 feet), 916 fathoms (5,496 feet), and 545 fathoms (3,270 feet).

Trinidad and Tobago are on soundings (less than 100 fathoms), both being in fact on the submarine slope of the South American Continent, and the deeper water found by the "Yantic" between the former Island and the Grenada bank, in (about) Lat. 11° 50', Long. 61° 45', was 386

fathoms (2,316 feet), while the maximum depth known, as above stated, between Tobago and Barbados, is 1,060 fathoms (6,360 feet).

It appears from the foregoing evidence, that Trinidad, Tobago, the Grenada bank (an elevation of which to the extent of 40 fathoms would give an Island nearly 100 miles in length), and St. Vincent, stand on a partially submerged ridge, an extension of the South American Continent, having, say, 1,000 fathoms depth of water on the west side, and still greater depths between its northern termination and St. Lucia, also on its eastern side between it and Barbados, and between the latter Island and Tobago. The summit of this ridge is 2,316 feet beneath the level of the sea between Trinidad and the Grenada bank, and, say, 1,800 feet between that and St. Vincent, while the altitudes above the sea are, of Trinidad 3,100, Tobago 1,800, Grenada 2,746, and St. Vincent about 3,000 feet.

The genera and species of land Mollusks which occur in the Islands on the "submerged ridge" just mentioned (Trinidad to St. Lucia inclusive), are chiefly allied to those which are characteristic of Venezuela, the portion of the Continent contiguous to Trinidad. The species of *Helix*, in its wide application, including *Stenopus*, *Hyalina*, and *Zonites*, are 15 only in number, while there are of *Bulimus* (as restricted by Albers) 5, and of *Bulimulus* 14 species, the total number of species of the latter in the West Indies, being about 38. The subgenus *Dentellaria* (*Helix*) is characteristic of the Islands embraced in Subdivision 1 of Section V., but has few representatives in those named in Subdivision 2. *D. perplexa*, Fer., is peculiar to the Grenadines and Grenada, *D. Isabella*, Fer., is common to one of the Grenadines, Barbados, and Cayenne, (French Guiana,) and *D. orbiculata*, Fer., to St. Lucia, Martinique and Cayenne.

The genus *Bulimus*, of which the subgenera represented are *Borus*, *Pelecychilus*, and *Eurytus*, all South American, occurs in the West Indies only in the group (subdivision 2) embracing St. Lucia and Trinidad and the intermediate Islands. *Borus oblongus* inhabits Barbados, but it was introduced there from St. Vincent by the late Rev. Mr. Parkinson. *Eurytus aulacostylus*, Pf., occurs both in St. Lucia and Demerara. With respect to Trinidad, it is certainly curious that we have there a species of *Diplommantina* (*D. Huttoni*, Pf.) and of *Ennea* (*E. bicolor*, Hutton), the latter found also in Grenada and St. Thomas, both living in the East Indies. Guppy has lately discovered a species to which he has given the generic name of *Blandiella*, but it is, I think, a *Truncatella*, allied, at least, to the subgenus *Tabaitia*, H. and A. Adams, the type of which is *T. porrecta*, Gould, of Tahiti.

The land shell fauna of the Islands in subdivision 2 have marked alliance with that of Cayenne. There are on that group six species of *Helix* which are also found in Cayenne, viz.: *Dentellaria orbiculata*, *nux-denticulata*, *dentiens*, *Isabella*, *badia*, and *Thelidomus discolor*. The genus *Cyclophorus* has no less than seven species in Martinique, Dominica, and Guadeloupe, but none in any other part of the West Indies, while one, a different species, inhabits Cayenne. In Barbados no member of the family Cyclostomacea has been discovered. I have already referred to some other peculiarities of this fauna as compared with that of the Islands

embraced in section IV, and should add that *Dentellaria* does not occur in those Islands. *Helix* predominates over *Bulimus* in North America and the Islands in Sections I, II., III., and IV, while the reverse is the case in South America, and there is at least an increased proportionate number of *Bulimus*, as compared with *Helix* in Section V.

I have spoken of a "ridge" on which the Islands in subdivision 2 of that section stand (St. Lucia excepted), and must remark in addition, that there may have existed an extension of the South American Continent, from the eastern boundary of Guiana to some point west of the Grenada bank, and running North to the neighborhood of the Anguilla bank, on the western side of which extension there was the fauna now to be studied in the Islands from St. Lucia to Trinidad, and on the eastern side, in those from the St. Christopher and Antigua banks to Barbados.

Reference has been made to the similarity of depths in nearly the same Latitude between Jamaica and Cuba, and Saba and the Virgin bank.

Mr. Rawson has directed my attention to a comparison of the following depths in the Caribbean sea, ascertained by soundings between Kingston (Jamaica *) and Chagres, and those between Barbados and Tobago :

Lat. $12^{\circ} 00'$, Long. $79^{\circ} 25'$ —924 fa. Lat. $12^{\circ} 10'$, Long. $60^{\circ} 05'$ —1,030 fa.
 " $11^{\circ} 25'$, " $79^{\circ} 30'$ —969 fa. " $11^{\circ} 40'$, " $60^{\circ} 10'$ —1,060 fa.

Taking a wide view of land shell distribution in the West Indies, it may be said that the fauna of the Islands on the northern side of the Caribbean sea, from Cuba to the Virgin and Anguilla banks, was derived from Mexico and Central America, and that of the Islands of the eastern side, from the Antigua and St. Christopher banks to Trinidad, from tropical South America. It is noticeable that the mountains in the former Islands, range, generally, from West to East, but in the latter from South to North, excepting in Tobago and Trinidad, where they are parallel with, or in the same direction as the coast mountains of the adjacent continent.

The present geological condition of the Islands affords ample evidence of the lapse of vast periods of time in the earlier tertiary epochs, during which the Limestone formations, extensively developed in most of the Islands, were deposited. The white Limestone of Jamaica, referred by Sawkins (Geology of Jamaica, London, 1869), to the Post Pliocene, covers more than three-fourths of the Island and is computed at 2000 feet in thickness. It rests on the yellow Limestone (Miocene), which, he remarks, during the deposition of the former, "sank to great depths, in some places apparently 3000 feet, so as to permit the growth of those great coral structures, from the débris of which the enormous calcareous development of the white Limestone has been derived. The lapse of time required for these important phenomena cannot be easily realized by the imagination."

That the Islands, or some of them, were formerly united and formed part of an ancient continent, may, it would seem for various reasons, be inferred, and the discovery of mammalian and other remains in Anguilla, Sombrero, etc., is an important one.

* The Pedro bank, within 50 miles of the southern shores of Jamaica, with an elevation of 30 to 40 fathoms would give an Island 100 miles long, 30 in breadth near its centre, and 45 at its western edge.

Referring to the Anguilla cave remains, Prof. Cope remarks (Proc. Acad. N. S. Phila., 1868) on their indicating "that the Caribbean continent had not been submerged prior to the close of the Post-pliocene, and that its connection was with the other Antilles, while a wide strait separated it from the then comparatively remote shores of North America."

The occurrence with the Anguilla fossils of a land shell of a species now living, points to the age of the existing fauna, but the marked difference, both generic and specific, between the present land shell fauna of the Islands upon and to the North and West of the Anguilla bank and those to the South of it, may be taken as evidence of their early and continued separation.

Captain Parsons, in MS. Notes on the Geology of some of the West Indies, for a perusal of which I am indebted to Mr. Rawson, observes that the eastern or windward edge of the Grenada bank is at an average distance of 7 miles from the Islands, while the western edge is not more than two-thirds of a mile, and that there is a similar great disparity in other of the banks and Islands. He concludes that such increased development of the eastern over the western sides is primarily due to the equatorial current, which running for ages through the Islands has brought and deposited material on the windward side.*

On this subject, the following quotation from "The Natural History of Barbadoes," by the Rev. W. Hughes, London, 1750, is really interesting, and particularly so in connection with the views of Sawkins with regard to Jamaica.

"The current of the Deluge between the Tropics ran from East to West. Notice the shattered condition of the eastward side of the chain of hills and cliffs, which are as barriers to the Island (Barbados), from Cuckold's Point to Conset's Bay, for as they face the East their torn state on that side alone and no where else, shews that they not only by their situation, first stemmed, but as they were higher than any other part of the Island, they wholly bore the repeated percussions of the current in the gradual ascent of the Deluge. Notice, also, the coping figure of the Island from East to West, for if we view narrowly the several gradual descents of so many continued ridges of rock, like cascades, descending precipitously to the westward (for instance, the long chain of hills from Mount Gilboa, in St. Lucia's Parish, to the Black Rock in St. Michael's), we shall conclude from the deep soil on the eastward of these where the land is level, and from the rugged and bare washed surface of the west, that the latter was thus torn by the violence of the waters falling over them, and the former, the effect of the subsided sediment upon the decrease of the Deluge. The want of such a bed of rocks from Black Rock to St. Anne's Castle caused the chasm which opens to the sea through Bridgetown opposite to the Valley of St. George's. The course of the gullies is, too, from East to West, and they were caused by the current of the Deluge, the regular course of which to the westward between the tropics was the natural consequence of the easterly trade wind."

* In the Bahamas the Islands are, generally speaking, on the windward side of their respective groups and banks.—(Nelson.)

Sawkins, in the Report on Jamaica, to which I have already referred, shows that the highest elevations on that Island are situated to the east, and the inclined slope rises from the west. With respect to this, he draws "deductions from two important elements:

"1. The great equatorial currents have existed in times past as at present.

"2. That the trade winds also prevailed with the same uniformity."

Referring to vestiges of volcanic action and certain stratified deposits towards the eastern end of the Island, containing pebbles and debris of previously existing rocks, Sawkins remarks: "This (volcanic) action might have operated intermittently, so as to permit the growth of coral reefs, marine animals, &c., of which the remains are contained in the limestone formations. Again, supposing the deposits to have originated from local igneous or volcanic action, or from debris derived from islands to the east, submersion having intervened, the lighter materials and finer sediment would be transported by the currents to the westward, these influences combining with subsequent changes of level, account for the prolongation of the land to the westward."

In connection with the facts stated I can only incidentally refer to the barrier presented by Trinidad, Tobago, the Grenada bank, and St. Vincent to the distribution, to the westward, of marine forms living at greater depths than 400 fathoms; and to the same barrier and others offered by the Islands and banks to the North of St. Vincent, to the flow of the equatorial current into the Caribbean sea. Also to the existence of a cold current at great depths between Barbados and Tobago, shown by the temperatures ascertained by Capt. Parsons, viz.:

Surface,	Max.	79°	Fah.,	at	1,030	fathoms,	Min.	38°
	"	82°	"	"	1,060	"	"	38°.5

NOTES ON LINGUAL DENTITION OF CERTAIN SPECIES OF NORTH
AMERICAN LAND SHELLS.

BY THOMAS BLAND AND W. G. BINNEY.

We are indebted to Miss Annie E. Law, of Jalapa, Tennessee, and to Mr. Henry Hemphill, of Oakland, California, for the specimens from which we extracted the jaws and lingual membranes here described.

ZONITES LÆVIGATUS, Pf.

Jaw as usual in the genus.

ZONITES INTERTEXTUS, Binney.

The jaw and lingual membrane are as usual in the genus.

ZONITES DEMISSUS, Binney.

Jaw arched, ends attenuated, pointed; anterior surface smooth, cutting edge with well developed sharp median projection.

Lingual membrane as usual in the genus. Laterals above eight in number on either side of central line.

ZONITES LASMODON, Phillips.

Jaw and lingual membrane as usual in the genus.

ZONITES INTERNUS, Say.

The jaw and lingual membrane are those of *Zonites* (or *Hyalina*), and not of *Helix*, thus showing the generic position of the species, which is not so well marked by the shell.

The jaw is slightly arcuate, ends attenuated, pointed; median beak-like prominence to the cutting edge.

The lingual membrane is long and narrow. Central teeth large, with a long median cusp. Laterals like the centrals, but bifid, four in number, marginals aculeate.

PATULA STRIGOSA, Gould.

Jaw long, low, slightly arcuate; anterior surface smooth excepting near the lower margin, where there are numerous, crowded, subobsolete ribs, or coarse striæ, crenellating the cutting edge. There is a very strong muscular attachment to the upper margin.

The lingual membrane is as usual in the genus. (See fig. 129 of L. and Fr. W. Shells, I.) The marginal teeth are wide and low, with one inner, long, obtuse, oblique denticle, and several short side blunt denticles, obtusely rounded.

PATULA COOPERI, W. G. Binn.

Lingual membrane as in *Patula strigosa*.

PATULA IDAHOENSIS, Newc.

The jaw very much resembles in form and in its crenellated cutting edge that of *Patula striatella*. (See fig. 141 of L. and Fr. W. Shells, part I.) Its anterior surface has coarse perpendicular striæ or obsolete wrinkles, not well formed ribs. There is a stout membranous attachment to the upper margin. Lingual membrane as in *Patula Hemphilli*. (See Am. Journ. of Conch., VI. 247.)

PATULA PERSPECTIVA, Say.

The jaw and lingual membrane are quite like those of *P. striatella*. The ends of the jaw, however, are more squarely truncated, and the striæ are not converging.

HELIX POLYGYRELLA, Bland.

Jaw slightly arcuate, ends but little attenuated, blunt; anterior surface with fifteen broad ribs, denticulating either margin.

Lingual membrane as in *H. auriculata*.

We are indebted to Mr. Harford for the living specimens from which the notes on this species are drawn.

HELIX PALLIATA, Say.

Jaw short, high; anterior surface with more than fifteen ribs, denticulating either margin.

HELIX OBSTRACTA, Say.

Jaw with ten ribs. Lingual membrane as in *H. palliata*.

HELIX DEVIA, Gld. var.

This small, doubtful form from Salmon River, Idaho, has the jaw arcuate, ends blunt, with about seven stout ribs denticulating either margin. The lingual membrane is broad, teeth as usual in the genus, the marginals low, wide, with one oblique, bluntly bifid, inner denticle, and several short, blunt, outer denticles.

HELIX FIDELIS, Gray.

In Amer. Journ. Conch., VI. p. 207, pl. ix. fig. 1, we described and figured the jaw as short, high, thick, rough, strongly arcuate, ends attenuated, blunt, cutting edge with a well developed, blunt, median projection, marked with decided longitudinal striæ, which crenellate its margin. We have lately had an opportunity of examining numerous other adult specimens, and find them decid-

edly costate, usually with about six ribs, denticulating either margin.

PALLIFERA DORSALIS, Binney.

An opportunity has lately been given us by Mr. H. Prime of examining living specimens from Westchester Co., New York. We find Mr. Morse's description and figure of the jaw to be quite correct, and have no doubt of the genus being distinct from *Tebennophorus*. The species appears to us well marked also, especially by the great activity of the animal's motions.

Mr. Prime noticed it climbing on trees, a habit often observed by us in several of our land shells. Thus *Helix thyroides* in the garden of one of us at Burlington, N. J., constantly climbs the fruit trees, to eat the gum which exudes from the branches.

Our figure 535, of L. and Fr. W. Shells, part I., is defective. The head does not extend beyond the mantle. See the upper figure in *Terrestrial Mollusks*, III., pl. lxiii.

XIX—On the Lingual Dentition of Certain Terrestrial Pulmonata Foreign to the United States.

BY THOMAS BLAND AND W. G. BINNEY.

Read Dec. 9, 1872.

[Reprinted from the Annals of the Lyceum of Natural History, N. Y., Vol. x, Oct., 1872.]

Helix Jayana, C. B. ADAMS (*Sagda*).

Like *Sagda connectens* C. B. Adams and *Sagda Haldemaniana* C. B. Adams (see Amer. Jour. Conch. VII, p. 175), this, also a Jamaica species, has quadrate, not aculeate, marginal teeth on its lingual membrane. The cusps of the marginals are short, stout and blunt, centrals and laterals as usual.

Jaw smooth anteriorly, with scarcely any median projection to its cutting edge.

This is an additional proof of the position of *Sagda*

being among the *Helicea* rather than the *Vitrinea* of von Marten's arrangement.

We received from Mr. Henry Vendryes the specimen examined.

***Leucochroa Boissieri*, CHARP.**

The genus *Leucochroa* is adopted by von Martens (Die Heliceen ed. 2, p. 78) the type being *Helix candidissima* Drap, a species whose anatomy has been described by Moquin-Tandon as being more nearly related to *Zonites*, than to *Helix*. The genus is classed by von Martens among the *Vitrinea*, the section of *Helicea* containing the genera furnished with ribless anterior surface and median projection to the jaw, and aculeate, marginal teeth to the lingual membrane. Among the species catalogued by von Martens is *Leucochroa Boissieri* Charp. Having sometime since received a specimen of this species from Mr. John Van Nostrand, collected by him in Palestine, we have examined its jaw and lingual dentition with the following results.

Jaw very low, long, arcuate, ends but little attenuated, bluntly rounded. Cutting edge with a decided median projection, anterior surface free from ribs, with a strong, transverse line of reinforcement. The jaw resembles that of *Clausilia* or *Pupa* more than that usually found in *Helix*.

Lingual membrane as usual in the *Helicide*. Centrals short and stout with a bluntly pointed median tooth, the side teeth almost obsolete. Laterals with a very long, oblique, blunt inner tooth, the outer tooth almost obsolete. Marginals subquadrate, with several short, blunt, papillæ-like teeth.

From the above it will be seen that *Leucochroa Boissieri* must be classed among the *Helicea*, its lingual membrane having the quadrate type of marginal teeth, and not the aculeate type common to *Vitrina*, *Zonites* and other *Vitrinea*. Its jaw is of the form often found in the *Helicea*. Judging from both jaw and lingual membrane, we would not separate the species from the genus *Helix* as received by von Martens. We are inclined to believe that further investigations will

prove the genus *Leucochroa* to be only a subgenus of *Helix*, in the arrangement of "Die Heliceen."

***Helix circumfirmata*, REDFIELD.**

Lingual membrane long and broad, centrals tricuspid, laterals bicuspid, cusps long and slender, marginals aculeate.

From the above description it will appear that this species belongs to the *Vitrinea* rather than to the *Helicea* of von Marten's arrangement, in which latter it is classed in "Die Heliceen" as a species of the subgenus *Microphysa*.

***Helix Bermudensis*, PFR.**

Jaw extremely thin, arched, with a blunt, median projection to its cutting edge.

Lingual membrane long and narrow. Central teeth tricuspid, laterals bicuspid; the cusps in each long and slender. Marginals numerous, aculeate in oblique rows.

As in the *H. circumfirmata*, the result of our examination of the lingual membrane throws light on the generic position of this species. It can no longer be retained in *Caracolus*, a sub-genus of *Helix*, as it has the dentition of the *Vitrinea* of von Marten's arrangement. For the specimens examined of this and the preceding species, both from Bermuda, we are indebted to Mr. J. J. Crooke.

***Helix perplexa*, FER. (*Dentellaria*).**

Jaw with a median projection to its cutting edge. The anterior surface of the jaw is of irregular thickness, showing some approach to the ribbed form of jaw.

Lingual membrane as usual. Central and lateral teeth with short, stout, blunt cusps. Marginal teeth quadrate, with one wide, stout, bluntly rounded median cusp, and two small, blunt side cusps.

We are indebted to Governor Rawson for this specimen collected in the Island of Grenada.

Pupa sulcata, MULLER (*Gonidomus*).

Lingual membrane long and very narrow. Rows of teeth arranged *en chevron*. Teeth separated, aculeate, as in *Pupa palanga* Lesson, photographed by us (*Amer. Jour. Conch.* V, pl. XI, fig. 1.)

We obtained no jaw on boiling the buccal mass in a solution of caustic potash.

This species belongs to the genus *Gonospira*, in which *P. palanga* was placed by Crosse and Fischer (*Journal de Conch.* IX, 213 (1869), pl. XI, figs. 6-8).

The specimen examined, sent from Mauritius by Consul Pike, was kindly supplied by Mr. John G. Anthony.

Bulimus aulacostylus, PFR. (*Eurytus*).

Lingual membrane as usual in the genus, the marginal teeth simply modified from the laterals.

Jaw slightly arcuate, membranous, almost transparent, in one single piece, but divided by delicate ribs into more than sixty plate-like sections, as common in the genera *Bulimulus*, *Cylindrella*, etc. No upper median triangular plate, but the ribs run somewhat obliquely to the centre.

We are indebted for this specimen from St. Lucia, and for the following from St. Vincent, to Governor Rawson.

Bulimus auris-sileni, BORN (*Pelecychilus*).

Jaw and lingual membrane as in the last species. The middle cusp of the central teeth and inner cusp of the lateral teeth long, acute.

The jaw of this and the preceding species do not agree with the generic description of von Martens "costis validis exarata," but are like that of *Bulimulus*. This fact gives still more proof of the difficulty of classifying the *Bulimi* by their jaw, at the present stage of our knowledge of the subject, as already remarked by Fischer (*Jour. de Conch.* XII, 295, 1872).

ADDITIONAL NOTE ON THE GENUS AMPHIBULIMA.

Since our paper "On The Relations of Certain Genera of Terrestrial Mollusca of, or related to, the Sub-family Succininae, with Notes on the Lingual Dentition of *Succinea appendiculata* Pfr." (pp. 198-207) was printed, we have received, through the kindness of Dr. W. J. Branch of the island of St. Kitts, two specimens of *Amphibulima patula* with the animals, preserved in glycerine, and can in consequence offer a decided opinion as to the generic relations of the species.

Finding a note among the papers of the late Mr. Robert Swift to the effect that "*S. patula* Brug. is found at St. Kitts on Bayford's estate on the wild plantain which grows on the banks of a small water-course," Bland wrote on the 21st November last, requesting Dr. W. J. Branch, a correspondent of Mr. Swift and also of Governor Rawson, to obtain specimens, if possible, for examination. To this request Dr. Branch most kindly responded. We subjoin copy of his interesting letter, which accompanied the specimens.

"I went a few days ago to Bayford's to look for the *S. natula* but, after a long and fatiguing search, found only two small (young) specimens. When I was in the place several years since, the bushes on each side of the little river were covered with snails* (a striped *Bulimus*, a species of *Helicina* and the *S. patula*), but the other day I saw only three arboreal snails. The present scarcity of these creatures in St. Kitts is probably due to the hurricane which visited the island in 1870. Many trees, some of enormous size, were torn up by the roots, others lost all their branches, and scarcely a single leaf was left on any tree. The supply of water to the estates was cut off or much diminished by the drying up of the numerous streams from the mountains. This was, no doubt, caused by the want of foliage to protect the moisture, which collects on the slopes of well-wooded hills, from the sun's heat. So the poor snails have come to grief from the actual violence of the hurricane itself, and the subsequent cutting off of their supplies both of meat and drink.

You will see that both the snails sent are completely tucked into their shells, but I do not think that they often, or perhaps ever, draw in either the head or the posterior part of the foot during life. Their flesh is partic-

* *B. multifasciatus* Lam. and *H. fasciata* Lam. (T. B.)

ularly watery and gelatinous and shrinks up as they die. When they are moving about, the foot looks very large and when I touched the creature it could not or would not retreat into its shell. * On this point, however, I shall be able to give more accurate information when I can collect additional specimens."

We find that the animals are completely retracted into their shells and very much in the same manner as in *Succinea*, little more than the entire surface of the foot being alone seen within the aperture, the edges of the peristome projecting slightly beyond it. While the sensitiveness of the animal to touch may be slight and its habit as described by Dr. Branch, they cannot be said to be much larger than their shells, as remarked by Sallé of *Xanthyx*, and described by Fischer and Crosse, or as described by Dr. Cooper of *Binneia*. The specimens for which we are indebted to Dr. Branch, must have been taken alive in the month of December, and very soon at least after death, before becoming dry, put in the glycerine.

It will be remembered that Guppy considers *Omalonyx* and *Brachyspira* as groups or sections of *Amphibulima*. In a very recent letter he repeats his assurance that "the animals of both *Amphibulima patula* and *pardalina* are very much larger than the shells and quite incapable of retraction into them." His observation agrees, so far as it goes, with that of Dr. Branch, who adds a remark as to the shrinking up of the animals "as they die." This shrinking before death must be accompanied by the exercise of contractile muscular force, and probably further observation will prove that the animal, while in possession of its full vital power, can and does withdraw itself into the shell, and especially, perhaps, in seasons of drought.

The jaw of *A. patula*, of which we subjoin description, has not the accessory plate characteristic of *Succinea*, and which is found in *Omalonyx* and *Brachyspira*; while the latter subgenera therefore belong to the *Succininae*, *Amphibulima* must be associated with the *Helicinae*. By the character of the ribs of the jaw, it is most nearly allied to the

genus *Bulimulus*. The same may be said of *Gæotis* lately examined by us.

Amphibulima patula.—Body obtuse in front, pointed behind, entirely retractile within the peristome, though usually greatly expanded. Mantle simple as in *Succinea*, *Helix*, etc. Base of foot wrinkled transversely, without distinct locomotive disk. Generative orifice? Respiratory orifice?

Jaw slightly arcuate, low, ends attenuated: extremely thin and transparent with prominent transverse striæ; divided longitudinally by about forty-five delicate ribs into so many plate-like sections of the same character as those of *Cylindrella*, *Macroceramus* and many species of *Bulimulus*. No upper triangular median plates as in *Cylindrella*. Margin serrated by extremities of ribs.

The figure we have given of the jaw of *Succinea? appendiculata* Pfr. (Ann. Lyc. Nat. Hist. N. Y., X, pl. ix, fig. 2) offers a correct general idea of the jaw of *Amphibulima patula*. See also our photograph of jaw of *Cylindrella rosea* (Am. Journ. Conch., V, pl. xi, fig. 2) for the character of the ribs and plate-like sections.

Lingual membrane as already described and figured by us from a specimen from Dominica (See Am. Journ. Conch., VII, 186, pl. xvii, figs. 1-2), long and broad, composed of numerous horizontally waving rows of teeth, of the form usual in the *Helicidæ*. Centrals subquadrate, extended at basal angles, narrowing towards the centre, expanding towards the upper edge, which is reflected and tricuspid, extending quite to the base of the tooth; the cusps are stout, the median one bluntly pointed. The lateral teeth are of the same type as the centrals, but unsymmetrical. The marginals are long and narrow, rounded at base, narrowed at apex, reflected and bicuspid; cusps short, stout, and generally a simple modification of those of the laterals. The extreme marginals have irregular teeth, like simple papillæ.

XXI. — *On the Lingual Dentition of Gæotis.*

BY THOS. BLAND AND W. G. BINNEY.

Read January 6, 1873.

[Reprinted from the Annals of the Lyceum of Natural History, N. Y., Vol. x, Oct., 1872.]

THE genus *Gæotis* was described by Shuttleworth,* founded on a curious mollusk from Porto Rico. The lingual dentition was said to be nearly the same as in *Vitrina* and *Zonites*, the teeth arranged in oblique rows, centrals obtusely tri-

*“Lamina lingualis fere ut in *Vitrina* et *Zonites* constituta videtur, papillæ nempe numerosæ in seriebus utrinque obliquis ordinatæ sunt: papilla centrali obtuse tri dentata; mediis vix a centrali diversis; lateralibus autem subulato-productis, arcuatis basi? bifurcatis. An maxilla adsit hæret.” “E formatione linguæ animal videtur sine dubio carnivorum.” Shuttleworth, Bern Mit. 1854, p. 34.

dentate, laterals scarcely differing from the centrals, marginals lengthened, awl-shaped, arcuate, at base ? bifurcate. The presence of a jaw was not verified by Shuttleworth. The character of the dentition was considered such as to denote carnivorous habits of the animal.

This is all the information as to the lingual dentition of *Gæotis* hitherto published. Mörch, indeed, places the genus (Jour. de Conch. 1865, 384) in his section *Odontognatha*, which comprises the Terrestrial Pulmonata furnished with a ribbed jaw, not from any original investigations, but simply from its assumed identity with *Parmacella*, a genus believed to have a ribbed jaw, judging from the obscure figure given by Férussac of the mouth of *Parmacella palliolum* (Hist. t. 8 A, fig. 8). Shuttleworth's description rather indicates the form of dentition figured by us (Land and Fresh Water Shells, I), of many species of *Vitrina*, *Hyalina* and *Zonites*. The bifurcated base of the marginal teeth may even be supposed to be such as we have figured (*l. c.* 17) in the centrals of *Glandina truncata*.

We have long had in our possession the jaw and lingual membrane of a specimen of *Gæotis* from Porto Rico. The animal was received many years ago by one of us (Bland) from the late Mr. Robert Swift, the alcohol in which it was originally preserved evaporated, and the jaw and lingual membrane were, not very long since obtained, by maceration, in a somewhat imperfect condition. Comparing the latter with Shuttleworth's description, we find that at first we had misunderstood his words, which, indeed, are quite liable to mislead, especially in the infelicitous comparison with *Vitrina* and *Zonites*. We give, therefore, a more detailed description and figure, in order to prevent further errors.

Jaw (plate xi, fig. 1) long, low, slightly arcuate, ends attenuated, extremely thin and delicate, transparent: in one single piece, but divided by over forty* delicate ribs into as many plate-like compartments of the type

* Fragments only of the jaw were saved; the largest one we have figured, and from it estimate the whole number of ribs.

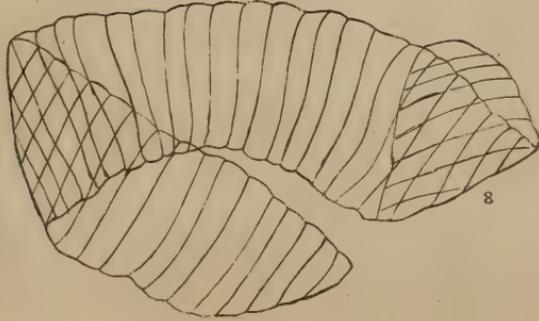
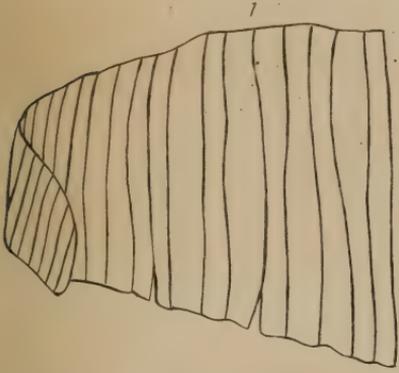
common in *Bulimulus* and *Cylindrella*, but without the upper median triangular plate characteristic of the latter; both margins scarcely serrated by the ends of the ribs.

From our numerous observations on the jaws of *Pulmonata* (see Ann. Lyc. N. H. of N. Y., X, 165), we consider this to be a form of ribbed jaw, the plate-like sections being actually divided by delicate longitudinal ribs. It is to be understood that the jaw is not in separate pieces, as in *Orthalicus* and *Liguus* (see Ibid, p. 168). Our figure of the jaw of *Helix turbiniformis*, Pfr. (Ibid, pl. ii, fig. 2), gives the same type of jaw, though differing in form. That of *Succinea ? appendiculata* (Ibid, X, pl. ix, fig. 2) is still nearer the jaw we are considering.

The lingual membrane is entirely different from what we had supposed from our interpretation of Shuttleworth's description. We recognize no resemblance to that of *Zonites* and *Vitrina*, but rather (in arrangement and shape of teeth and position of cusp) to that figured by us of *Orthalicus zebra* and *undatus* (Amer. Jour. of Conch. 1870, pl. ix, figs. 2, 6, 10, 12,) and *Liguus fasciatus* drawn by Leidy, (Terr. Moll. U. S. II, 270). From these, however, it differs in the development of its cusp, which shares the trifid character, and nearly resembles that of *Helix muscarum* (Am. Jour. Conch. l. c. fig. 4).

Lingual membrane long and broad, composed of numerous rows of teeth arranged *en chevron*. Centrals very long, narrow, obtuse above, incurved at sides, obtusely rounded and expanded at base near which is a short, gouge-shaped, expanded cusp, whose lower edge is bluntly tridentate. Laterals same as centrals in shape, but a little larger, and unsymmetrical from the disproportionate expansion of the outer denticle of the cusp. Marginals same as laterals, but more slender, with more developed and graceful teeth, of which the median is pointed, often bifid. There is much variety in the shape and denticulation of the cusps. The middle denticle is always the smallest.

We find no distinct marginal teeth of the aculeate type noticed by Shuttleworth, but believe he was misled by seeing these teeth in exact profile, when they have somewhat that form as shown in our figure 6. Seen from above,



however, the same teeth retain their subquadrate form, figure 7. Both jaw and lingual membrane, therefore, prove that the genus belongs to the *Helicinae* of our proposed arrangement of Pulmonata (see Ann. Lyc. N. H. of N. Y., l. c. 165), or to the *Helicea* of von Martens. (Die Heliceen, ed. 2.)

By its jaw, *Gæotis* calls to our mind the genus *Amphibulima* (see pl. xi, fig. 8), as well as the shell known as *Succinea? appendiculata* Pfr., whose generic position we have left in doubt (Ibid, X, pl. ix, fig. 2), and many species of *Bulimulus*. We have above shown the resemblance of its lingual dentition to that of *Orthalicus* and *Liguus*, as well as of *Helix muscarum*. It also forcibly reminds one of some of the features of the dentition of *Triboniophorus*.

Our figure 5, plate xi, gives the central and adjacent lateral teeth: fig. 6 an extreme marginal in profile, on a different scale of enlargement: fig. 7 a marginal seen as in fig. 6: fig. 1 the largest fragment saved of the jaw.

XXII. — Note on a curious form of Lingual Dentition in *Physa*.

BY THOS. BLAND AND W. G. BINNEY.

Read January 6, 1873.

WE have received from Governor Rawson specimens in alcohol of a shell apparently belonging to the genus *Physa*, collected at Point á Pitre by M. Schramm. On examining its jaw and lingual dentition, we find both different from what is usual in that genus. The jaw is not at all chevron-shaped,* but is simply slightly arcuate, long, low, ends attenuated. The lingual membrane wants entirely the broad transverse rows of comb-like teeth arranged *en chevron*

* See figure of jaw of *Physa* in Land and Fresh Water Shells of North America, II p. 75, fig. 123.

which are characteristic of *Physa*.* On the other hand, the lingual membrane is long and narrow, with almost horizontal rows of teeth. The centrals are narrow, somewhat expanded at the base, at apex recurved into a slightly produced quinquedentate cusp, the central denticle the largest. The laterals are quadrate, the whole apex recurved into a broad cusp produced almost to the base of the tooth, with one large, inner, stout, pointed denticle which bears on its inner side another small pointed denticle, and two, small, irregular, sharp, side denticles. The marginals are but modifications of the laterals, wider than high, with one bluntly bifid inner, and several small, blunt, irregular side denticles.

The centrals and laterals are like those of *Limnæa*† rather than of *Physa*, the marginals more like those of *Planorbis*‡ but much more quadrate.

In our figure 2 of plate xi, we give one central and several lateral teeth, in fig. 3 one marginal: fig. 4 represents the jaw.

A view of the shell is also given in fig. 9.

We have not been able to determine this species of *Physa*, represented by M. Schramm to be very rare. In some respects it appears to be allied to *P. striata* D'Orb. (Cuba I. 192, Tab. xiii, figs. 14-16), received by that author from M. Ferdinand de Candé, but whether from Martinique or Cuba was not positively known.

EXPLANATION OF PLATE XI.

- Fig. 1. A portion of jaw of *Gæotis* (p. 253.)
 2. *Physa* —? (See p. 255.) One central tooth and two laterals from the lingual membrane.
 3. The same as 2. One marginal tooth.
 4. The same. The jaw.

* See Ibid, p. 81, fig. 138: p. 82, fig. 141. *Physa ampullacea*, Gld. from Colorado Territory, lately collected by Dr. E. Palmer, has the same type of lingual. Dall has detected a more simple form of tooth alternating with the comb-like laterals of *Physa*. See his exhaustive review of *Limnæidæ* etc., in Ann. of Lyc. N. H. of N. Y., IX, 333, for valuable information on the dentition of the fresh water Pulmonates.

† See our figures in the Amer. Jour. of Conch., 1871, pl. xii.

‡ See our figure in Ann. of Lyc. N. H. of N. Y., IX, p. 292.

- Fig. 5. Lingual dentition of *Gaotis*. One central tooth with adjacent laterals.
6. Same as last, but more enlarged. An extreme marginal tooth in profile.
7. Same as 5. An extreme marginal tooth.
8. *Amphibulimæ patula* (see p. 225.) The jaw folded as it appears on the microscope slide, the position taken from its extreme tenuity.
9. *Physa* sp. indet. Shell. Jaw and Lingual dentition. Figs. 2-4.

[Printed at the Salem Press.

[From the Annals of the Lyceum of Natural History of New York,
Vol. 10. May, 1872.]

XII. *Description of a New Species of Mollusc of the
Genus Helicina.*

BY THOMAS BLAND.

Read April 22nd, 1872.

Helicina gloynei, nov. sp.

T. subglobosa, tenuis, pellucida, pallide cornea, epidermide lineis spirali-
bus, confertis, pilosulis induta, sub epidermidem nitida, striatula, lineis
microscopicis concentricis decussatula; spira parum elevata, apice acuti-
cusculâ, rufescente; anfr. $4\frac{1}{2}$, convexiusculi, ultimus rotundatus, seri-

ebus 5 angustis fusco-pilosis longioribus ornatus, basi impressus; columella breviter recedens, compressa, alba, callum tenuem, album emittens; apertura vix obliqua, semicircularis; perist. tenue, margine dextro breviter reflexo, basali cum columellâ angulum formante. Opere. ?

Shell subglobose, thin, pellucid, pale horn colored, with epidermis having closely set spiral lines of short hairs, beneath the epidermis shining, delicately striate, and with microscopic spiral lines; spire slightly elevated, apex rather pointed and tinged with reddish color; whorls $4\frac{1}{2}$ rather convex, the last rounded and ornamented with five spiral series of longer dark hairs, base impressed; columella shortly receding, compressed, and with thin white callus over the umbilical region; aperture scarcely oblique, semicircular; perist. thin, the right margin slightly reflected, basal margin forming an angle with the columella.

Diam. maj. 9, min. 7, mill. Alt. 5, mill.

Habitat. Newcastle, in the Parish of St. Andrews, Jamaica, West Indies, at an elevation of about 4,000 feet above the sea.

Remarks. This interesting species is very unlike any other hitherto found in Jamaica. It has the hirsute character of *Alcudia hirsuta* C. B. Adams, of that island, and in that respect, as well as in general form has, to a remarkable degree, the aspect of a *Schasicheila*, without, however, the incised peristome.

I am indebted for this, as well as many other species, to my valued correspondent Mr. C. P. Gloyne, R. E., who refers to it, the specific name having been communicated by me, in his Notes on the Land Shells of Jamaica, Jour. de Conchyliologie XII, p. 44. January, 1872.

[Reprinted from the Annals of Lyceum of Natural History of N. Y.,
Vol. 10, Nos. 10-11, March-June, 1873.]

XXVIII.—*On the Physical Geography of, and the Distribution of Terrestrial Mollusca in, the Bahama Islands.*

BY THOMAS BLAND.

Read April 28, 1873.

THE northern end of the extensive and remarkable group called the Bahama, or Lucayos Islands, lies opposite southern Florida, and from this point the islands stretch off in a double series, nearly parallel to the trend of Cuba and San Domingo, and terminate properly in the Turk's Island Bank, on which are the last, and most easterly, of this chain of inhabited islands, which extends about 600 miles, from within 70 miles of the coast of Florida, to within 100 miles of that of San Domingo.

The following brief description of the Banks and Islands, defined generally by the 100-fathom line of soundings, is taken principally from the valuable "Report on the Bahamas," by Governor Rawson, which report accompanied the official "Blue Book" of that colony, for 1864; the soundings from the charts issued by the U. S. Coast Survey, and the Hydrographic Office of the U. S. Navy.

The Little Bahama Bank.—This is the most northerly bank; its northwestern point, Matanilla Reef, is 70 miles from the Florida shore, sepa-

rated from it by the Gulf of Florida, the greatest depth of which, on the line of the axis of the Gulf Stream, off the western edge of the Reef, is 344 fathoms (2,064 feet). The area of the Bank is about 5,560 square miles, of which the islands occupy about 1,200; it is separated from the Great Bahama Bank by the northwestern and northeastern Providence Channels, but is not more than 45 miles from any part of it; at the nearest point only 15 miles.

The Little Bank contains only two islands of considerable size; Abaco (divided by a narrow channel into Great and Little Abaco) and Grand Bahama. "Hole in the Wall," at the southeast end of Great Abaco, is 568 miles distant from Cape Hatteras.

The Great Bahama Bank.—This Bank, south and southeast of the Little Bank, is separated from it by the Providence Channels, from Florida by the Gulf of Florida, by the Santaren Channel from Salt Key Bank, and by the Nicholas or Old Bahama Channel from Cuba, from which Key San Domingo, the southern extremity of the Bank, is distant about 40 miles.

The greatest depth of the Gulf of Florida between Cape Florida and Gun Key, on the western side of the Great Bank, is 309 fathoms (1,854 feet), and more southerly, between Carysfort Reef and Orange Key (distance about 60 miles), 475 fathoms (2,850 feet). The greatest depth of the Santaren Channel, between the Great Bank and Anguilla Island on the Salt Key Bank (distance about 27 miles), is 386 fathoms (2,316 feet).

The Great Bank has an area of about 37,000 square miles, of which the islands upon it occupy about 2,357 square miles.

This Bank is penetrated at its centre by a deep Sound, the Gulf of Providence (known as the "Tongue of the Ocean"), for a distance of 110 miles, with an average width of 25 to 30 miles, approached from the northwest and northeast by the two Providence Channels.

The principal islands on the Great Bank are as follows:—

The Biminis, two small Keys on the western side, about 45 miles from Cape Florida. On the western edge of the Gulf of Providence, skirting the Bank, is Andros Island, the largest of the group (area 1,600 square miles), and to the northeast of it, the Berry Islands.

East of the Gulf of Providence and at the northeast and east edge of the Bank, is Eleuthera, followed in the same direction, southeast, and then south, by a succession of long, narrow islands, viz., San Salvador or Cat Island,* Long Island and Ragged Island.

On the north edge of the Bank, at the eastern entrance of the Gulf of Providence, is New Providence, and to the southeast of it, Exuma, with its chain of Keys extending 100 miles, lying on the eastern edge of the bank and on the western side of Exuma Sound, which breaks the continuity of the Bank between San Salvador and Long Island, and runs about 100 miles in a northwesterly direction, with an average width of 40 miles.

* Watling's Island is, by some, called San Salvador, but in giving that name to Cat Island I follow Governor Rawson.

Salt Key Bank.—This Bank lies in the triangular interval west of the Great Bank, between it, Florida and Cuba. Its area is about 1,430 square miles; there are no inhabited Keys upon it.

Elbow Key, on its west side is about 50 miles distant from Sombrero Key (Florida Keys), and the greatest depth of water between them is 500 fathoms (3,000 feet). Salt Key, on the southwest of the Bank, is about 30 miles from Bahia de Cadiz (Keys north of Cuba), with depth between them of 534 fathoms (3,204 feet). The distance and depth of the Santaren Channel, between Anguilla Island (Salt Key Bank) and the Great Bank, have been already stated.

Islands east of, and between, the Great Bank and the Caicos Bank.—To the eastward of the Great Bank, and separated from it and from each other by deep water, are Watling's Island (40 miles east of the south end of San Salvador), Rum Key (24 miles from the northeast end of Long Island) and Conception Island, which is between San Salvador and Rum Key.

Southeast of Long Island the chain of islands is continued to the southeast and south, as follows:—On a distinct Bank, separated from Long Island on the Great Bank by the Crooked Island Passage (25 miles in width), are Crooked Island, Acklin's Island, with Castle Island, of small size, at its southern extremity, and Fortune Island or Long Key.

To the northeast of Crooked Island lies Samana or Atwood Key (uninhabited), and to the east of Acklin's Island there is a cluster of small islets, called Plana, or French Keys. To the southeast, about 45 miles from Acklin's Island, is Mayaguana.

Caicos and Turk Islands Banks.—In the same southeasterly direction is the Caicos Bank (on which are several islands), separated from Mayaguana by the Caicos Channel, about 30 miles in width, and at a short distance to the southeast, on another Bank, with the Turk Passage between it and the Caicos Bank, lie the Turk Islands.

Mouchoir Carré, Silver and Navidad Banks.—These three Banks of coral and sand, separated by deep water channels of 30 to 40 miles in width, extend the Bahama chain of islands to the southeast, about 100 miles, viz., Mouchoir Carré, Silver Bank, which is about 36 miles north of Cape Viejo Francés (San Domingo) and Navidad Bank, the southeast end of which lies north-northeast about 32 miles from Cape Cabron, the nearest part of San Domingo.

Great and Little Inagua, or Heneagua—Detached from all the other islands, from 60 to 70 miles south of Acklin's Island and Mayaguana, nearly in the latitude of the Turk Islands, are Great and Little Inagua, standing, I believe, on one Bank. Great Inagua (area 530 square miles) is one of the largest and finest of the Bahama group. These islands, north of, and opposite the Windward Passage, between Cuba and San Domingo, are about 65 miles from the northwestern extremity of the latter and about 50 miles from Point Maysi the northwestern end of the former.

Lieut. Nelson (Proc. Geo. Soc., IX, 203) mentions that, generally speaking, the islands are on the windward sides of their respective groups and banks. The exceptions referred to by Mr. Rawson (Report, 11) are Grand Bahama on the southern side of the Little Bank, New Providence on the northern side, and the Biminis on the northwestern edge of the Great Bank.

No part of any of the islands exceeds the height of 200 feet, generally much less. The shores of a few present an abrupt face, or cliff, not exceeding 40 feet in height. They are almost universally environed with reefs or shelves of rock, which extend often to a considerable distance, and usually terminate abruptly. Professor Agassiz (Bulletin Mus. Comp. Zool., I, 271) observes that "the Bahamas and the reefs to the northeast of Cuba exhibit very abrupt slopes and a great depth is reached close to the shores of the Banks, so that the Bahamas resemble the coral reefs of the Pacific much more than the reefs of the coast of Florida."

Dana refers to the Bahamas as being coral reefs and reef islands, essentially like atoll reefs.

The geological formation of these islands appears to be very similar to that of Bermuda; their form and surface condition, being due to a great extent to the prevailing winds and currents, but owing much, probably, as remarked by Dana, with reference to the Bermudas, "to the configuration of the land upon which the coral reefs were built up."

Nelson (*l.c.*) explaining his reasons for calling the Bahamas the *Gulf Stream Delta*, refers to it as,—

"A *Delta* which has been apparently thrown down by the waters of the Gulf Stream on their receiving a check from those of the Atlantic as they emerge in full strength from the Gulf of Mexico." He adds, "although such deposits will be greatly accelerated in formation, and gain much stability, by finding ready-made hilly ground under the sea, nevertheless they can be formed without this; but taking into account the remarkably symmetrical relation between the sweep of the Bahamas and that of the submarine mountain range of the Leeward Islands (with which they form a continuous S-like series), as well as the very general absence of shifting

sands, it may be surmised that the Bahama Delta *has had* the advantage of such ready-made base and submarine nucleus of aggregation."

With respect to the present surface condition of the Bahamas, as compared with that of the Bermudas, the evidence lately made known by Mr. J. Matthew Jones of subsidence in the latter should not pass unnoticed.

In a communication published in "Nature" (Aug. 1, 1872), Mr. Jones explains that about two years ago submarine blastings were carried on at the entrance of Hamilton harbor, and at a depth of over six fathoms a cavern was broken into which contained stalactites and red earth. Also, that during the past two years similar blastings had taken place inside an artificial harbor, situate at the western extremity of the islands, for the purpose of forming a bed of sufficient depth for the reception of the great dock constructed several years ago, in England.

Mr. Jones thus states and comments on the results:—

"The excavations extended to a depth of 52 feet below low water mark. At 46 feet occurred a layer of red earth 2 feet in thickness, containing remains of cedar trees, which layer rested upon a bed of compact calcareous sandstone. Here we have the first satisfactory evidence of the submergence of an extensive deposit of soil once upon the surface, and that to the depth of 48 feet below the present low water level, which consequently grants an equal elevation above it in former times. Now on carefully surveying the Bermuda chart, we find that an elevation of 48 feet will bring the whole space which intervenes between the present land and the barrier reef, now covered with water, above the water level. This attained, what more is required to prove the former extent of the island group, before the present submergence, to the present barrier reef?

Mr. Jones promises further evidence on this interesting subject.

Whether any similar proofs of subsidence have been noticed in the Bahamas, I am unable to state.

I now propose to consider the evidence afforded by the distribution of the Land Shells on the Bahama Islands.

The total number of species known to inhabit the Bahamas is about 80, of which a few species have not yet been satisfactorily determined or described;* 20 belong to operculate genera, and the remainder are inoperculates.

The operculate genera represented are *Ctenopoma*, *Cyclostomus*, *Cistula*,† **CHONDROPOMA**, *Trochatella*, **HELICINA** *Schasicheila* and *Alcadia*.

The occurrence on the Great Bank, in New Providence and Eleuthera, of a *Schasicheila* (*S. Bahamensis* Pf.), is singular, inasmuch as the genus is not otherwise represented in the West Indies. Of the four other known species, three belong to the Mexican fauna; the habitat of *S. minuscula* Pf. is unknown.

The operculates considered, the land shell fauna of the Bahamas is essentially West Indian, and that of the Great Bank closely allied to the Cuban fauna.

Of the five species (exclusive of *Cistula scabrosa*) on the Great Bank, all of which are confined to it, the three following are also found in Cuba; *Chondropoma canescens* Pfr., *Trochatella rupestris* Pfr., and *Alcadia minima* Orb.

There are no Cuban operculate species east of the Great Bank. Several species of the Crooked Island Bank occur in Inagua, and one on the Turk Bank, while three species are common to the latter and Inagua.

With respect to the inoperculate species, omitting several, the affinities of which have not been determined, the following genera and groups are represented, viz.: *Zonites* (*Conulus?*); *Helix* (*Microphysa*, *Polygyra*, *Thelidomus*, **PLAGIPTYCHA** and **POLYMITA**); *Cylindrella* s. s., one species; *Macroceramus*, two species; *Bulinulus* (*Liostracus*, *Mesembrinus* and *Leptomerus*, one species of each); *Cionella* (*Lepitaria*, one species); *Stenogyra* (*Opeas*, *Subulina*, *Melan-*

* A complete catalogue of the species, showing their distribution, is in course of preparation and will shortly be published.

† The single species *C. scabrosa* Humph., referred by Sowerby to Providence Island, and by Gray to Jamaica, I do not know. The names of genera or groups (of the inoperculates also), most numerously represented, are printed in capital letters.

iella); *Pupa* (STROPHIA and *Leucochila*); *Orthalicus*; *Succinea*; *Glandina* (*Oleacina*, one species).

Judging from the inoperculates, as well as the operculates, the West Indian character of the Bahama land shell fauna is manifest.

The following is a list of the inoperculate species common to the Bahamas and the adjacent continent, Bermuda and certain of the West India Islands. The distribution in the Bahamas is indicated by the use of the abbreviations L. and Gt. Bk. (Little and Great Bank); Is. East (islands between the Great and Caicos Banks); Turk Is.; Gt. and L. Inagua (Great and Little Inagua).

ZONITES.

Conulus? Gundlachi Pfr., . . . Gt. Bk., . . . Florida, Cuba,
Haiti, Porto Rico.

HELIX.

Microphysa vortex Pfr., . . . Gt. Bk., . . . Florida, Cuba,
Haiti, Porto Rico.

Microphysa Boothiana Pfr., . . . Gt. Bk., . . . Cuba, Haiti.

Polygyra microdonta Desh., . . . Gt. Bk., . . . Bermuda.

Thelidomus provisoria Pfr., . . . Gt. Bk., . . . Cuba.

Plagioptycha Albersiana Pfr., . . . Gt. Inagua, Turk Is., Haiti.

Plagioptycha disculus Desh., . . . Turk Is., . . . Haiti.

Polymita varians Mke., . . . L. and Gt. Bk.,
Is. East., . . . Florida Keys.

MACROCERAMUS *Gossei* Pfr., . . . Gt. Bk., . . . Florida, Cuba.

BULIMULUS.

Leptomerus sepulcralis Poey, . . . Gt. Bk., . . . Cuba.

STENOGYRA.

Opeas subula Pfr., Gt. Bk., . . . Florida, Cuba,
Haiti, Porto Rico.

Opeas octonoides C. B. Ad., . . . Gt. Bk., . . . Florida, Cuba,
Porto Rico.

Subulina octona Ch., Gt. Bk., . . . Florida, Cuba,
Haiti, etc.

Melaniella gracillima Pfr., . . . Gt. Bk., . . . Florida, Cuba,
St. Thomas.

PUPA.

<i>Strophia mumia</i> Brug., . . .	L. Bk.,	Cuba.
	Turk Is.	
<i>Strophia iostoma</i> Pfr.,	Turk Is., Gt. Inagua, .	Cuba.
<i>Strophia incana</i> Binn.,	Is. East, . . .	Florida Keys.
		Cuba.
<i>Strophia marmorata</i> Pfr.,	Gt. Bk.,	Cuba.
<i>Strophia cyclostoma</i> Küst.,	Gt. Bk.,	Cuba.
<i>Strophia Cumingiana</i> Pfr.,	Is. East,	Cuba.
<i>Leucochila fallax</i> * Say,	Is. East,	Bermuda,
	Turk Is., . . .	Florida, Cuba,
	Gt. Inagua,	Haiti.
<i>Leucochila pellucida</i> Pfr.,	Turk Is., Gt. Bk., Bermuda, Texas?	Cuba, Haiti.
ORTHALICUS <i>undatus</i> † Brug., . .	Gt. Bk., . . .	Florida, Cuba.
SUCCINEA <i>luteola</i> Gould,	Gt. Bk., . . .	Texas, Florida,
		Haiti.

GLANDINA.

<i>Oleacina solidula</i> Pfr.,	Gt. Bk.,	Cuba.
--	--------------------	-------

The distribution shown in the foregoing list proves in a marked manner the alliance of the Bahamas, and of the Great Bank especially, with Cuba. The numerous representatives of *Polymita* and of *Strophia*, and the occurrence of *Polygyra*, *Thelidomus* and *Melaniella* on the Great Bank only (all three groups unrepresented in Haiti) afford similar proof, while the development of *Plagioptycha* in the Turk Islands and Great Inagua, with the fact that *P. Albersiana* and *disculus* are common to them and Haiti, appears to indicate their connection with the latter island.

Dr. Cleve (Geology of the N. E. West India Islands, Stockholm, 1871) mentions that Anegada (on the Virgin Bank) is geologically in all respects different from the other Virgin Islands, that it lies northwest to southeast (the others extending from west to east) and has a close resemblance to the Bahamas. The land shells of Anegada, however, in common with those of the other islands on the

* I include, for the present purpose, the forms known as *marginatus* and *nitidulus*.

† A single specimen in the cabinet of Mr. Rawson, said to be from the Biminis.

Virgin Bank, have no special relations with those of the Bahamas. Most of the Anegada species occur in other of the Virgin Islands and in Porto Rico, none of them in the Bahamas.

In connection with the facts stated as to the distribution of terrestrial shells in the Bahama Islands, and the inferences with regard to their former more intimate relations with each other and with adjacent lands, the views of Prof. Dana (Corals and Coral Islands, 1872) are of great value. In the chapter vi (p. 348), entitled "Geological Conclusions," Dana considers at some length "The Oceanic Coral Island Subsidence," and after treating the subject with reference more especially to the Pacific tropics, he says (p. 368):—

"The changes which took place cotemporaneously in the Atlantic tropics are very imperfectly recorded. The Bahamas show by their form and position that they cover a submerged land of large area, stretching over six hundred miles from northwest to southeast. The long line of reefs and the Florida Keys, trending far away from the land of southern Florida, are evidence that this Florida region participated in the downward movement though to a less extent than the Bahamas. Again, the islands of the West Indies diminish in size to the eastward, being quite small in the long line that look out upon the blank ocean, just as if the subsidence increased in that direction. Finally, the Atlantic beyond is water only, as if it had been made a blank by the sinking of its lands.

"Thus the size of the islands as well as the existence of coral banks, and also the blankness of the ocean's surface, all appear to bear evidence to a great subsidence.

"The peninsula of Florida, Cuba and the Bahamas look, as they lie together, as if all were once part of a greater Florida, or southeastern prolongation of the continent. The northwestern and southwestern trends, characterizing the great features of the American continent, run through the whole like a warp and woof structure binding them together in one system; the former trend, the northwest, existing in Florida and the Bahamas, and the main line of Cuba; and the latter course, the west-southwest, in cross lines of islands in the Bahamas (one at the north extremity, another in the line of Nassau, and others to the southeast), on the high lands of northwestern and southeastern Cuba, and in the Florida line of reefs, and even further, in a submerged ridge between Florida and Cuba. This combination of the two continental trends shows that the lands are one in system, if they were never one in continuous dry land.

"We can not here infer that there was a *regular* increase of subsidence from Florida eastward; or that Florida and Cuba participated in it equally

with the intermediate and adjoining seas; for the facts in the Pacific have shown that the subsiding oceanic area had its nearly parallel bands of greater and less subsidence; that areas of greatest sinking alternated with others of less, as explained on page 326; and that the groups of high islands are along the bands of least sinking. So in the Atlantic, the subsidence was probably much greater between Florida and Cuba than in the peninsula of Florida itself; and greater along the Caribbean Sea parallel with Cuba, as well as along the Bahama reefs, than in Cuba.

“The position of the lonely Bermuda atoll confirms these deductions. Its solitary state is reason for suspecting that great changes have taken place about it; for it is not natural for islands to be alone. The tongue of warm water, due to the Gulf Stream, in which the Bermudas lie, is narrow, and an island a hundred miles or more distant to the northeast-by-east, or in the line of its trend (p. 219), if experiencing the same subsidence that made the Bermuda land an atoll, would have disappeared without a coral monument to bear record to its former existence. Twenty miles to the southwest-by-west from the Bermudas, there are two submerged banks, twenty to forty-seven fathoms under water, showing that the Bermudas are not completely alone, and demonstrating that they cover a summit in a range of heights; and it may have been a long range.”

The facts regarding the diminution in size of the islands of the West Indies to the eastward, are of peculiar interest, not only as affording conclusive evidence of the greater subsidence in that direction, but in connection with geographical distribution.

The banks and islands forming the long Bahama chain diminish in size to the southeast, where are situated at its termination the submerged Mouchoir Carré, Silver and Navidad Banks. In a similar manner the submerged Virgin Island Bank (with Anegada on its northeastern extremity, geologically, in the opinion of Dr. Cleve, resembling the Bahamas), Sombrero and the Anguilla Bank, terminate the chain of the West Indies (parallel with the Bahamas) eastward from Cuba.

In the caves of Anguilla the remains of large extinct mammalia are found, which must have inhabited a far more extensive area, subsequently broken up by subsidence.

Packard (*Amer. Nat.*, 1872) remarks, “there is every probability that the separation of these islands (of the east-

ern part of the West Indies) took place at a late period of time, and probably subsequent to the spread of the post-pliocene fauna over North America.”*

Dr. Cleve (*l. c.*) observes that “the Bahama Islands, the Island of Anegada, and a part of Barbuda belong to a very recent period.”†

The same author (*l. c.* 18), referring to the “Leeward Islands,” states as follows:—

“The Islands north of Guadaloupe form two parallel chains from northwest to southeast. The western chain commences with *Saba* and consists of *St. Eustatius*, *St. Kitts*, *Nevis*, *Redonda* and *Montserrat*. All of those islands are volcanos and if the line were extended farther to the North it would reach the island of Anegada, of post-pliocene date, and all the volcanos seem to be of the same or nearly the same geological time. The Bahama Islands, which are also most probably of post-pliocene date, have the same direction and seem to be the continuation of the same or of a parallel line of elevation. East of the volcanic range is another completely different range of islands. They are not volcanic and commence with *Sombbrero* comprising *Anguilla*, *St. Martin*, *St. Bartholomew*, *Barbuda* and *Antigua*. All of these islands are of the tertiary age, *eocene*, *miocene* and *pliocene*.”

In his “Summary of the Geology of the West Indies” (*l. c.* 47), Dr. Cleve says:—

“From the facts exposed above it may consequently be inferred, that of the two prevailing lines of elevation in the West Indies, the one running from west to east originated before the miocene time, and that the other from northwest to southeast, commencing with the Bahamas and continuing in the same direction down to Trinidad, was formed after the miocene time.”

While considering the facts, and geological grouping of the Islands quoted above from Dr. Cleve’s paper, it should be remembered that the land shell fauna of *Saba*, of *St. Eustatius*, *St. Kitts* and *Nevis* (all three on one Bank) and of *Redonda* and *Montserrat*, and of *Barbuda* and *Antigua* (the

*See also Cope, Proc. Acad. Nat. Sci. Phil., 1868, and Bland, Proc. Amer. Phil. Soc. 1871.

†*Helicina convexa* is common to Bermuda and Barbuda.

last two on the same Bank) is, in common with most of the islands to the south, to and inclusive of Trinidad, distinct from the fauna of the islands between and inclusive of the Bahamas and Cuba, and the Anguilla Bank, on which are Anguilla, St. Martin and St. Bartholomew.*

This difference of the faunas, and the well defined line of their separation, must be considered in connection with the past and present geological history of the Islands.

The distribution of the species of the genera *Macroceramus* and *Strophia* illustrates in a marked manner the distinctness of the two faunas just mentioned. *Macroceramus* has two species in the Bahamas (1 common to the Great Bank, Florida and Cuba, *M. Gossei*, being the only species found in Jamaica); 36 in Cuba, and 10 in Haiti of which 1 (*M. Gundlachi*) occurs in both.

There are two other species only in the islands between and inclusive of Porto Rico and those on the Anguilla Bank, *M. signatus* which besides Haiti, is found in Tortola, Necker Island and Anegada, all on the Virgin Bank, and in Anguilla and St. Bartholomew on the Anguilla Bank; *M. microdon* occurs in Porto Rico, Vieque, St. Thomas, Tortola and Anegada. The genus is not represented in St. Croix, and not in any of the islands south of the Anguilla Bank.

Strophia has 16-18 species in the Bahamas of which 1 is also in the Florida Keys, and at least 6 in Cuba; 17 in Cuba; none in Jamaica; 2 in Haiti, of which one, *S. striatella*, occurs in Cuba, Porto Rico, Necker Island and Anegada, and the other, *S. microstoma*, is found also in Cuba, Haiti and Porto Rico (*vide* Pfr.). Remains of a fossil species, undeterminable, are noticed in Sombrero, and a fossil species in St. Croix. There is no representative of the genus on the Anguilla Bank or to the south of it.

The exceptions are curious, *Macroceramus Gossei* and *Strophia uva* are found in Curaçao! †

* See Bland, Proc. Amer. Phil. Soc., *l. c.*

† I desire to acknowledge my obligations for specimens and the means generally

Dana as already quoted, refers to parallel bands of greater and less subsidence in the Pacific Ocean, and to analogous conditions in the Atlantic;—the subsidence was probably, he says, “much greater between Florida and Cuba than in the Peninsula of Florida itself; and greater along the Caribbean sea parallel with Cuba, as well as along the Bahama reefs, than in Cuba.” Recent soundings show in these respects the following facts:

The greatest depth in the Gulf of Florida, between Key West and Havana is within 5 miles of the latter, 800 fathoms (4,800 feet), and I have already stated that there is a depth in the Nicholas Channel, between Salt Key Bank and Cuba of 534 fathoms (3,204 feet).

Between Cuba and the east end of Jamaica the depth is 1,244 fathoms (7,464 feet). Eastward of Jamaica, along the southern side of Haiti, in about the latitude of Beata Island, great depths have been ascertained, — one sounding west of that Island gave 2,136 fathoms (12,816 feet), and one to the eastward of it 1,840 fathoms (11,040 feet). The greater subsidence still further to the east, between the Virgin Bank and St. Croix, may be inferred from the enormous depth there found of no less than 2,580 fathoms (15,480 feet).

A line of soundings from the south side of Jamaica and east of the Pedro Bank, across the Caribbean Sea to Aspinwall (a distance of about 550 miles), shows the instructive fact that, with no very considerable exception, the sea bottom slopes gradually from Jamaica towards the coast of the Isthmus of Panama. About 60 miles from Manzanilla Point (N.E. of Aspinwall), the depth is 1,215 fathoms (7,290 feet). The bottom then rises comparatively rapidly, — the depth at about 40 miles from Aspinwall being 677 fathoms (4,062 feet), and at about 20 miles, 227 fathoms (1,362 feet).

of studying the land shells of the Bahamas, to the late Mr. Wm. Cooper, Dr. Bryant, and Mr. Robert Swift: also to Mr. W. W. Miller, Mr. Daniel Sargent, of Inagua, and Dr. Weinland, but especially to Mr. Rawson W. Rawson formerly Governor of the Bahamas, and now of Barbadoes and the Windward Islands.

In connection with the relations of the land shell faunas of the islands on the north side of the Caribbean Sea, I may mention that the greatest depth between the coast of Yucatan and Cape San Antonio, the western extremity of Cuba, about midway between the two, is 1,164 fathoms (6,984 feet),*—between the east end of Jamaica and the west end of Haiti (so far as is yet known), 600 fathoms (3,600 feet), and north of Mona Island, in the Mona Passage (between Haiti and Porto Rico) 250 fathoms (1500 feet). I postpone comparison of the faunas of the islands and the adjacent parts of the North American continent, but in regard to the depth between Haiti and Jamaica on the west side, and Porto Rico on the east it is noticeable, that while the fauna of Haiti has very little relation with that of Jamaica, it has much alliance with that of Porto Rico.

*I am indebted to the kindness of Professor Peirce, Superintendent of the U. S. Coast Survey, and of Professor Henry, of the Smithsonian Institution, for full particulars of the deep-sea soundings between Cape Catoche and Cape San Antonio, ascertained on the survey in 1872.

Oct. 1873

ead-color, feathered in front about half way below the joint, protected beneath by ten large transverse scales. Toes dark lead-color, large. Claws black, and strong.

The female does not differ much from the male in the general appearance of the plumage, is considerably larger, as usual with the birds of prey. The back is rather lighter brown, the white spots larger.

Tail darker, more of an umber tint on the middle feathers, which are edged and tipped with white. The forehead is white, but the feathers of the head and neck are tipped with small lanceolate spots of brown. Under parts entirely white, with fewer spots on the flanks than the male, the tarsi and feet more robust, and of a similar-color.

Dimensions.—Male, total length $20\frac{1}{2}$ inches, tail 9 inches. Female, total length $22\frac{1}{2}$ inches, tail $9\frac{1}{2}$ inches.

The above description is made from two specimens, male and female, collected in Winnebago County, Iowa, by Mr. John Krider of Philadelphia, in September, 1872, and carefully prepared by that gentleman.

He mentioned having seen several others, and described them as having the habits and manner of flight common to the buzzard family, and, from their being noticed in the autumn, were possibly migrating from more northern breeding-grounds. During a previous visit to the same locality, in 1871, he saw a specimen evidently similar to these, but was unable to secure it. Being informed by residents of the country that the appearance of a "white hawk" there was not an unusual occurrence, he felt confident of ultimately procuring one, and has not been disappointed.

Being convinced that it is undescribed, I have named it in honor of the veteran naturalist to whom we are indebted for the discovery.

Spec. in Mus. Acad. Nat. Sciences, Philadelphia.

ON THE LINGUAL DENTITION AND JAW OF CERTAIN TERRESTRIAL
PULMONATA FROM THE UNITED STATES, WITH REMARKS ON THEIR
SYSTEMATIC VALUE.

BY THOMAS BLAND AND W. G. BINNEY.

The character of the jaw and lingual dentition of the various genera and subgenera of our land shells is now so well known, and apparently so constant, that we have not thought it necessary to give full descriptions in each case. We simply refer to a published description or figure under each genus or subgenus, unless some unusual feature has been observed. The number of ribs upon the jaw is given approximately when there is a difficulty in deciding whether certain stages of thickening of the material of the jaw shall be counted as rudimentary ribs or not.

MACROCYCLIS DURANTI, Newcomb.

Los Angeles, California, Mr. Henry Hemphill.

On examining the lingual membrane, we find it does not agree with that of *Hyalina* or *Zonites*, but with that of *Macrocyclus Vancouverensis*, *sportella* and *concava*. The species must therefore be recognized as a *Macrocyclus*.

The jaw was injured in extraction and imperfectly examined. It seems, however, to have the usual characteristics of the genus.

LIMAX CAMPESTRIS, Binney.

New Jersey, W. G. Binney.

Jaw and lingual membrane as usual in the genus.

ZONITES LIMATULUS, Ward.

Near Cincinnati, Ohio. Mr. A. G. Wetherby.

The species has the longitudinal furrows along the side, above the foot, and the caudal mucus slit, as in *Zonites suppressus*; (see our fig. 524 on p. 292 of Land and Fresh-water Shells of N. A., I.) In two individuals examined we found the sac and dart as figured by Leidy in *Z. ligerus* (Terr. Moll., I, pl. xii. fig. 3).

Jaw and lingual membrane as usual in the genus.

VITRINA PFEIFFERI, Newcomb.

Lake Tahoe, California, Dr. J. G. Cooper.

Jaw and lingual membrane as usual in the genus (see our fig. 21, 22, on p. 26, l. c.). About ten lateral teeth. Marginals bluntly bifid as usual.

VITRINA EXILIS, Morel.

Petropaulouski, W. H. Dall. The species is also found in Alaska.

Jaw and lingual membrane as usual in the genus, the former with ends somewhat recurved as in our figure of *Zonites arboreus* (l. c. p. 33). About seven lateral teeth.

HELIX MOOREANA, W. G. Binney. (*Polygyra*.)

Bosque County, Texas. Mr. Hugo W. Ericsson.

Jaw¹ with about fifteen, adjoining, broad ribs, denticulating either margin.

Lingual membrane as in *Polygyra*.¹

HELIX HAZARDI, Bland. (*Polygyra*.)

Munroe Co., Tennessee, Miss Annie E. Law.

Jaw as usual in *Polygyra*, ribs adjoining, stout, denticulating either margin.

Lingual membrane as in *H. auriculata* (see our fig. l. c.).

HELIX AURIFORMIS, Bland. (*Polygyra*.)

Savannah, Georgia.

Jaw with ribs as usual in the subgenus—see last species.

Lingual membrane as usual in the subgenus. (See *H. Mooreana*, above.)

HELIX HIRSUTA, Say. (*Stenotrema*.)

New Jersey, T. Bland.

Jaw as usual in the subgenus.² Lingual membrane already described by us. (l. c. p. 119, fig. 197.)

HELIX SPINOSA, Lea. (*Stenotrema*.)

Philadelphia, Munroe Co., Tenn. Miss Annie E. Law.

Jaw as usual in *Stenotrema*.²

Lingual membrane as usual in the subgenus.²

HELIX RUGELI, Shuttleworth. (*Triodopsis*.)

Philadelphia, Munroe Co., Tenn. Miss Annie E. Law.

¹ See our figures l. c. p. 87 and 92.

² The jaw in *Stenotrema* is arcuate, ends blunt, anterior surface with crowded, broad ribs, denticulating either margin. See our figure of the jaw of *H. monodon*, l. c. p. 122, fig. 204. For lingual membrane, see fig. 205.

Jaw with about ten ribs; as usual in the subgenus.¹

Lingual dentition as usual.¹

HELIX FALLAX, Say. (*Triodopsis*.)

Philadelphia, Munroe Co., Tenn. Miss Annie E. Law.

Lingual membrane and jaw as usual in *Triodopsis*,¹ the latter with about fourteen ribs.

HELIX TRIDENTATA, Say. (*Triodopsis*.)

Same locality as last.

Jaw as usual in the subgenus.¹

Lingual membrane already figured by us. (l. c. fig. 220, p. 130.)

HELIX HOPETONENSIS, Shuttleworth. (*Triodopsis*.)

Charleston, S. C. Mr. W. G. Mazyck.

Jaw with over ten ribs; as usual in the subgenus.¹

Lingual membrane as usual.

HELIX DENTIFERA, Binney. (*Mesodon*.)

Mohawk, New York. Dr. James Lewis.

Jaw with fourteen ribs; as usual in the subgenus.²

Lingual membrane as usual.² The marginal teeth remind us of those of *Helix thyroides* (l. c. p. 148, fig. 252), but the inner denticle is more obtusely pointed. The figure referred to is liable to mislead. The marginals are subquadrate (not aculeate), with one long, oblique, sharply pointed denticle, much more produced than usual in the genus.

HELIX ROËMERI, Pfr. (*Mesodon*.)

Bosque Co., Texas. Mr. Hugo W. Ericsson.

Animal externally as in *H. thyroides*, *dentifera*, etc.

Jaw and lingual membrane as usual in the subgenus,² the former with over seven ribs.

HELIX ELEVATA, Say. (*Mesodon*.)

Philadelphia, Munroe Co., Tenn. Miss Annie E. Law.

¹ In *Triodopsis* the jaw is arcuate, ends blunt, anterior surface with stout, adjoining ribs, which denticulate either margin. See our fig. 214, p. 127, l. c. For lingual dentition, see fig. 215.

² In *Mesodon* the jaw is arcuate, ends blunt; anterior surface with stout, separated ribs, denticulating either margin. See our fig. 231, on p. 137, l. c. The lingual dentition is figured on p. 138, fig. 232. The central and lateral teeth are obtuse, short, stout, with obsolete side denticles to the reflected cusps.

Lingual membrane and jaw as usual in the subgenus,¹ the latter with over twelve ribs.

HELIX GERMANA, Gould. (*Mesodon*.)

California, Mr. Henry Hemphill.

Jaw more resembling the type usual in the subgenus *Stenotrema* than *Mesodon*, the ribs, eleven in number, being broad and crowded.

Lingual membrane as usual in *Helix*.

There are forms of *H. germana* closely connecting the species with *H. Columbiana*, Lea. The jaw of the latter is described by Dr. Cooper as strongly arched, with eight broad ribs.

HELIX GRISEOLA, Pfr. (*Fruticicola*.)

Bosque Co., Texas. Mr. Hugo W. Ericsson.

Jaw with about ten broad, crowded ribs, denticulating the cutting margin; upper margin with membranous attachment. The jaw is somewhat of the type figured by Moquin Tandon for that of *Helix hispida*. (See our fig. 274, p. 159, l. c.)

Lingual membrane as usual in the genus *Helix*. The reflected cusps of the teeth are short, stout. Marginals with blunt denticulations.

HELIX SEQUOICOLA, J. G. Cooper. (*Arionta*.)

Jaw as usual in the subgenus.² Ribs from four to six.

Lingual membrane as usual in the subgenus. Central and lateral teeth with short, stout cusps. Marginals with two bluntly bifid denticles.

HELIX EXARATA, Pfr. (*Arionta*.)

Santa Cruz, California, Mr. Henry Hemphill.

Lingual membrane and jaw as usual in the subgenus,² the latter with six ribs.

HELIX TRASKI, Newcomb. (*Arionta*.)

Los Angeles, California, Mr. Henry Hemphill.

Lingual membrane and jaw as usual in the subgenus,² the latter with eight ribs, five stout, three slight.

¹ See note 1 to p. 242.

² In *Arionta* the jaw is strongly arched, ends blunt; anterior surface with a few, stout, distant ribs, projecting far beyond, and deeply scalloping either margin. See our figure of that of *H. redimita* in Am. Journ. of Conch. VI. pl. ix. fig. 11. For lingual dentition, see our fig. 284, p. 164, of Land and Fresh-water Shells of N. A., I.

HELIX AYRESIANA, Newcomb. (*Arionta*.)

San Miguel Island, California. Mr. Henry Harford.

Animal long and slender, smoky-white, covered with white coarse granulations running longitudinally down the back, one line of granulations very prominent and central, bordered on either side with a deep furrow. Also oblique lines of granulations running down the sides of the foot. Foot dirty-white below. Tail short, broad, pointed. Some individuals are darker, with a purplish tinge.

Jaw and lingual membrane as usual in the subgenus,¹ the former with six ribs.

HELIX RUFICINCTA, Newcomb. (*Arionta*.)

Catalina Island, California. Mr. Henry Hemphill.

Jaw more like the type common in *Mesodon* than in *Arionta*, *i. e.*, arcuate rather than arched, margins rather pectinated than scalloped by the ends of the ribs, which are about ten in number.

Lingual membrane as usual in the subgenus.¹

HELIX KELLETTI, Forbes. (*Arionta*.)

Catalina Island, California. Mr. Henry Hemphill.

Jaw and lingual membrane as usual in the subgenus,¹ the former with about six ribs.

HELIX NEWBERRYANA, W. G. Binney. (*Glyptostoma*.) See our plate I., fig. 12, 3.

San Diego, California. Mr. Henry Hemphill.

This species belongs to no described section or subgenus, we propose for it, therefore, the name *Glyptostoma*, (*γλυπτος, στωμα*), from the peculiar sculptured lines which revolve upon the parietal wall.

GLYPTOSTOMA, subgen. nov.

Testa late umbilicata, depressa, ruguloso-striata, solida, anfractus 6, ultimus depresso-globosus, antice non descendens; apertura obliqua, subcircularis; peristoma simplex, acutum, intus incrassatum, marginibus approximatis, columellari brevi, vix reflexiusculo.

Maxilla arcuata, costis validis distantibus (circa 16) exarata; margines valde dentati.²

Lamina lingualis ut in *Helice* videtur; dentes marginales subquadrati.

¹ See note 2 to p. 243.

² See our plate I., fig. 1, and the explanation of the plate.

Systema sexuale simplex;¹ desunt sagitta, bursa, flagellum, et vesica multifida. Orificium ut in *Helice* positum.

Externally, the animal resembles that of *Helix*. It is bluish-slate colored.

We have already described and figured the lingual dentition (see Am. Journ. Conch., VII. 190, pl. xvii. fig. 3, 4). The jaw is long, low, slightly arcuate; ends blunt; anterior surface with about sixteen stout, separated ribs, scalloping either margin. The jaw is lower, less arcuate and longer than in *Arianta*. Its ribs resemble those of that subgenus in projecting far beyond and scalloping the margins of the jaw, but they are much more numerous.

This description applies only to the more perfect form of the jaw (fig. 1 of our plate), noticed only in one individual. In several other individuals the ribs on the jaw were much more narrow and less projecting at the upper and lower margins. There is more difference between these than is usually found in different individuals of the same species.

SUCCINEA CAMPESTRIS, Say.

Charleston, S. C. Mr. W. G. Mazyck.

Jaw as usual in the genus; the anterior surface has no decided ribs.

Lingual membrane as usual in the genus (see our figure on p. 267, l. c.).

SUCCINEA LINEATA, W. G. Binn.

Little Colorado River, Arizona. Dr. E. Palmer.

Jaw and lingual membrane as usual in the genus, the former without distinct anterior ribs.

Having published many descriptions and figures of the jaws and lingual dentition of mollusks, mostly terrestrial, we here propose to review our work, to see how nearly our observations agree with the generic descriptions published by Albers and von Martens for the various genera. We give below a list of our descriptions published previous to 1873 in other works than the Land and Fresh-water Shells of North America, Parts I. II. and

¹ See our plate, fig. 3. There is one accessory organ, of use unknown to us. See below, explanation of plate.

III., and the second edition of the Invertebrata of Massachusetts. In cases where we have not published together, the name of the separate author is given.

PULMONATA GEOPHILA.

(a.) *Without jaw.*

Gonospira sulcata, Müller. Ann. Lyc. N. H. of N. Y., X. 222. See next species.

Gonospira palanga, Fér. Am. Journ. Conch., V. 37, pl. xi. fig. 1, photograph.

Lingual membrane quite distinct from *Pupa*, in which it is placed by von Martens.

Glandina rosea, Fér. Am. Journ. Conch., VI. 202, fig. 1.

(b.) *With jaw in one single piece.*

?**Hyalina Baudoni**, Petit. (*Mörchia*.) Am. Journ. Conch., VII. 175.

There are no lateral teeth as usual in *Hyalina*. The lingual is like that of *Macrocyclus*, to which genus we believe it belongs.

Macrocyclus Voyana, Newc. Am. Journ. of Conch., VII. 175.

We have shown the dentition to be peculiar in this genus.

Stenopus Guildingi, Bland. Ann. Lyc. N. H. of N. Y., VIII. 158, fig. 3. T. Bland.

Nanina Calias, Benson. Am. Journ. Conch., VII. 188, pl. xvii. fig. 6, 8.

Lingual membrane not given in Albers' ed. 2. We have shown that it differs from Troschel's figures.

Nanina cultrata, Gould. Am. Journ. Conch., VII. 189.

Nanina inversicolor, Fer., **leucostyla**, Pfr., **rufizonata**, H. Ad., **militaris**, Pfr. Ann. Lyc. N. H. of N. Y., X. 169.

All shown by us not to belong to the genus *Helix*.

Limax flavus, Lin. Copied in Am. Naturalist, IV. 167, fig. 42, 43. W. G. B.—Ann. Lyc. N. H. of N. Y., IX. 285, fig. 6.

Limax maximus, Lin. Am. Journ. Conch., VI. 203.

Zonites capsella, Gould. Am. Journ. Conch., VII. 174.

Zonites ligerus, Say. Am. Journ. Conch., VII. 174.

Zonites gularis, Say. Am. Journ. Conch., VII. 174.

Zonites intertextus, Say. Pr. Phila. Ac. N. Sc., 1872, 135.

Zonites demissus, Binney. Proc. Phila. Ac. N. Sc., 1872, 135.

Zonites lasmodon, Phillips. Proc. Phila. Ac. N. Sc., 1872, 135.

Zonites internus, Say. Proc. Phila. Ac. N. Sc., 1872, 135.

Zonites lævigatus, Pfr. Ann. Lyc. N. H. of N. Y., IX. 284, fig. 4.—Proc. Ac. N. Sc. Phila., 1872, 135.

Pallifera dorsalis, Binney. Proc. Phila. Ac. N. Sc., 1872, 137.

Hemphillia glandulosa, Ann. Lyc. N. H. of N. Y., X. pl. ix. fig. 15, 16, 17.

Ariolimax Columbianus, Gould. Am. Journ. Conch., I. 48, pl. vi. fig. 12, 13. W. G. B.

Veronicella Floridana, Binney. Ann. Lyc. N. H. of N. Y., IX. 285, fig. 5.

Veronicella. Am. Journ. Conch., VII. 163, pl. xii. fig. 7.

Bulimus oblongus, Müll. (*Borus*.) Am. Journ. Conch., VII. 180.

Bulimus pardalis, Fer. (*Dryptus*.) Am. Journ. Conch., VII. 181.

Bulimus marmoratus, Dunker. (*Dryptus*.) Am. Journ. Conch., VII. 181.

Jaw not examined.

Bulimus multicolor, Rang. (*Anthinus*.) Am. Jour. Conch., VI. 208.
The jaw is ribless, thus differing from description of *Bulimus*.

Bulimus Hanleyi, Pfr. (*Orphnus*.) Am. Journ. Conch., VI. 208.

Jaw quite unlike generic description. Strongly arched, with a median projection, ribless.

Bulimus magnificus, Grat. (*Orphnus*.) Am. Journ. Conch., VI. 208.
Jaw quite like generic description.

Bulimus odontostomus, Sowb. (*Macrodontes*.) Am. Journ. Conch., VI. 209.

The jaw differs from the generic description in being ribless.

Bulimus aulacostylus, Pfr. (*Eurytus*.) Ann. Lyc. N. H. of N. Y., X. 222.

The jaw as in *Bulimulus*.

Bulimus auris-Sileni, Born. (*Pelecychilus*.) Same as last species.

Cochlostyla fulgetrum, Brod. Am. Journ. Conch., VII. 180.

Jaw not described in Albers and v. Martens. We find it with ribs.

Limicolaria Numidica, Reeve. Am. Journ. Conch., VII. 181.

Jaw differs from the generic description in being ribless.

Eucalodium Newcombianum, Gabb (= *Berendtia Taylori*, Pfr.).
Ann. Lyc. N. H. of N. Y., VIII. 175, fig. 3. T. Bland.

Stenogyra decollata, Lin. Am. Journ. Conch., VII. 183.

Stenogyra gonostoma, Gundl. Am. Journ. Conch., VII. 183.

Stenogyra octona, Chemn. Am. Journ. Conch., VII. 183.

We have shown the peculiar characters of the dentition constant in the three species.

Clausilia tridens, Chemn. Am. Journ. Conch., VII. 28, pl. ii. fig. 1-5, 7, 8.

Amphibulima patula, Brug. Am. Journ. Conch., VII. 186, pl. xvii. fig. 1, 2, lingual membrane. Jaw in Ann. Lyc. N. H. of N. Y., X. 225, pl. xi., fig. 8.

We have shown the jaw and dentition to be unlike *Succinea*.

Pellicula? appendiculata, Pfr. Ann. Lyc. N. H. of N. Y., X. 206, pl. ix. fig. 2, 9-11.

Bulimulus pallidior, Sowb. Ann. Lyc. N. H. of N. Y., IX. 282, fig. 2, lingual.

Bulimulus laticinctus, Guppy. Ann. Lyc. N. H. of N. Y., X. 81, pl. ii. fig. 1, 5.

The teeth are peculiarly modified.

Bulimulus Bahamensis, Pfr. Ann. Lyc. N. H. of N. Y., X. 82, pl. ii. fig. 3, 4.

The teeth are peculiarly modified.

Bulimulus sufflatus, Gould. Am. Journ. Conch., VI. 209, pl. ix. fig. 8, 13.

Bulimulus Marielinus, Poey. Am. Journ. Conch., VI. 209. Jaw alone.

Bulimulus Jonasi, Pfr. Am. Journ. Conch., VII. 182, as in *B. aureolus*.

Bulimulus aureolus, Guppy. Am. Journ. Conch., VII. 181.

Lingual membrane as in *B. laticinctus*. Jaw not examined.

Bulimulus alternatus, Say. Am. Journ. Conch., VII. 181.

Bulimulus membranaceus, Phil. Am. Journ. Conch., VII. 182.

Teeth as in *B. laticinctus*.

Bulimulus dealbatus, Say. Am. Journ. Conch., VII. 182. Jaw only.

Bulimulus Berendti, Pfr. Am. Journ. Conch., VII. 182.

The species referred to proves to be *B. corneus*, Sow.

Bulimulus durus, Spix. Am. Journ. Conch., VII. 182.

Cylindrella subula, Fér. Am. Journ. Conch., VII. 183.

Cylindrella seminuda, Ad. Am. Journ. Conch., VII. 184.

Cylindrella rosea, Ad. Am. Journ. Conch., V. 37, pl. xi. fig. 2, photograph.

Cylindrella scæva, Gundl. Ann. Lyc. N. H. of N. Y., VIII. 161, fig. 4. Lingual membrane only. Ibid. IX. 77. T. Bland.

Cylindrella Blandiana, Pfr. Ann. Lyc. N. H. of N. Y., IX. 85, fig. 5. T. Bland.

Cylindrella trinitaria, Pfr. Am. Journ. Conch., IV. 187, fig. T. Bland. Jaw first noticed, also jaw described in *C. rosea*, *sanguinea*, *brevis*, *Maugeri*, *gracilis*, *elongata*, *Bahamensis*, *scæva*, *Ellioti*, *Brooksiana*.

Macroceramus Gossei, Pfr. Am. Journ. Conch., VII. 187, pl. xvii. fig. 9, 11, 12.

Teeth quite different from the form usual in *Cylindrella* and *Macroceramus*.

Macroceramus signatus, Guild. Ann. Lyc. N. H. of N. Y., VIII. 162, fig. 5, 6. Ibid. IX. 84. T. Bland.

Pineria Viequensis, Pfr. Ann. Lyc. N. H. of N. Y., X. 26.

Lingual membrane entirely distinct from *Pupa*, where it is placed by von Martens.

Patula strigosa, Gould. Proc. Phila. Ac. N. Sc., 1872, 135.

Patula Idahoensis, Newc. Same as last, 136.

Patula Cooperi, W. G. Binn. Same as last, 136.

Patula perspectiva, Say. Same as last, 136.

Patula solitaria, Say. Am. Journ. Conch., VII. 176.

Patula Hemphilli, Newcomb. Am. Journ. Conch., VI. 207, pl. ix. fig. 3.

Patula Cooperi, W. G. Binn. Am. Journ. Conch., VI. 207. Jaw.

Sagda connectens. Ad. Am. Journ. Conch., VII. 175.

The marginal teeth are quadrate, not aculeate, proving the genus to belong to the *Helicea*, not to the *Vitrinea*.

Sagda Haldemaniana, Adams. Am. Journ. Conch., VII. 175. See last species.

Sagda Jayana, Adams. Ann. Lyc. N. H. of N. Y., X. 219. See last species.

Helix circumfirmata, Redf. (*Microphysa*.) Ann. Lyc. N. H. of N. Y., X. 221.

The species shown to belong to the *Vitrininae*.

Helix turbiniformis, Pfr. (*Microphysa*.) Ann. Lyc. N. H. of N. Y., X. 79, pl. ii. fig. 2.

Jaw unusual in the genus—resembling that of *Bulimulus*. •

Helix Boissieri, Charp. (*Leucochroa*.) Ann. Lyc. N. H. of N. Y., X. 220.

The species shown to be more nearly related to *Helix* than to any of the *Vitrininae*.

Helix Yatesii, J. G. Cooper. (*Gonostoma*.) Am. Journ. Conch., VII. 176.

Helix polygyrella, Bland and Cooper. (*Polygyrella*.) Proc. Phila. Ac. N. Sc., 1872, 136.

Helix microdonta, Desh. (*Polygyra*.) Am. Journ. Conch., VI. 205.

Helix septemvolva, Say. (*Polygyra*.) Am. Journ. Conch., VI. 206.

Helix fastigans, L. W. Say. (*Polygyra*.) Am. Journ. Conch., VII. 176.

Helix stenotrema, Fer. (*Stenotrema*.) Am. Journ. Conch., VI. 207.

Helix loricata, Gould. (*Triodopsis*.) Am. Journ. Conch., VI. 206.

Helix inflecta, Say. (*Triodopsis*.) Am. Journ. Conch., VI. 206.

Helix palliata, Say. (*Mesodon*.) Proc. Phila. Ac. N. Sc., 1872, 136.

Helix obstricta, Say. (*Mesodon*.) Same as last, 136.

Helix devia, Gould. (*Mesodon*.) Proc. Phila. Ac. N. Sc., 1872, 136.

Helix similis, Fér. (*Dorcasia*.) Am. Journ. Conch., VII. 176.

Helix Newberryana, W. G. B. Am. Journ. Conch., VII. 190, pl. xvii. fig. 3, 4.

Helix fidelis, Gray. (*Aglaja*.) Am. Journ. Conch., VI. 207, pl. ix. fig. 1, 9.

Jaw said to be ribless, but a better specimen found normal, Proc. Phila. Ac. N. Sc., 1872, 136.

Helix redimita, W. G. Binn. (*Arionta*.) Am. Journ. Conch., VI. 206, pl. ix. fig. 11.

Helix tudiculata, Binney. (*Arionta*.) Am. Journ. Conch., VI. 208, pl. ix. fig. 7.

Helix Townsendiana, Lea. (*Arionta*.) Am. Journ. Conch., VI. 206.

Helix reticulata, Pfr. (*Arionta*.) Am. Journ. Conch., VII. 177.

Helix Nickliniana, Pfr. (*Arionta*.) Am. Journ. Conch., VII. 177.

Helix Tryoni, Newc. (*Euparypha*) jaw, W. G. B. Am. Journ. Conch., I. 93, pl. vi. fig. 2-10.

Showing variation in number of ribs.

Helix Gossei, Ad. (*Coryda*.) Am. Journ. Conch., VII. 177. Lingual membrane only.

Helix aspera, Fer. (*Thelidomus*.) Am. Journ. Conch., VI. 204.

Helix notabilis, Shuttl. (*Thelidomus*.) Am. Journ. Conch., VII. 177. Lingual membrane only.

Helix pemphigodes, Pfr. (*Cysticopsis*.) Am. Journ. Conch., VII. 177. Lingual membrane only.

Helix tumida, Pfr. (*Cysticopsis*.) Ann. Lyc. N. H. of N. Y., IX. 283, fig. 3, lingual.

Jaw, different from generic description, figured in Am. Journ. Conch., VI. 203, fig. 2.

Helix loxodon, Pfr. (*Plagioptycha*.) Am. Journ. Conch., VII. 177.

Unlike the generic description, the jaw has a median projection, and is ribless.

Helix diaphana, Lam. (*Plagioptycha*.) Am. Journ. Conch., VII. 178. See last species.

Helix monodonta, Lea. (*Plagioptycha*.) Am. Journ. Conch., VII. 178. See last.

Helix Albersiana, Pfr. (*Plagioptycha*.) Amer. Journ. Conch., VII. 178. Jaw same as in last species.

Helix macroglossa, Pfr. (*Plagioptycha*.) Am. Journ. Conch., VII. 178. Jaw with median projection and no anterior ribs.

Helix varians, Mke. (*Polymita*.) Am. Journ. Conch., VI. 206, lingual.

Helix muscarum, Lam. (*Polymita*.) Am. Journ. Conch., VI. 204, pl. ix. fig. 4, 16.

Jaw ribless, lingual widely differing from the usual type of *Helix*.

Helix graminicola, Ad. (*Polymita*.) Amer. Journ. Conch., VII. 178.

Jaw different from generic description of *Helix* in having no anterior ribs—and in having a median projection to its cutting edge.

Helix crispata, Pfr. (*Eurycratera*.) Am. Journ. Conch., VII. 179.

Helix orbiculata, Fér. (*Dentellaria*.) Am. Journ. Conch., VI. 205, pl. ix. fig. 14. Jaw apparently costate.

Helix Isabella, Pfr. (*Dentellaria*.) Am. Journ. Conch., VII. 179. Jaw surely costate.

Helix dentiens, Fér. (*Dentellaria*.) Am. Journ. Conch., VII. 179. Jaw as in last.

Helix perplexa, Fér. (*Dentellaria*.) Ann. Lyc. N. H. of N. Y., X. 221. Jaw with traces of anterior ribs, but with a median projection to its cutting edge.

Helix Schroeteriana, Pfr. (*Pleurodonta*.) Am. Journ. Conch., VII. 179.

Lingual membrane alone examined.

Helix acuta, Lam. (*Pleurodonta*.) Am. Journ. Conch., VI. 204.

Helix excellens, Pfr. (*Caracolus*.) Am. Journ. Conch., VII. 180. Lingual membrane only examined.

Helix Bermudensis, Pfr. (*Caracolus*.) Ann. Lyc. N. H. of N. Y., X. 221.

The species shown to belong to the *Vitrinina*.

Helix fuscocincta, Ad. (*Leptoloma*.) Am. Journ. Conch., VII. 180. Jaw unlike generic description in having a median projection and no ribs.

Helix Phoenix, Pfr. (*Acavus*.) Am. Journ. Conch., VII. 180. Jaw with no anterior ribs.

(c.) *With jaw in separate pieces.*

Liguus virgineus, Lin. Am. Journ. Conch., VI. 209, fig. 3, 4, lingual membrane.

Liguus fasciatus, Müll. Am. Journ. Conch., VI. 211, pl. ix. fig. 6.

Orthalicus zebra, Müll. Am. Journ. Conch., VI. 212, pl. ix. fig. 2.

Orthalicus undatus, Brug. Am. Journ. Conch., VI. 213, pl. ix. fig. 10, 12.

(d.) *With jaw with supplementary upper plate.*

Succinea effusa, Shuttl. Am. Journ. Conch., VI. 213, pl. ix. fig. 15.

Succinea Nuttalliana, Lea. Ann. Lyc. N. H. of N. Y., IX. 282, fig. 1.

PULMONATA LIMNOPHILA.

Limnæa appressa, Say. Am. Journ. Conch., VII. 161, pl. xii. fig. 1, 2, 5.

Limnæa megasoma, Say. Am. Journ. Conch., VII. 162, pl. xii. fig. 3, 6.

Pompholyx effusa, Lea. Ann. Lyc. N. H. of N. Y., IX. 290, fig. 9.—
Amer. Journ. Conch. VI. 312, pl. xviii.

Planorbis trivolvis, Say. Ann. Lyc. N. H. of N. Y., IX. 292, fig. 10.

Melampus bidentatus, Say. Ann. Lyc. N. H. of N. Y., IX. 286, fig. 7.

PECTINIBRANCHIATA.

- Geomelania.** Am. Journ. Conch., VII. 185, pl. xvii. fig. 7, 10.
Blandiella reclusa, Guppy. Am. Journ. Conch., VII. 185, pl. xvii. fig. 5.
Cyclotus stramineus, Rve. Am. Journ. Conch., I. 45, pl. v. fig. 1, 4. T. Bland. Jaw and teeth.
Megalomastoma cylindraceum, Chemn. Am. Journ. Conch., I. 45, pl. v. fig. 2, jaw. T. Bland.
Megalomastoma Antillarum, Sowb. Same as last, fig. 3, teeth. T. Bland.
Megalomastoma bituberculatum, Sowb. Am. Journ. Conch., VI. 213, fig. 6.
Tulotoma magnifica, Conrad. Ann. Lyc. N. H. of N. Y., IX. 293, fig. 11.

SCUTIBRANCHIATA.

- Stoastoma pisum,** Ad. Am. Journ. Conch., VII. 184.
Helicina occulta, Say. Ann. Lyc. N. H. of N. Y., IX. 287, fig. 8.—Am. Journ. Conch., VII. 29, pl. ii. fig. 6.
Helicina orbiculata, Say. Am. Journ. Conch., VI. 214, pl. ix. fig. 5.

From the observations we have catalogued above, it appears that the jaw cannot be depended upon as a generic character in the genus *Bulimus*, as constituted in the second edition of Die Heliceen. We have found it strongly ribbed, with ribs as described below in *Bulimulus*, ribless, and ribless with a decided median projection to its cutting edge. In *Limicolaria* the jaw is described with ribs, we find it ribless in one species. In *Bulimulus*, von Martens describes the jaw as composite. We have shown it to be in one single piece, though divided by delicate ribs into numerous plate-like sections. The jaw is also very thin and transparent. This form of jaw seems constant in *Bulimulus*. It is also found in *Cylindrella*, *Macroceramus*, *Amphibulima*, *Gæotis*, and even in *Helix* (*H. turbiniformis*). The tendency to an upper triangular median plate is more or less seen in this form of jaw—its greatest development being in *Cylindrella*.

In the genus *Helix* as constituted by von Martens, the jaw is said to be ribbed, but we have found every variety of jaw except that with an upper additional plate, and that with free imbricated plates as in *Orthalicus*. We believe, however, that the form of jaw is constant in all the species of each section or subgenus of

Helix. Thus we have found the jaw alike in all the species we have examined of *Patula*. So of *Sagda*, *Polygyra*, *Mesodon*, *Arionta*, *Stenotrema*, *Triodopsis*, *Plagioptycha*, *Polymita*, *Dentelaria*.

It appears to us, therefore, that we may hope to find a reliable generic character in the jaw, when the present subgenera, or some of them at least, are recognized as distinct genera. On account of the gradations in the ribs and median projection, we have elsewhere¹ suggested that for the purpose of grouping the genera into subfamilies, we may depend only upon the following distinctions in the jaw.

(a.) Jaw in one piece.

(b.) Jaw in separated, imbricated pieces.

(c.) Jaw in one piece with an upper accessory plate.

As regards the lingual dentition, it appears that the distinction, as far as the central and lateral teeth are concerned, is but slight between the various families and genera. The marginal teeth, however, give us two very distinct types, the aculeate and quadrate.

The former is found either unaccompanied by a jaw, or by its simplest form. Up to this date no instance is on record of aculeate marginal teeth together with a jaw complicated by anterior ribs, free imbricated plates, or an upper accessory plate. The presence of aculeate marginal teeth is usually (not always) indicated by a smooth, shining shell, with acute peristome. The shell, however, is not always reliable as an indicator of the form of marginal teeth, for we have shown the rough shells of several *Mauritius* species to have a lingual membrane with aculeate marginal teeth. It appears, therefore, that the shell alone will not indicate the generic position of some species.

The quadrate marginal teeth are accompanied by various forms of jaw. They are usually constant in shape in the various genera. Sometimes, however, we have met with unexpected variation—such as in *Macroceramus Gossei*, *Helix muscarum*, and a group of *Bulimulus* represented by *B. lalicinctus*.

The form of jaw with free, imbricated plates seems (excepting in *Punctum*) constantly accompanied by a peculiar form of quadrate teeth, as in *Orthalicus* and *Liguus*. To our surprise, however, we have detected a somewhat similar form of teeth in *Gæotis*,

¹ Ann. Lyc. N. H. of N. Y., X. 163.

whose jaw is like that of *Bulimulus*.¹ It seems, therefore, that the lingual dentition is less reliable as a generic character than the jaw, at least in cases where the aculeate marginal teeth are absent.

Finally, we are convinced that most satisfactory results will follow the patient investigation of the jaw and lingual dentition of the *Geophila*. Although we have in many cases proved the distinctions, which have been based on them, to be unreliable, we believe that a further accumulation of facts will lay the foundation of a natural and generally acceptable classification.

EXPLANATION OF PLATE I.

Fig. 1. The jaw of *Helix Newberryana* (see page 244).

Fig. 2. Genitalia of *Helix infumata*. See references to fig. 5, except 9, the duct of the genital bladder.

Fig. 3. Genitalia of *Helix Newberryana*. Same references as in 5, excepting 12, probably a rudimentary dart sac, for which see page 245. The names of the organs are the same as used by Dr. Leidy in the plates of Vol. I. of Dr. Binney's *Terrestrial Air-breathing Mollusks of the United States*.

We failed to detect any accessory gland of the epididymis. The epididymis is very long, convoluted in the lower half of its length, straight above. It runs free for a long distance outside the membrane which covers the oviduct, before entering into the liver, where it joins the testicle. The latter is imbedded in the liver, near its upper extremity. It is composed of several, apparently six, separated fasciculi of blind tubes. The vas deferens enters the penis about its middle, not at its end. The penis is small, cylindrical. There is no trace of lobuli in the ovary, but its under, concave surface is reticulated. The genital bladder is oval, its duct is long, free only for a short distance, then attached to the oviduct the whole length of the latter; at its base it becomes again free, and enters the vagina below the terminus of the oviduct. At about the same point, the vagina receives the mouth of a long, broad, rounded organ, (12 of fig. 3). This organ is hollow. Its use is unknown to us, it may be a dart sac, or a prostate gland.

¹ We are about publishing this in the *Ann. N. Y. Lyc. of N. H.*, 1873, X. 251, pl. xi. fig. 5.

The vagina is very long, the penis enters it at its lower extremity near the exterior opening of the genitalia.

For the sake of comparison, we have also given figures of the genitalia of two other Pacific subgenera, *Arionta* and *Aglaja*. In *Helix Townsendiana*, Lea (*Arionta*), see plate I. fig. 4, we detected the accessory gland of the epididymis (3), composed of several acini of different sizes. The genital bladder is lengthened oval (9), and differs greatly from that of *Helix Newberryana* in having a very short, stout duct. At the opening of the penis there is a decided enlargement, perhaps of the nature of a prepuce, or prostate. The vas deferens enters the penis below its apex. The retractor muscle is at the apex of the penis. There seems no accessory organ, the genitalia being reduced to their simplest type.

Of *Aglaja* we have examined two species, *H. fidelis*, Gray, and *H. infumata*, Gould. The genitalia of these are almost exactly similar. In neither have we detected any accessory gland to the epididymis. In both the penis is extended into a decided flagellum (15). The vas deferens (7) enters below the flagellate extension (15). The retractor muscle (6) is attached on the opposite side and still lower down. There is a well-marked prepuce (12). Opposite the entrance of the penis on the other side of the vagina, which is here considerably swollen, is a small sac-like organ (14), ending in a smoothly rounded cul-de-sac, of what use in the economy of the animal is unknown to us, unless it be a rudimentary dart sac. There was no appearance, however, of a dart within it. Just above this organ opens the stout duct of another organ (13), cylindrical, bluntly pointed, hollow, of a reticulated appearance. There is a contraction where this organ joins its duct, which is of about the same size. The two together are about as long as the penis with its flagellum, and stouter. No dart was noticed within this organ. It is, no doubt, a form of vaginal prostate, as described by Moquin Tandon. The genital bladder (9) is globular. Its duct is long, free in the upper half of its course. The oviduct, ovary, genital bladder, testicle, etc., of *H. infumata*, fig. 2, are not figured by us. They are as in *H. fidelis*, fig. 5, excepting the testicle, which is as in *H. Newberryana*.

Fig. 4. Genitalia of *Helix Townsendiana*, Lea. Same reference as in Fig. 5, excepting 3, the accessory gland of the epididymis.

Fig. 5. Genitalia of *Helix fidelis*, Gray.

1. Testicle.
2. Epididymis.
4. The prostate gland.
5. The sac of the penis.
6. The retractor muscle of penis.
7. The vas deferens.
8. The oviduct.
9. The genital bladder.
10. The exterior orifice of genitalia.
11. The ovary.
12. The prepuce.
13. Vaginal prostate.
14. Rudimentary dart sac?
15. The flagellum, which contains a capreolus.
16. The duct of the genital bladder.

XXXII.—*Description of a new Species of Helix, and Note on H. Mobiliana, Lea.*

BY THOMAS BLAND.

Read Jan. 5, 1874.

[Reprinted from the Annals of the Lyceum of Natural History, N. Y., Vol. x, Nov., 1873.]

Helix Wetherbyi, nov. sp. (*Mesodon*.)

T. obtecte-perforata, orbiculato-depressa, tenuis, granulato-striata, pallide cornea; epidermide fusca, pilis prostratis, obliquis obsita, induta; spira breviter conoidea, sutura impressa, apice obtusiusculo; anfr. 5, convexiusculi, lente accrescentes, ultimus antice subito deflexus, gibbosulus, constrictus, subtus convexus, ad peripheriam subangulatus; apertura obliqua, rotundato-lunari, dente albo, erecto, obliquo, linguæformi, parietali munita; perist. labiatum, angulatim reflexum, margine supero ad insertionem expanso, columellari dilatato, adnato.

Shell with umbilicus covered, orbicular-depressed, thin, granulately striate, pale horn-colored; epidermis dark, covered with oblique, prostrate hairs; spire somewhat conoidal, suture impressed, apex obtuse; whorls five, slightly convex, gradually increasing, the last suddenly deflected, rather gibbous, constricted, beneath convex, subangulate at the periphery; aperture oblique, roundly lunate, with a

white, erect, oblique, tongue-shaped parietal tooth; peristome thickened, angularly reflected, the upper margin expanded, the columella margin dilated, covering the umbilical perforation. Diam; maj. 17, min. 15 mill.; Alt. 8 mill.

Habitat. At the base of sandstone cliffs, mouth of Laurel River, Whitley Co., Kentucky. A. G. Wetherby.

Remarks.—This species belongs to the same group (*Mesodon*) as *H. dentifera*, Binn., and *H. Roemeri*, Pf., but is of smaller size, somewhat more elevated, and readily distinguished from them by the sculpture and epidermis. It differs from *H. divesta*, Gould, in having a parietal tooth, and, although in general appearance like a small form of *H. appressa*, Say, is without the lamina on the basal margin of the peristome.

Five specimens were collected by Mr. Wetherby, to whom I dedicate the species. I am under obligation to him for examples of this and many others, some of them rare species.

I am indebted to my friend W. G. Binney for the following particulars of the dentition of *H. Wetherbyi*.

Jaw as usual in *Mesodon*, low, wide, arcuate, ends but little attenuated, blunt, with about eighteen decided ribs, denticulating either margin. Lingual membrane long and narrow; teeth as usual in the subgenus (see L. and F. W. Shells N. A., I, figs. 232, 242). Centrals with a long bluntly-pointed middle cusp, and obsolete side cusps; laterals like centrals, but with no inner cusps. Marginals low, wide, quadrate, with one very long, oblique, blunt, inner denticle, and one outer, short, blunt denticle.

***Helix Edwardsi*, Bland. (*Stenotrema*.)**

This pretty species, hitherto solely known from Virginia, where it was discovered in 1857, by Mr. W. H. Edwards, and not found since, was collected by Mr. Wetherby, in Laurel and Whitley counties, Kentucky.

***Helix Mobiliana*, Lea. (*Mesodon*.)**

In "Remarks on North American Helicidæ" (Ann. Lyc. N. Y., VI, 341, 1858), concurring in a suggestion of Dr.

Pfeiffer, I placed this species in the synonymy of *H. jejuna*, Say, having before me adult specimens from Georgia, and others, immature, from Florida. W. G. Binney (Terr. Moll., IV, 67, 1859), Tryon (Amer. Jour. Conch., II, 308, 1866), and Binney and Bland (Land and Fresh-water Shells, Part I. 151, 1869) adopted this view. Having since the latter date acquired specimens from Baldwin, Florida, collected by Col. Jewett and the late Dr. Hubbard, also from Mobile, by Mr. Mohr, I am satisfied that two species have been confounded,—that *H. Mobiliana*, Lea, is distinct from the small species, known especially from the vicinity of Savannah, Ga., now recognized as *H. jejuna*.

The figures in Terr. Moll., pl. xlii, f. 2, of Tryon (*l.c.*), pl. v, f. 3. and Land and Fresh-water Shells, fig. 258, are of *H. jejuna* and do not represent Lea's species.

In *H. Mobiliana* there are six whorls; the last whorl is remarkably constricted and gibbous at the aperture, more tumid at the base and with smaller umbilicus than in *jejuna*. The microscopic spiral lines on the embryonic whorls of the latter are absent in the former. The peristome at its junction with the penultimate whorl is sharp, not reflected nor thickened, but elsewhere reflected, thickened by a whitish callus within, the edge of which forms a distinct portion of the peristome, and has an obsolete tooth-like development near the columella. The aperture is more lunate than in *jejuna*.

H. Mobiliana may be compared, so far as regards the tumid base, small umbilicus, constricted aperture and gibbous character of the superior part of the last whorl behind the aperture, with a Texan form in my cabinet of *H. Berlandieriana*.

The measurements of my largest specimen (six whorls) of *H. Mobiliana*, from Baldwin, are as follows: Diam.; maj. 10, min. 7 mill.; alt. 6 mill.

L. A. Cole

[Reprinted from the Annals of the Lyceum of Natural History, N. Y.,
Vol. xi, February, 1874.]

VIII. — *Notes on Certain Terrestrial Mollusks, with Descriptions of New Species.*

BY THOMAS BLAND.

Read Oct. 5, 1874.

***Oleacina flexuosa*, Pfr.**

THIS was described in 1854 (Zool. Proc.), from a specimen in Cuming's cabinet, and subsequently figured in Nov. Conch., I, t. 3, f. 16-17, but the habitat was unknown.

There is in the Swift cabinet * a very fine example, with

*I have recently had the opportunity of examining the collection of my late esteemed friend, Mr. Robert Swift, before its delivery to the Philadelphia Academy, to which it has been presented by his daughter.

note that it was received from Aux Cayes, in November, 1856, from Mr. Ross. Mr. Swift communicated this, and probably sent to Dr. Pfeiffer the imperfect shell referred to in Mon. VI, 278.

The specimen in the Swift cabinet is long. 65, diam. 24 mill., apert. 37 mill. long., infra medium 10 mill. lata.

This is the only species in the West Indies nearly allied to the large Mexican forms.

Macrocyclus euspira, Pfr.

In the Swift cabinet I lately found young specimens, as well as adults, of this Venezuelan species, and from one of the former obtained the animal. W. G. Binney favors me with the following report on its dentition:—

“The lingual membrane is indeed like that of *Macrocyclus* in its general type. It differs from our North American species only in having all the teeth purely aculeate, the usual form of marginals in the *Vitrininae*. It has no laterals, but the first teeth are of a transitional character, between laterals and marginals. This cannot be considered a generic difference. *Zonites lævigatus* has no true laterals, and several species have not more than two.

M. euspira has a true *Glandina*-like lingual, especially in the form of the central tooth, which is of a somewhat different character in the North American species of *Macrocyclus*.

The presence of a jaw with smooth anterior surface and decided median projection to the cutting margin, in connection with the form and arrangement of the teeth and the absence of true laterals, warrant our placing *euspira* in *Macrocyclus*.”

v. Martens has this species in *Ammonoceras*, subgenus of *Hyalina*, with, among others, *H. caluca*, Pfr. of Mexico, which is doubtless a *Zonites*.

Macrocyclus Baudoni, Petit.

The jaw and dentition of this species were described (Amer. Jour. Conch., VII, 1871, and Annals, X, 1873), by W. G. Binney and myself, and we found it to be a *Macrocyclus*.

Macrocyclus concolor, Fer.

This species, judging from its great similarity, if not identity, with *M. Baudoni*, is doubtless a *Macrocyclus*.

Shuttleworth (Diag. n. Moll. 1854) mentions, on the authority of Blauner, that *M. concolor* is viviparous. In the Swift cabinet a specimen is preserved, which he had alive, and from which he took five embryo shells. What the habit is in that respect of the North American species of *Macrocyclus* has not been noticed.

M. concolor and *Baudoni* are placed by v. Martens in *Mörchia* (subgenus of *Hyalina*), which must now, however, be treated as a synonyme of *Macrocyclus*.

M. laxata, Fer., is the type of that genus, but its dentition is, I believe, unknown.

The geographical distribution of the species shows that *Macrocyclus* is essentially an American genus.

In the Pacific Province of the Northern Continent, four species are found; *M. Vancouverensis*, *sportella*, *Voyana* and *Duranti*. In eastern North America, *M. concava*. *H. paucispira*, Poey, of Cuba, will, I think, prove to be a *Macrocyclus*. *M. concolor* belongs to Puerto Rico, and *Baudoni* to Guadaloupe and Dominica; *M. euspira* to Venezuela.

Zonites Lansingi, nov. sp.

T. imperforata, orbiculato-depressa, fusco-cornea, superne lævigata, basi substriatula; sutura impressa; anfr. $5\frac{1}{2}$ convexiusculi, ultimus non descendens, ad peripheriam obsolete angulatus, subtus convexior, circa regionem umbilicarem excavatus; apertura anguste lunaris; peristomate acuto, margine dextro lamella obsolete serrata intus incrassato, columellari vix reflexiusculo.

Shell imperforate, orbicular-depressed, shining, dark horn-colored, smooth above, at the base substriate; suture impressed; whorls $5\frac{1}{2}$ rather convex, the last not descending, obsoletely angular at the periphery, more convex at the base, excavated around the umbilical region; aperture narrow, lunate; peristome acute, the right margin thickened within by an obsoletely denticulated lamella, columellar margin scarcely reflected.

Diam. maj. vix 3, min. $2\frac{1}{2}$ mill., alt. $1\frac{1}{2}$ mill.

Habitat. In damp moist places, among leaves. Astoria, Oregon.

Remarks. Two figures of the species are annexed. The aspect of the upper surface of the shell is very like that of *Z. multidentatus*, Binney.

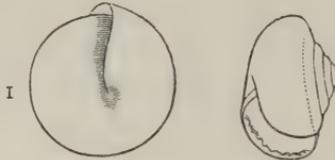


Fig. 1. *Zonites Lansingi*.

I am indebted to Mr. Henry Hemphill for this interesting little species, and dedicate it to my young friend, Mr. A. Ten Eyck Lansing of Burlington, New Jersey, a very promising student, to whom Mr. W. G. Binney and myself are much indebted for assistance in our examination of the dentition of terrestrial mollusks.

One specimen of *Z. Lansingi*, appearing to have the animal within it, was crushed between two glass slides, enabling Mr. Binney, without the use of potash, satisfactorily to observe the jaw and teeth remaining uninjured in the tissues of the animal. I am indebted to him for the subjoined particulars.

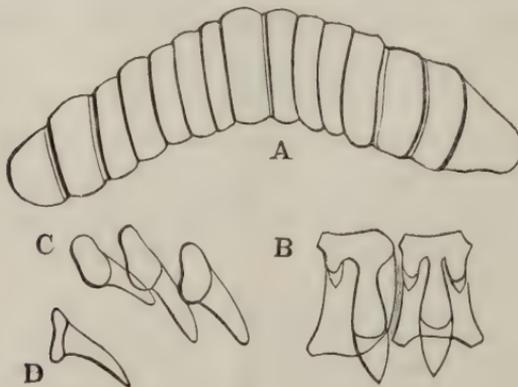


Fig. 2.

Jaw (fig. 2, A) low, wide, slightly arcuate; ends scarcely attenuated, blunt; cutting margin without median projection; anterior surface with fourteen, broad, unequal, crowded, flat ribs, slightly denticulating either margin.

The first impression given by the jaw is that it bears narrow, separated ribs, as in *Bulimulus*, *Cylindrella*, etc. A more careful study of it, however, shows the ribs to be very broad, crowded, flat, with narrow interstices between them.

Lingual membrane with 17-1-17 teeth; six laterals. Centrals (fig. 2, B) with the base of attachment longer than wide, the lower lateral angles expanded; upper margin broadly reflected; reflection very short, tricuspid, side cusps decidedly developed, short, bearing distinct cutting points, median cusp long, slender, bulging at sides, reaching nearly to the lower edge of the base of attachment, beyond which projects slightly the distinct, long cutting point. Laterals like the centrals, but unsymmetrical by the suppression of the inner, lower angle of the base of attachment, and inner side cusp and cutting point. Marginals (fig. 2, C) aculeate, their base of attachment less sole-like than usual in *Zonites*, but more circular in outline. Fig. C shows these bases of attachment. Fig. D gives one marginal tooth in profile.

This is the first known instance of a species with ribs on its jaw having aculeate marginal teeth; or of a species furnished with a *Zonites*-like shell having decided ribs on its jaw. It will be difficult to find a place for the species under any description of genus or subfamily. The shell is that of *Zonites*, but that genus has a ribless jaw with median projection.

Zonites Stearnsii, nov. sp.?

With land shells from the west coast, kindly sent to me for examination by my friend Mr. Stearns, I lately noticed a single specimen of a form from Astoria, Oregon, allied to *Z. Lansingi*. It is larger, more elevated and more distinctly striated than that species, has seven whorls, with rather wider and more rounded aperture, but without the lamella within the outer margin of the peristome.

The measurements are diam. maj., 4, min. $3\frac{1}{2}$ mill., alt. $2\frac{1}{2}$ mill.

Having before me a single specimen I am unwilling formally to describe the species, which for the present I designate as *Zonites Stearnsii*.

The accompanying figures of this and the preceding species were kindly drawn for me, on wood, by Mr. W. G. Binney.

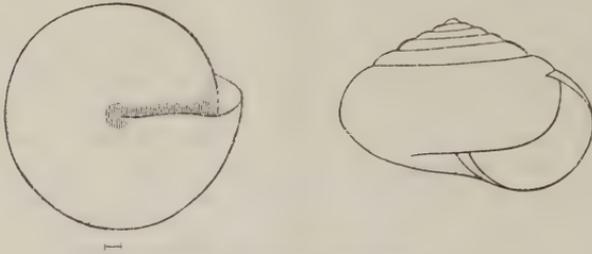


Fig. 3. *Zonites Stearnsii*.

***Zonites indentatus*, Say.**

Pfeiffer, on the authority of Hjalmarson, mentions the occurrence of this species in St. Domingo.

I have specimens collected by Dr. Cleve in Puerto Rico which are scarcely distinguishable from *Z. indentatus*, but the color is very much darker than of American shells.

***Hyalina Bermudensis*, Pfr.**

This has been shown (Bland and Binney, Annals, X, 221) from the character of the lingual dentition, to belong to the *Vitrinea*, not to the *Helicacea* of v. Marten's arrangement.

I am indebted to Mr. J. Matthew Jones for an opportunity of examining a remarkable sub-fossil form found in stalagmitic conglomerate, in caverns at Tucker's Town, Bermuda.

The living *H. Bermudensis*, as described by Pfeiffer (Zool. Proc., 1845), has seven whorls and in size is diam. maj. 23, min. 21 mill., alt. 12 mill.

The extinct form differs from it in having nine whorls, the last more convex above, a less acute carina, umbilicus smaller, but especially in size. The measurements are diam. maj. 37, min. 34 mill., alt. 19 mill.

I propose the name of *Hyalina Nelsoni* for the sub-fossil species, in honor of Lieut. Nelson, the author of valuable geological memoirs on the Bermuda and Bahama Islands.

Although its contemporary and survivor, *H. Bermudensis*, is nearly allied to it, I cannot refer to them as being identical.

The occurrence of this large extinct form in Bermuda is very interesting. It may surely be inferred that the species lived at a period when the area of the land was more extensive and elevated. The existing form, it should be mentioned, is also found sub-fossil.

Wollaston (Variation of Species, 1856) remarks, with respect to some large extinct Madeira Helices, that they may have been but forms of the smaller living species,—“coexistent with them, though more sensitive to the great diminution of altitude and area which were consequent on the breaking-up of a once continuous land.”

Sub-fossil are not unfrequently larger than living allied or identical forms. I have noticed that the sub-fossil *Chondropoma? basicarinatum* and *chordiferum* of St. Croix are larger than their very near ally *C. Santacruzense*, now living on that Island. The extinct *H. Josephinæ*, found in St. Kitts, is considerably larger than the living forms of the neighboring Islands. St. Croix and St. Kitts, geologically speaking, are but fragments of larger areas.

Some living species, however, vary very much in size: I may instance *H. Luquillensis* Shuttl. of Puerto Rico. The measurements given by Shuttleworth are diam. maj., 40; min. 32 mill.; alt. 30 *ad* 33 mill. In the Swift cabinet there is a remarkably small specimen, diam. maj., 29; min. 25 mill.; alt. 18 mill.

M. concolor, Fer., of the same Island is another instance. In the Swift Cabinet there is one, $5\frac{1}{2}$ whorls, diam. maj. 25; min. 23 mill.; alt. 9 mill. Adult specimens collected by Dr. Cleve, having $4\frac{1}{2}$ whorls, are not more than half that size. Unfortunately, I have no note as to the stations of the different sized forms.

Guesteria Powisiana, Pfr.

M. Crosse (Jour. de Conch., 1872) described and figured *Helix Powisiana*, Pfr., placing it in the new genus *Guesteria*,

of which it is the only known species. He remarks on its rarity and the absence of mention of it in my Catalogue of shells collected in New Grenada (Cont. to Conch., 1852).

On a recent examination of shells, which my late valued friend Mr. Robert Swift had from me in 1852, still preserved in his Cabinet, I identified a young specimen of *Guesteria Powisiana*, which I found in 1851 near Marmato, at an elevation of about 5,000 feet, on the Western Cordillera of the Andes. The shell had not been previously determined.

***Simpulopsis dominicensis*, Pfr.**

In the Swift Cabinet are two specimens, marked "*Vitrina*," found by Hjalmarson near Puerto Plata (Haiti), but which are I believe young shells of *Simpulopsis dominicensis*. In Mal. Blatt. 1858, p. 146, Pfeiffer mentions a *Vitrina* from Haiti, on the authority of Hjalmarson, which was subsequently found probably, to be what I have suggested.

***Helix bracteola*, Fer. (*Microphysa*).**

M. Mazé enumerates this in his Catalogue of Martinique species (Jour. Conch. April, 1874) and I am indebted to M. Crosse for a specimen of it. Looking at the description and figure by Deshayes (in Fer. Hist. I, p. 84, t. 86, f. 2), I do not doubt the determination, but believe that the species is the same as *H. vortex*, Pfr.

***Helix Sargenti*, nov. sp.**

T. sub-perforata, globoso-depressa, oblique striata, tenuis, pallide cornea?; spira brevis, apice obtusa; anfr. 5, convexiusculi, ultimus antice descendens, ad peripheriam obsolete angulatus, basi subplanulatus; apertura obliqua, lunato-rotundata; perist. marginibus approximatis, dextro expansiusculo, columellari superne per dilatato, reflexo, perforationem fere tegente, basali introrsum lamellato-callosa.

Shell subperforate, globose-depressed; obliquely striated, thin, pale horn-colored?; spire short, apex obtuse; whorls 5, rather convex, the last descending at the aperture, obsoletely angular at the periphery, base subplanulate; aperture oblique, lunate-rounded; peristome with the margins

approximating, right margin somewhat expanded, columellar margin much dilated above, reflected, nearly covering the perforation, basal margin with a lamelliform callus within. Diam. maj. 15; min. 13 mill.; alt. 8 mill.

Habitat. Little Inagua, Bahamas.

Remarks. This in general form is much like *H. Duclosiana*, Fer., but the interior projecting tooth is wanting and the callus on the basal margin is more developed.

The species belongs to the subgenus *Plagioptycha*, which is peculiarly characteristic of the Haitian fauna. I have elsewhere remarked (Annals X, 318) on the evidences of the former more intimate connection of Inagua and Turks Islands with Haiti. I name the species after Mr. Daniel Sargent of Inagua, to whom I am indebted for many interesting shells from the Bahamas.

***Helix marginella*, Gmel. (*Caracolus*).**

In the Swift Cabinet there are specimens from Mayaguez, Puerto Rico, in which the dark band almost covers the upper whorls, leaving simply a narrow lighter colored margin next the sutures; the dark band equally wide at the base. There is also an *albino* specimen, which was found in 1864, by the late Mr. Haägenon in a wood, on San Isidio Estate, near the city of San Juan.

This species occurs in Vièque and Culabre as well as in Puerto Rico.

***Helix Gaskoini*, Pfr. (*Caracolus*).**

M. Sallé first collected this in St. Domingo. He noticed, I learn from him, many specimens, but all appearing dead and white, collected two only, one of which remains in his Cabinet, the other in Cuming's.

Professor Gabb found specimens during his explorations in St. Domingo, and one of them was given to me by Dr.

Newcomb. It agrees entirely with Pfeiffer's description (Zool. Proc., 1851) and with Reeve's figure.

Helix bizonalis, Desh.

Several years ago Mr. Ferguson found on logwood brought to the Port of New York, two specimens of a shell allied in form to *H. marginella*, Gmel. of Puerto Rico; with them were examples of *H. crispata* Fer., an indication that the logwood was from Haiti. One of the specimens is still in my possession, the other in the Swift Cabinet.

Dr. Newcomb collected one fresh example when crossing the eastern end of the Island; the shell was sent to me for examination and found to be similar to that had from Mr. Ferguson.

In 1872 I received another (dead) specimen from Mrs. Wm. Klatté, found near Port au Prince, with *H. crispata*.

The Ferguson shell was compared in 1871, by Mr. Sowerby, in the British Museum, and agreed with specimens there labelled *H. bizonalis*, Desh.

In 1873 my specimens were examined by Sallé with the type of *H. bizonalis* in the collection of Deshayes, and pronounced identical with it.

Deshayes (Fer. Hist. I, 68, N. 90) has, in the synonymy of the species, *H. marginata*, Var. Fer. Hist., t. 63, f. 11-12, which figures certainly agree with *bizonalis*.

Deshayes does not give the habitat of *bizonalis*; in Chem. ed. 2, N. 956, the species is attributed, apparently on the authority of specimens in Cuming's Cabinet, to Manila, but undoubtedly it belongs to Haiti. Looking at the variability of *H. Sagemon* of Cuba, I am much inclined to consider that *H. Gaskoini* is a var. of *bizonalis*.

The occurrence of the nearly allied forms of *Sagemon* in Cuba, *bizonalis* in Haiti, and *marginella* in Puerto Rico, is an interesting fact. The connection of the faunas of the two latter Islands is strikingly shown by the prevalence of forms

closely related to *H. caracolla**, and *H. Audebardi* of Haiti has a near ally in *H. Luquillensis* of Puerto Rico.

H. bizonalis is placed by v. Martens (Albers ed. 2) in the sub-genus *Obba*, probably with reference to the supposed habitat, "Luzon," while *Sagemon* and *marginella* are in *Caracolus*.

Helix platystyla, Pfr. (*Leptoloma*).

Pfeiffer described this species in the Zool. Proc., 1849, from a specimen, "*expallescens*," in Cuming's Cabinet. In Mon. Hel. III, 175, the habitat doubtfully given is Moluccas; it is placed next before *H. conspersula*, Pfr. and *H. fusco-cincta*, C. B. Ad. of Jamaica, to which it is very closely allied.

An example from Jamaica in my Cabinet agrees closely with Pfeiffer's description and Reeve's figure (Conch. Icon. N. 487, t. 90). Similar specimens in the Chitty Collection, British Museum, are labelled *H. fusco-cincta*, var. *H. conspersula* was described by Pfeiffer in 1845, the habitat unknown. In 1871 Mr. Sowerby informed me that a specimen in the British Museum is ascribed to India.

H. platystyla belongs, I believe, to Jamaica as well as *H. conspersula* and *fusco-cincta*.

Cylindrella gracilicollis, Fer.

I am indebted to Mrs. Wm. Klatte for several specimens of this species, found in the vicinity of Port au Prince, Haiti. It has been erroneously attributed to St. Thomas. Judging from a very young individual it appears that the number of whorls in a perfect shell must be from twenty to twenty-two. The four upper whorls are smooth.

On the axis there are two revolving laminae. I have not had an opportunity of examining the internal structure of many species from the Island of Haiti, but find two lamellae

* *H. caracolla* is found semi-fossil only in St. Croix, but Mr. Swift assured me that I erroneously referred to *H. marginella* as occurring there in a similar condition (Annals VII, 357).

on the axis of *C. Salleana* and *Hjalmarsoni*. It is curious that no species peculiar to Jamaica has a similar character of axis.

Macroceramus Swifti, nov. sp.

T. imperforata, cylindraceo-turrita, confertim striata, punctis numerosis et strigis obliquis fusco-corneis variegata; spira ovato-conica, apice obtusula, pallide cornea; anf. $11\frac{1}{2}$ vix convexiusculi, ultimus rotundatus, infra medium obsolete filo-carinatus; apertura diagonalis, rotundato-lunario, perist. albido, expansiusculo, incrassato, margine dextro arcuato, columellari dilatato.

Shell imperforate, cylindrically turreted, crowdedly striated, variegated with oblique dark horn colored stripes and numerous spots; spire ovate-conic, apex rather obtuse, pale horn-colored; whorls $11\frac{1}{2}$ scarcely convex, the last rounded, obsoletely carinated below the middle; aperture diagonal, roundly lunate; peristome whitish, rather expanded, thickened, the right margin arcuate, columellar margin dilated.

Long. 11, lat. 4 mill.; ap. 3 mill. long, 2 lat.

Habitat. Turks Island, also Inagua, Bahamas.

Remarks. This species is allied to *M. Hermannii*, Pfr., of Haiti, but is less distinctly costulated, the suture not crenulated and has thicker peristome.

I dedicate the species to the late Mr. Robert Swift, from whom I originally received specimens.

Macroceramus Klatteanus, nov. sp.

T. rimata, oblongo-turrita, solidula, oblique costulata, albida, strigis interruptis et maculis castaneis ornata; spira elongata, apice albido; sutura subcrenulata; anfr. 10 convexiusculi, ultimus rotundatus, basi ad aperturam compressus, infra peripheriam fascia 1 nigricante, interrupta, notatus; apertura diagonalis, subcircularis; perist. albo, obtuso, marginibus approximatis, dextro subarcuato, columellari subdilatato.

Shell rimate, oblong-turreted, rather solid, obliquely ribbed, whitish with chestnut colored interrupted stripes and spots; spire elongate, apex whitish; suture subcrenulated; whorls ten, rather convex, the last rounded, compressed at the base near the aperture, one interrupted dark band below the periphery; aperture diagonal, subcircular; perist. white, obtuse, with approximating margins, right margin subarcuate, columellar margin scarcely dilated.

Long. 11, lat. 4 mill.; ap. 3 mill. longa.

Habitat. Near Port au Prince, Haiti.

Remarks. This is allied in form and ornamentation to *M. tenuiplicatus*, Pfr., but is much smaller, is costate, and differs from it in form of aperture. I received specimens of this and other interesting Haitian shells from Mrs. Wm. Klatte after whom I name this species.

***Bulimulus stramineus*, Guilding (*Drymaeus*).**

Several years ago I sent to Dr. Pfeiffer a specimen from St. Vincent, which he described (Mon. VI, p. 44) under this name as an authentic example of Guilding's species, of which however it is probably a variety. I have since received from Governor Rawson extremely fine specimens more closely agreeing with Guilding's description.

Pfeiffer (Mon. II, 203) gives the following description, "T. subdiaphana, straminea, transverse densissime striatula; anfr. 6-7, apicalis ferrugineus (G.). On referring, however, to the Linn. Trans. XIV, p. 340, I find the description to be "Testa tenera, tota straminea, transverse obscuro-dense striata; anfr. sex."

The most common form is of uniform bright yellow, some specimens have a purple apex and others several narrow reddish-brown bands. One of my specimens measures: long. 34, lat. 14; ap. 16 mill. long., $10\frac{1}{2}$ lata. *B. stramineus* occurs also in the Island of Mustique one of the Grenadines.

***Bulimus stramineus*, Richard.**

In the Swift Cabinet there are shells under this name, received from M. Sallé and said to be from St. Domingo. I can find no mention of, or reference to, such a species in the books.

The largest specimen, which is scarcely adult, has $5\frac{1}{2}$ whorls; the two upper whorls have a pale yellowish tinge, the apex rather darker in color. It is very like and may be a variety of *B. liliaceus*, Fer. which occurs in Puerto Rico.

Stenogyra Dominicensis, Pfr. (*Pseudobalea*).

This was described in 1850 by Pfeiffer as a *Balea*, but in 1854 Shuttleworth (Diag. n. Moll. No. 6) referred it to *Stenogyra*.

Pfeiffer described it as *Bulimus hasta* in Malak. Bl. 1856.

From a Cuban specimen, in the Cabinet of R. Swift, I obtained the animal and found it to be viviparous. From one I took five embryonic shells, of from two to three whorls.

The jaw and lingual membrane were examined by W. G. Binney, who informs me that they exhibit the characters prevailing in *Stenogyra*, the jaw striate, without median projection; central lingual tooth small, laterals large, subquadrate, perfectly symmetrical in base of attachment and tricuspid.

The jaw of *S. decollata* has the same fine striæ.

Strophia calcarea, Pfr.

Several dead specimens of this rather rare shell were collected by Mr. D. Sargent on Little Inagua. The habitat of the species has not hitherto been known.

In a young shell (4 whorls), the umbilicus is $1\frac{1}{2}$ mill. in diameter. The parietal tooth is shown in the figure in Chem. ed. 2, t. 19, fig. 4, but not referred to in Pfeiffer's description.

Strophia iostoma, Pfr.

From Mr. Sargent I have remarkably fine specimens of this species, from Turtle Cove, Great Inagua. The following are measurements of extreme forms:

13	whorls,	Long.	46	lat. in med.	14	mill.
11 $\frac{1}{2}$	"	"	35	"	15	"
11	"	"	31	"	10	"

Choanopoma occidentale, Pfr.

Pfeiffer refers this species (Malak. Bl. 1860, p. 216) to Martinique, but as M. Mazé (l. c.) mentions, it does not occur in that Island.

Dr. V. Rijgersma collected it several years since in the Island of St. Martin, and very kindly supplied me with specimens.

Helix ammonoceras, Pfeiffer. (*Ammonoceras*, Pfr.)

I discovered this species in 1851, in New Grenada, and it was described, from a specimen in the Cumingian Collection, by Pfeiffer in 1854 (*Zool. Proc.*).

During last year Governor Rawson sent to me, for determination, a single shell from the Island of Grenada, W. I., which I found on comparison with a specimen of *H. ammonoceras*, preserved in the Robt. Swift Cabinet, to be identical with it.

Helix Hubbardi, A. D. Brown. (*Strobila*.)

This was first found near Indianola, Calhoun Co., Texas, by Mr. E. W. Hubbard, and described by Brown in the *Phila Proc.* (Oct., 1861). It was subsequently discovered at Bellevue, in the Parish of St. Andrew, Island of Jamaica, and described (*Jour. de Conch.*, Oct., 1871) by Mr. C. P. Gloyne, as *H. Vendryesiana*.

In November, 1872, Dr. W. Newcomb found a few specimens on the trees in Bonaventure Cemetery, near Savannah, Georgia, and kindly sent to me a couple.

I have no doubt as to the identity of the Texas, Jamaica and Georgia shells.

Gloyne mentions the parietal lamella only, but there are others as described by Brown. The species is in fact allied to *H. labyrinthica*, Say, and not to *H. paludosa*, to which group it is referred by Gloyne.

The distribution of *H. Hubbardi* is certainly curious, but it may be observed that *H. Strebli*, Pfr., which is extremely like, if not identical with, *labyrinthica*, belongs to the Mexican fauna.

Helicina nemoralis, Guppy.

This Trinidad species can scarcely be considered distinct from *H. Columbiana*, Philippi of Venezuela.

Auricula pellucens, Menke.

In 1871 I received several dead specimens of this species of *Auricula* from Mr. Henry Prime. He informed me that he "found about a dozen, none with the animal, on Punta Rasa, a small island on the west coast of Florida, at the mouth of Calvasahachee River; they were in one place only, at the edge of a mangrove swamp, in company with *Melampus bidentatus* and *M. coniformis*; the latter were in great abundance."

Auricula pellucens is referred to Demerara and *Ellobium Ceylanicum*, H. & A. A., placed in its synonymy by Pfeiffer, to Ceylon. I have one specimen from each of those localities, given to me by the late Mr. Swift, and they are certainly very like those from Florida.

Pfeiffer gives the Antilles also, with doubt on the authority of Férussac, as one of the habitats.

I never heard of the collection of the species on the Florida Coast by any one excepting Mr. Prime. Stimpson (*Am. Naturalist*, IV, 587) refers to the present tropical character of the shells of the west coast of Florida as being plainly due to the influence of the Gulf Stream. *A. pellucens*, whether now living or not on that coast, doubtless originally owed its introduction there to the agency mentioned by Stimpson.

XXI. — *Notes on certain Terrestrial Mollusks, with description of a New Species of the Genus Amphibulima.*

BY THOMAS BLAND.

Read October 11th, 1875.

Helix Sagemon, Beck. (*Caracolus*).

IN former papers (Annals XI, 81 and 148) I mentioned the receipt from Haiti of dead specimens of *H. bizonalis*, Desh., and referring to *H. Gaskoini*, Pfr., of Santo Domingo, remarked as follows: "looking at the variability of *H. Sagemon* of Cuba, I am much inclined to consider that *H. Gaskoini* is a variety of *bizonalis*." I am now indebted to Professor Linden of Buffalo, for several living specimens, collected by himself on Gonave Island, of a species not only very closely allied in every respect to, but I believe identical with the variety of *H. Sagemon*, described as *H. Arangiana* by Poey.*

The Gonave shells differ only from a Cuban specimen of *Arangiana*, received from my friend Don Rafael Arango, in having a white instead of a reddish brown peristome.

Seeing that this Cuban form belongs also to the Haitian fauna, and comparing *H. Gaskoini* with varieties of *H. Sagemon*, I am led to the conclusion that the former belongs to the latter group, and is not a variety of *bizonalis*. Indeed *H. Gaskoini* is strikingly similar to *H. marginelloides*, Orb., as figured by Pfeiffer (Nov. Conch. taf., XCI, figs. 9 and 10).

I submitted the animal of the Gonave shell to my friend W. G. Binney, who examined that of the Cuban *Arangiana* received from Arango. Binney reported that in jaw and dentition they agree, but the former has an outer small cut-

* Poey, in his Introduction to the Catalogue of Land and Fresh Water Mollusks of Cuba, by Arango (Repertorio I, 71), acquiesces in placing *Arangiana* and other allied species in the synonymy of *Sagemon*.

ting point to the outer laterals and marginals, appearing first on the ninth tooth.

In correspondence on the subject of this difference, Binney remarked as follows :

“ I have reëxamined the linguals of the Gonave and Cuban shells, with a view of verifying the existence of the side cutting point. In the Cuban *Arangiana* (Notes, Proc. Acad. N. S. Phila., pl. XXI, fig. 1) you will see in the 8th and 11th teeth, an approach to a side cutting point by the bulging on the side of the main cutting point. This sometimes occurs on the extreme marginals also, both of *Arangiana* and *Sagemon* (l. c. fig. 4), while in the Gonave species it is very much more pronounced on the outer laterals. The difference is quite worth noting ; whether it be specific may well be doubted, especially as we have never examined many linguals of any one species to ascertain the limits of variation.”

The occurrence in Haiti of the Cuban *Sagemon* affords additional evidence of the faunal connection of the two Islands. Identical species are, however, rare. The following may be mentioned as the most important : *Helicina rugosa*, Pfr., *Succinea ochracina*, Gund., *Zonites Gundlachi*, Pfr., *Helix Boothiana*, Pfr., *Montetaurina*, Pfr., *vortex*, Pfr., *Oleacina oleacea*, Fér., *Strophia striatella*, Fér., *microstoma*, Pfr., *Macroceramus Gundlachi*, Pfr., *Coeciliana Gundlachi*, Pfr., *Stenogyra hasta*, Pfr.

Helix cepa, Mull. (*Cepolis*).

Prof. Linden found in the vicinity of Port au Prince, living specimens of *H. cepa*, var. *minor*. The color is an uniform, very dark (blackish) chestnut,—rather more rufous at the apex ; the pale band scarcely perceptible. I had not previously seen fresh specimens of this curious species.

Liguus virgineus, L.

This species doubtless lives on Gonave Island.

Prof. Linden found specimens inhabited by living *Pagurus*, "moving about briskly in an old pasture, at a distance of two miles from the nearest sea beach."

Bulimulus Bahamensis, Pfr.

One specimen was found by Prof. Linden near Port au Prince (at Fort Jacques), of the var. of *B. Bahamensis* collected by my friend Mr. D. Sargent, at Durham Creek, Great Inagua.

In a former paper (Annals X, 318) I remarked on the faunal connection of that Island with Haiti.

Amphibulima Rawsonis, nov. sp.

T. ovato-oblonga, tenuis, subruguloso-striata, lineis impressis sutura parallelis subdecussata, nitens, vix pellucida, fusco-cornea, maculis rufis raris ornata; spira brevis, obtusiuscula, rubescens; linea rufa infra suturam impressam posita; aufr. 3, ultimus convexus, antice perdeflexus, columella callosa, recedens; apertura obliqua, peroblongo-ovalis, intus nitido-cærulescens; perist. simplex, leviter incrassatum, margine dextro sinuato, columellari arcuato.

Shell ovate-oblong, thin, with rather rib-like striæ irregularly decussated by impressed lines parallel with the suture; shining, scarcely pellucid, rather dark horn-colored, ornamented with a very few reddish spots; spire short, rather obtuse, rufous; with a reddish line beneath the impressed suture; whorls 3, the last convex, much deflexed at the aperture; columella callous, receding; aperture oblique, oblong-oval, cærulescent within; perist. simple, slightly thickened, right margin sinuous, columellar margin arcuate.

Long. 18; Diam. 10 mill.; Ap. longit. max. 14; Diam. max. (infra medium) 9 mill.

Habitat. Island of Montserrat, West Indies.

Remarks. This species is most nearly allied in form to *A. pardalina*, Guppy, of Dominica, but very distinct from *A. patula* and *rubescens*. The single specimen found was

sent to me for determination by Sir Rawson W. Rawson, to whom I dedicate the species.

W. G. Binney, in the preceding paper, has described the jaw and dentition of the animal, pointing out the peculiarities of the latter as compared with other species of the genus.

As might be expected from the geographical position of Montserrat, the land shells inhabiting it, belong to the same fauna as that of the neighboring islands. With *A. Rawsonis*, were found *H. Josephinæ*, *B. exilis*, *Helicina Guadelupensis* and *picta*.

Helix Van Nostrandii, nov. sp. (*Triodopsis*).

This species is in form and character of the aperture very nearly allied to *H. introferens*, but is more decidedly costate, more convex at the base, with smaller umbilicus, and without the internal tubercle. It connects *introferens* and *vultuosa* with, but is quite distinct from *fallax*.

The measurements of a specimen with $6\frac{1}{2}$ whorls, are, diam. max. $12\frac{1}{2}$: min. 11, mill. Alt. 7 mill. Of a specimen with 6 whorls; diam. max. 10; min. 8 mill.; alt. 5 mill.

Several specimens were collected at Aiken, S. Carolina, in the winter of 1874-5 by Miss Emma Van Nostrand, daughter of my esteemed friend Mr. Henry D. Van Nostrand.

Mr. W. G. Binney has, in the preceding paper, described the dentition of this species.

CATALOGUE
OF THE
TERRESTRIAL AIR-BREATHING MOLLUSKS
OF THE
UNITED STATES AND ADJACENT TERRITORIES
OF NORTH AMERICA.

PULMONATA GEOPHILA.

AGNATHA.

- | | |
|-------------------------------------|---------------------------|
| Glandina Vanuxemensis, Lea. | Glandina decussata, Desh. |
| truncata, Gmel. | bullata, Gld. |
| <i>syn. parallela</i> , W. G. Binn. | Texasiana, Pfr. |

HOLOGNATHA VITRINEA.

- | | |
|--|---|
| <p>Macrocyclus Vancouverensis, Lea.
sportella, Gld.
concava, Say.
Voyana, Newc.
Duranti, Newc.</p> <p>Zonites <i>Mesomphix</i>.
capnodes, W. G. Binn.
fuliginosus, Griff.
friabilis, W. G. Binn.
caducus, Pfr.
lævigatus, Pfr.
demissus, Binn.
<i>syn. Z. acerra</i>, Lewis.
ligerus, Say.
intertextus, Binn.
subplanus, Binn.
inornatus, Say.
sculptilis, Bland.
Elliotti, Redf.
cerinoideus, Anth.
<i>Hyalina, s. s.</i>
cellarius, Müll.
Whitneyi, Newc.
nitidus, Müll.
arboreus, Say.
viridulus, Mke.
indentatus, Say.
limatulus, Ward.
minusculus, Binn.
miliun, Morse.</p> | <p>Zonites Binneyanus, Morse.
ferreus, Morse.
conspectus, Bland.
exiguus, Stimpson.
chersinellus, Dall.
capsella, Gld.
placentula, Shuttl.
<i>Conulus</i>.
fulvus, Drap.
Fabricii, Beck.
Gundlachi, Pfr.
Stearnsi, Bland.
<i>Gastrodonta</i>.
gularis, Say.
suppressus, Say.
lasmodon, Phillips.
significans, Bland.
internus, Say.
multidentatus, Binn.</p> <p>Vitrina latissima, Lewis.
limpida, Gould.
Angelicæ, Beck.
Pfeifferi, Newc.
exilis, Morelet.</p> <p>Limax maximus, L.
flavus, L.
agrestis, L.
campestris, Binn.
Hewstoni, J. G. Cooper.
montanus, Ingersoll.</p> |
|--|---|

HOLOGNATHA HELICEA.

Patula	solitaria, Say. strigosa, Gld. <i>syn. Cooperi</i> , W. G. Binn. — <i>Haydeni</i> , Gabb. Hemphilli, Newc. Idahoensis, Newc. alternata, Say. Cumberlandiana, Lea. perspectiva, Say. striatella, Anth. <i>syn. Cronkheiti</i> , Newc. pauper, Gld. Horni, Gabb. asteriscus, Morse.	Pupa	Arizonensis, Gabb. hordeacea, Gabb. armifera, Say. contracta, Say. rupicola, Say. corticaria, Say. pellucida, Pfr. borealis, Morelet. alticola, Ingersoll.
		Vertigo	Gouldi, Binn. Bollesiana, Morse. milium, Gld. ovata, Say. ventricosa, Morse. simplex, Gld.
Microphysa	incrustata, Poey. vortex, Pfr. Lansingi, Bland. Ingersolli, Bland.	Strophia	incana, Binn. * * *
Hemitrochus	varians, Mke.	Arion	fuscus, Müll. foliolatus, Gld.
Holospira	Roëmeri, Pfr. Goldfussi, Mke.	Ariolimax	Columbianus, Gld. Californicus, J. G. Coop. niger, J. G. Coop. Hemphilli, W. G. Binn. Andersoni, J. G. Coop.
Onchidella	borealis, Dall.	Prophysaon	Hemphilli, Bland and Binn.
Tebennophorus	Caroliniensis, Bosc.	Veronicella	Floridana, Binn. olivacea, Stearns.
Helicodiscus	lineatus, Say.	Binneya	notabilis, J. G. Coop.
Ferussacia	subcylindrica, L.	Hemphillia	glandulosa, Bland and Binn.
Cœcilianella	acicula, Müll.	Pallifera	dorsalis, Binn. Wetherbyi, W. G. Binn.
Stenogyra	<i>Rumina</i> . decollata, L. <i>Opeas</i> . octonoides, C. B. Ad. subula, Pfr. <i>Melaniella</i> . gracillima, Pfr.	Strobila	labyrinthica, Say. Hubbardi, A. D. Brown.
Pupa	<i>Pupilla</i> . muscorum, L. Blandi, Morse. Hoppii, Möll. variolosa, Gld. pentodon, Say. decora, Gld. corpulenta, Morse. Rowelli, Newc. Californica, Rowell. <i>Leucochila</i> . fallax, Say. modica, Gld.	Gonostoma	Yatesi, J. G. Coop.
		Polygyra	auriculata, Say. uvulifera, Shuttl. auriformis, Bland. Postelliana, Bland. espiloca, Ravenel. avara, Say. ventrosula, Pfr. Hindsi, Pfr. Texasiana, Moricand. triodontoides, Bland. Mooreana, W. G. Binn. <i>syn. tholus</i> , W. G. Binn.

Polygyra hippocrepis, Pfr.
 fastigans, L. W. Say.
 Jacksoni, Bland.
 Troostiana, Lec.
 Hazienda, Bland.
 oppilata, Moricand.
 Dorfeuilliana, Lea.
 Ariadnae, Pfr.
 septemvolva, Say,
 cereolus, Muhlf.
 Carpenteriana, Bland.
 Febigeri, Bland.
 pustula, Fer.
 pustuloides, Bland.
 leporina, Gld. [Coop.]

Polygyrella polygyrella, Bland and J. G.

Stenotrema spinosum, Lea.
 labrosium, Bland.
 Edgarianum, Lea.
 Edwardsi, Bland.
 barbigerum, Redfield.
 stenotremum, Fer.
 hirsutum, Say.
 maxillatum, Gld.
 monodon, Rack.
 germanum, Gld.

Triodopsis palliata, Say.
 obstricta, Say.
 appressa, Say.
 inflecta, Say.
 Rugeli, Shuttl.
 tridentata, Say.
 Hartfordiana, J. G. Coop.
 fallax, Say.
 introferens, Bland.
 Hopetonensis, Shuttl.
 Van Nostrandii, Bland.
 vultuosa, Gld.
syn. Henrietta, Mażyck.

Mesodon major, Binn.
 albolabris, Say.
 divesta, Gld.
 multilineata, Say.
 Pennsylvanica, Green.
 Mitchelliana, Lea.
 elevata, Say.
 Clarki, Lea.

Mesodon Christyi, Bland.
 exoleta, Binn.
 Wheatleyi, Bland.
 dentifera, Binn.
 Roëmeri, Pfr.
 Wetherbyi, Bland.
 thyroides, Say.
syn. bucculenta, Gld.
 clausa, Say.
 Columbiana, Lea.
 Downiana, Bland.
 Lawi, Lewis.
 jejuna, Say.
 Mobiliana, Lea.
 devia, Gld.
syn. Mullani, Bland and J.
 profunda, Say. [G. Coop.]
 Sayii, Binn.
syn. Chilhoweensis, Lewis.

Acanthinula harpa, Say.
 Vallonia pulchella, Müll.
Fruticicola hispida, L.
 rufescens, Penn.

Dorcasia Berlandieriana, Moric.
 griseola, Pfr.

Turricula terrestris, Chemn.
Aglaia fidelis, Gray.
 infumata, Gld.
 Hillebrandi, Newc.

Arionta arrosa, Gld.
 Townsendiana, Lea.
syn. ptychophora, A. D.
 tudiculata, Binn. [Brown].
 Nickliniana, Lea.
 Ayresiana, Newc.
 redimita, W. G. Binn.
 intercisa, W. G. Binn.
 Kelletti, Fbs.
 Stearnsiana, Gabb.
 exarata, Pfr.
 ramentosa, Gld.
syn. reticulata, Pfr.
 Californiensis, Lea.
 Carpenteri, Newc.
 Mormonum, Pfr.
 sequoicola, J. G. Coop.
 Diabloensis, J. G. Coop.
 Traski, Newc.

Arionta Dupetithouarsi, Desh.	Macroceramus Kieneri, Pfr.
ruficincta, Newc.	Gossei, Pfr.
Gabbi, Newc.	Bulimulus patriarcha, W. G. Binn.
<i>syn. facta</i> , Newc.	alternatus, Say.
Glyptostoma Newberryanum, W. G. Binn.	Schiedeanus, Pfr.
Euparypha Tryoni, Newc.	dealbatus, Say.
Tachea hortensis, Müll.	serperastrus, Say.
Pomatia aspersa, Müll.	multilineatus, Say.
* * *	Dormani, W. G. Binn.
Cylindrella Poeyana, D'Orb.	Marielinus, Poey.
jejuna, Gld.	Floridanus, Pfr.

GONIOGNATHA.

Liguus fasciatus, Müll.	Punctum pygmæum, Dr.
Orthalicus undatus, Brug.	<i>syn. minutissimum</i> , Lea.
<i>syn. zebra</i> , Binn.	

ELASMOGNATHA.

Succinea Haydeni, W. G. Binn.	Succinea Totteniana, Lea.
retusa, Lea.	campestris, Say.
Sillimani, Bland.	Hawkinsi, Baird.
ovalis, Gld., not Say.	rusticana, Gld.
Higginsi, Bland.	Nuttalliana, Lea.
Concordialis, Gld.	Oregonensis, Lea.
luteola, Gld.	effusa, Shuttl.
lineata, W. G. Binn.	Salleana, Pfr.
avara, Say.	* * *
Stretchiana, Bland.	Haleana, Lea.
Verrilli, Bland.	Mooresiana, Lea.
aurea, Lea.	Grosvenori, Lea.
Groenlandica, Beck.	Wilsoni, Lea.
obliqua, Say.	

See Bulletin of the Museum of Comparative Zoology, at Harvard College, Cambridge, Mass., Vol. IV.

The Terrestrial Air-Breathing Mollusks of the United States and adjacent Territories of North America, by W. G. Binney, Vol. V. Cambridge, July, 1878.

Considering that the foregoing Catalogue, compiled from the latest and most complete work, will be of value to students and collectors, I publish it for distribution.

NEW YORK, October, 1878.

THOS. BLAND.

V.—*Description of a New Species of Triodopsis, from New Mexico.*

BY THOMAS BLAND.

Read November 22d, 1880.

Triodopsis Levettei, nov. sp.

Testa umbilicata, orbiculato-convexa, tenuis, nitens, translucens, leviter et irregulariter oblique striata, castanea, superne pallescens; spira vix elevata, apice obtusa; sutura impressa; anfr. 7 convexiusculi, lente accrescentes, ultimus antice breviter depressus, spiraliter subobsolete striatus, pone aperturam constrictus, subscribiculatus, basi subconvexus; umbilicus mediocris ($\frac{1}{3}$ diametri), pervius; apertura perobliqua, subcircularis, dente albo, valido, flexuoso, transverso, in pariete aperturali intrante coarctata; peristoma reflexum, pallide castaneum, intus callosum, marginibus callo tenuissimo junctis, margine dextro dente albo, obtuso, erecto, submarginali, basali dentibus duobus, albis, transversis, supero majore, instructo.

Diam. maj. 16, min. 15, alt. $6\frac{1}{2}$; apert., perist. incluso, long. 7, lat. 8 mill.



Triodopsis Levettei, nat. size.

Shell umbilicate, orbiculate-convex, thin, shining, translucent, slightly and irregularly obliquely striated, chestnut colored, the upper whorls paler;

spire scarcely elevated, apex obtuse ; suture impressed ; whorls 7, rather convex, gradually increasing ; the last somewhat depressed at the aperture, obsolete spirally striated, constricted behind the aperture, and slightly scrobiculated, base sub-convex ; umbilicus moderate, $\frac{1}{8}$ diameter of the shell, pervious ; aperture very oblique, sub-circular, with a well developed flexuose, transverse white tooth on the parietal wall ; peristome reflected, pale chestnut colored, thickened within, the margins joined by a slight callus, the right margin with a white, obtuse, erect, submarginal tooth, the basal margin with two white transverse teeth, the upper one the larger.

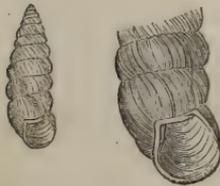
Habitat, near Santa Fé, New Mexico, where two living and one dead specimen were collected by my friend, Dr. G. M. Levette, who presented to me one of the former. Cabinet of Dr. Levette, and the Binney and Bland collection in the American Museum of Natural History, New York.

Remarks.—This species is quite distinct from any known North American or other form. The number of whorls, and of teeth, their form and color, with the color of the shell and peristome, are its peculiar features. The striae are by no means so well developed as shown in the figures.

VIII.—Notes on *Macroceramus Kieneri*, Pfr. and *M. pontificus*, Gould.

BY THOMAS BLAND.

Read January 24th, 1861.

*Macroceramus Kieneri*, Pfr.

Dr. Pfeiffer described *Macroceramus Kieneri* as a *Bulimus*, in Proc. Zool. Soc., 1846, and later, in Mon. Hel. Viv., II, 79, 1848, as follows :

T. breviter rimata, cylindraceo-turrita, tenuis, oblique confertim costata, fusco-corneo et albedo irregulariter marmorata ; spira turrita, apice acutiusculo nigricans ; sutura profunda, crenata ; anfr. 13 convexi, ultimus $\frac{1}{4}$ longitudinis subæquans, basi obsolete unicarinatus ; apertura lunato-circularis ; perist. simplex, undique expansum, marginibus conniventibus, dextro valde arcuato, columellari dilatato, patente.

Long. 18, diam. anfr. antepenult. 6 mill. Ap. $4\frac{1}{2}$ mill. longa, $4\frac{1}{2}$ lata. Habitat in Honduras.

In the Proc. Boston Soc. N. H., III, 1848, Dr. Gould described *Pupa pontifica*, and the following description is given of the species, as *Cylindrella pontifica*, in Terr. Moll., II, 306, Plate LXIX, fig. 1.

Shell fusiform, attenuated-cylindrical, whitish, or grayish clouded and marbled with brown ; spire acuminate ; whorls from 9 to 12, rounded, with numerous oblique, prominent striæ, or ribs ; suture impressed, crenulated by the extension of the alternate ribs across it ; aperture rounded, oblique ; lip thin, somewhat reflected ; axis impressed, not truly perforate. On the last whorl, a colored line revolves : this is sometimes raised a little from the surface, and sometimes is sharp like a delicate carina.

Extreme length, half an inch ; extreme diameter, $\frac{1}{8}$ of an inch ; ordinary size less.

Pfeiffer, in Mon. III and IV, places *C. pontifica*, Gld., in the Syn. of his species. In Mon. VI and VIII, he, treating his species as a *Macroceramus*, separates it from Gould's, assigning Florida and Orizaba, Mexico, as the habitats of the latter.

Binney and Bland, in Smith. Misc. Coll., 1869, and W. G. Binney, in Terr. Moll., V. 1878, following Pfeiffer's earlier opinions, described *M. Kieneri* as a United States species, with Gould's species in its synonymy.

Crosse and Fischer (Moll. Terr. Mex., p. 423, 1873) treated *M. pontificus*, Gould,—as I have shown Pfeiffer to have done in his later works,—as distinct from *M. Kieneri*, the latter from Honduras, and the former from Orizaba (Mexico), as well as Florida and the Florida Keys.

Crosse and Fischer (l. c.) describe *M. pontificus* as follows :

Testa ovato-fusiformis, superne attenuata, albida, griseo et fusco marmorata ; sutura impressa, crenulata ; anfr. 12 rotundati, costulis crebris, obliquis, alternatim suturam praeteriuntibus ornati, ultimus subcarinatus ; apertura lateralis, circularis, campanulata ; columella recta, umbilicum linearem tegens ; perist. reflexiusculum, albidum. Longitudo 18 mill., diam. maj. 6 mill. Apertura $4\frac{1}{2}$ mill. longa, $4\frac{1}{2}$ lata.

In some uncertainty as to the two species, I wrote to my friend Dr. Hy. Dohrn, the possessor of the late Dr. Pfeiffer's collection, asking if he could furnish me with an authentic specimen of *M. Kieneri*. In the latter part of 1879, Dr. Dohrn informed me, that in Pfeiffer's collection he found three adult and one young specimen of *M. Kieneri*, and very kindly sent to me one of the adults, which the foregoing figures represent, the left hand figure being of the natural size.

It is certain that the species *M. Kieneri* does not belong to the fauna of the United States.

DESCRIPTION OF
A New Species of *Triodopsis*, from New Mexico.

ON THE RELATIONS OF
THE FLORA AND FAUNA OF SANTA CRUZ, WEST INDIES.

NOTES ON
Macroceramus Kieneri, Pfr. & *M. pontificus*, Gould.

By THOMAS BLAND:

[FROM THE ANNALS OF THE NEW YORK ACADEMY OF
SCIENCES, VOL. II, No. 4.]

VII.—*On the Relations of the Flora and Fauna of Santa Cruz,
West Indies.*

BY THOMAS BLAND.

Read January 31, 1881.

Professor A. Agassiz (Bull. Mus. Comp. Zool., Cambridge, V, Nos. 14, 289, June, 1879) remarks, "One of the most interesting results reached by this year's cruise, is the light thrown upon the former extension of the South American Continent, by the soundings taken while dredging, and those subsequently made in the passages between the islands by Commander Bartlett. These, together with the soundings already known, enable us to trace the outline of the old continent with tolerable accuracy, and thus obtain some intelligible, and at the same time trustworthy, explanation of the peculiar geographical distribution of the fauna and flora of the West India Islands."

Professor Agassiz writes (l. c.): "In attempting to reconstruct, from the soundings, the state of things existing in a former period, we are at once struck by the fact, that the Virgin Islands are the outcroppings of an extensive bank. The greatest depth between these islands is less than forty fathoms, this same depth being found on the bank to the east of Porto Rico, the 100-fathom line forming, in fact, the outline of a large island, which would include the whole of the Virgin Islands, the whole of Porto Rico, and extend some way into the Mona Passage." * * "On examining the 500-fathom line, we thus find that Jamaica is only the northern spit of a gigantic promontory, which once extended toward Hayti from the mainland, reaching from Costa Rica to the northern part of the Mosquito coast, and leaving but a comparatively narrow passage between it and the 500-fathom line encircling Hayti, Porto Rico, and the Virgin Islands, in one gigantic island. The passage between Cuba and Jamaica has a depth of 3,000 fathoms, and that between Hayti and Cuba is not less than 873 fathoms, the latter being probably an arm of the Atlantic. The 500-fathom line

connects, as a gigantic island, the banks uniting Anguilla to St. Bartholomew, Saba Bank, the one connecting St. Eustatius to Nevis, Barbuda to Antigua, and from thence extends south so as to include Guadeloupe, Marie-Galante, and Dominica. This 500-fathom line thus forms one gigantic island of the northern islands, extending from Saba Bank to Santa Cruz, and leaving but a narrow channel between it and the eastern end of the 500-fathom line running round Santa Cruz. As Santa Cruz is separated from St. Thomas by a channel of forty miles, with a maximum depth of over 2,400 fathoms, this plainly shows its connection with the northern islands of the Caribbean group, rather than with St. Thomas, as is also well shown by the geographical relations of its mollusca."

Professor Agassiz gives (l. c.) an extract of a letter addressed to him by Commander Bartlett, from which I quote the following:—"I finished up the line connecting Saba Bank with St. Croix. I found the connection perfect, but the ridge has 700 fathoms water on it near St. Croix. There is 1,000 fathoms three miles north, and 1,800 fathoms five miles south of the ridge."

Professor Agassiz refers to the connection of Santa Cruz "with the northern islands of the Caribbean group, rather than with St. Thomas." As he bases his argument on the deep channel which separates Santa Cruz from St. Thomas, I judge that he excludes the Virgin Islands, of which St. Thomas is one, from the Caribbean group. In that case, in his view, Sombrero, Anguilla, St. Martin and St. Bartholomew (the three latter on the Anguilla Bank) and Saba (the Saba Bank connected by a ridge with Santa Cruz), are the "northern islands," to which the Professor alludes.

In my paper "On the Physical Geography of, and the Distribution of Terrestrial Mollusca in the Bahama Islands" (Ann. N. Y. Lyc., X, 1873, 320), after quoting some of the views of Professor Dana, expressed in his work, "Corals and Coral Islands," 1872, I wrote as follows:—

"The facts regarding the diminution in size of the islands of the West Indies to the eastward, are of peculiar interest, not only as affording conclusive evidence of the greater subsidence in that direction, but in connection with geographical distribution."

“The banks and islands forming the long Bahama chain diminish in size to the southeast, where are situated at its termination the submerged Mouchoir Carré, Silver and Navidad Banks. In a similar manner, the submerged Virgin Island Bank (with Anegada on its northeastern extremity, geologically, in the opinion of Dr. Cleve, resembling the Bahamas), Sombrero and the Anguilla Bank, terminate the chain of the West Indies (parallel with the Bahamas) eastward from Cuba.”

In a previous paper (Proc. Amer. Phil. Soc., 1871, 57) I endeavored to show, that the land-shell fauna of Porto Rico, with Viéque, the Virgin Islands, Sombrero, Anguilla, St. Martin, St. Bartholomew and Santa Cruz, is unquestionably the same.

My present object is to show that Santa Cruz is connected with St. Thomas, the fauna of both derived from Porto Rico, in common with that of Sombrero and the islands on the Anguilla bank, but by no means with Saba.

Before discussing the statement of Prof. Agassiz as to the connection of Santa Cruz with the northern islands of the Caribbean group rather than with St. Thomas (of the Virgin group), I would first shortly describe the general features of the geology of Santa Cruz, and the character of its flora.

Dr. P. T. Cleve (Proc. Royal Swedish Acad. of Sciences, Stockholm, 1871) remarks :—“The geological formations of the Island belong to different ages. The northern mountain ridge is the oldest, and to judge from its great petrographical resemblance with the rocks of the Virgin Islands, it would seem to belong to the same geological age as the latter, or the cretaceous. Upon those highly disturbed strata, very little disturbed beds of coralline limestone and white marls rest; they are probably of the miocene age. The youngest formation consists of detritus swept down from the mountains by rains and mixed with the white marls, and in a recent formation of calcareous sand around the shores.” * * *

“The recent formations of the island are partly terrestrial, partly marine. The former covers a great deal of the surface of the island in the plains below the mountains. It consists of detritus and clay, sometimes mixed with white marl. In this detrital mass are found shells of terrestrial mollusca, some of which are of extinct species and some no more extant in St.

Croix, but found living in the islands of Viéque, and Puerto Rico."

To Baron H. F. A. Eggers, scientists are indebted for an extremely valuable paper on "The Flora of St. Croix and the Virgin Islands" (Bulletin U. S. Nat. Mus., No. 13; Washington, 1879), from which I offer extracts. The distribution of the plants has an important bearing on that of the terrestrial mollusca, and the evidence to be derived therefrom as to the former faunal connections of Santa Cruz.

Baron Eggers remarks:—"Looking at the vegetation of St. Croix and the Virgin Islands in its generality, and without entering into details, we may consider it to be identical, showing the same main features." * * * "Yet, in looking more closely into details, we are soon struck by finding a great many species in the one which are not found in the other."

Referring to the list of plants given in his paper, it will be seen, the author says, that "out of a number of 881 indigenous phanerogamous species no less than 215, or c. $\frac{1}{4}$, are found in the Virgin Islands only, whilst 98, or about $\frac{1}{10}$, occur only in St. Croix, thus leaving only 568, or less than $\frac{2}{3}$, common to both." He adds, that it is "in the forest vegetation, which best represents the original flora of the islands, that the greatest and most varied differences are observed, showing especially the great variety of species in the Virgin Islands which are not at all found in St. Croix, and among which are many of the commonest and most generally distributed forms." * * *

"However great are the differences in the flora on the two groups of islands, yet this interesting fact is not due to their possessing endemic species, as all the plants known as growing on them are also found in other West India Islands, especially Porto Rico, whence the vegetation of both the Virgin Islands and St. Croix seems to be derived."

With respect to the question, "Why is it that St. Croix, although the largest of all, has received a comparatively and absolutely much less number of species than, for instance, the far smaller St. Thomas?" Baron Eggers offers the following solution:—"I am thus led to think that, at a former period, all the West India islands have been connected mutually, and perhaps with a part of the American continent also, during which time

the plants in common to all the islands, as well as to the West Indies and the continent, have expanded themselves over their present geographical areas, at least as far as they are not possessed of particular faculties for emigration over the sea. By a subsequent volcanic revolution, St. Croix, as well as many of the other islands, has thereafter been separated from Porto Rico and the Virgin Islands, and put into its present isolated position, which it seems to have retained ever since, whilst the latter group of islands has either still, for a long period, remained in connection with Porto Rico, or, if separated at the same time from it as St. Croix, has, by another revolution, been again connected with the former."

As to the plants now living in Santa Cruz, which have not been found in the Virgin Islands, Baron Eggers desires it to be understood, that whilst his investigations of Santa Cruz have been thorough, his explorations have been less complete, and he feels confident that not a few of such plants may, by closer research, still be discovered in the latter.

I propose, now, to examine the character of the terrestrial mollusca of Santa Cruz, and the evidence which they offer as to the connection of that island with others in its vicinity.

The most important feature is the number of species found semi-fossil only,—several extinct, others still living elsewhere: of the whole, I add the following list.

SEMI-FOSSIL SPECIES, EXTINCT.

- ? *Chondropoma basicarinatum*, Pfr.
 " " *chordiferum*, " "

The latter, perhaps, a variety of the former.

C. Santacruzense, Pfr., now living in Santa Cruz and St. Thomas, is of much the same type, and may be considered the living representative of *C. basicarinatum*.

In Malac. Blatt., xxi, p. 173, D. F. Weinland described a fossil, from Menke's collection, attributed to Hayti, as *Cyclostoma* (*Tudora*?) *Kazika*. He sent to me a specimen of it, and I forwarded to him the Santa Cruz fossil (*C. basicarinatum*), which he considers the same, the habitat Hayti of Menke being erroneous (Jahrb., vii, 1880).

Thelidomus incerta, Fér. This occurs, also semi-fossil, in St. Thomas;—its nearest ally is *T. notabilis*, Shuttl. of St. Jan and Tortola.

Plagioptycha Santacruzensis, Pfr. Allied closely to *P. nemoralina*, Pet., of St. Thomas, St. Jan and Tortola.

Bulimulus extinctus, Pfr. Near to *B. elongatus*, Bolt., which inhabits Porto Rico, the Virgin Islands, islands on the Anguilla Bank, several of the northern Caribbees, Curaçao and Buen Ayre.

Bulimulus Riisei, Pfr. This can scarcely be compared with any known West Indian form.

Strophia rudis, Pfr. var. *latilabris*, Pfr. Allied to species now living in Porto Rico and in several of the eastern Virgin Islands.

SEMI-FOSSIL SPECIES, EXTINCT IN SANTA CRUZ, BUT LIVING ELSEWHERE.

Chondropoma Tortolense, Pfr. A specimen from Santa Cruz, in my cabinet, I referred to this species, which now inhabits Tortola and several of the more eastern Virgin Islands.

Caracolus caracolla, L. This species is found living in Porto Rico and Viéque; it is nearly allied to *C. sarcocheila*, Morch, *C. insititia*, Shuttl., and *C. excellens*, Pf., of Hayti.

In my Catalogue, Ann. N. Y. Lye., vii, 1861, I included *C. marginella*, Gmel., as occurring semi-fossil in Santa Cruz, but erroneously, as I was assured by the late Mr. Robert Swift.

Succinea approximans Shuttl.—I referred a specimen in my cabinet to this species, which occurs in Porto Rico, the Virgin Islands, and several of the Caribbees.

SPECIES NOW LIVING IN, AND PECULIAR TO, SANTA CRUZ.

Cistula rufilabris, Beck.—Allied in many respects to *Chondropoma Julieni*, Pfr. of Sombrero.

Cylindrella chordata, Pfr. (*Trachelia*.)

SPECIES NOW LIVING IN SANTA CRUZ AND ELSEWHERE.

Chondropoma Santa-cruzense, Pfr.

* *Microphysa vortex*, Pfr. Also, St. Thomas.

* *Bulimulus fraterculus*, Fér.

* *B. elongatus*, Bolt.

* *B. marginatus*, Say.

* *Pupa pellucida*, Pfr.

* *Succinea Riisei*, Pfr.

With regard to the genera of the semi-fossil species, I may remark, *Thelidomus* is characteristic of Cuba and Jamaica, is represented in Porto Rico and the Virgin Islands, but has one species only in the Caribbees, *T. discolor*, Fér.

Plagioptycha belongs to Hayti, and *Caracolus* to Cuba and Hayti, with a representative in Porto Rico, but neither in the Caribbees.

Strophia, with numerous species in Cuba and the Bahamas, several in Hayti, Porto Rico and the Virgin Islands, does not occur in the Caribbees. One species, however, lives in Curaçao and Buen Ayre. The impression only of a species, is found in the phosphatic lime-rocks of Sombrero.

* These species, more or less widely distributed, cannot be said to be characteristic of the faunas of any of the islands.

The discovery of a submarine ridge, connecting Santa Cruz with Saba is interesting; but its geological age is as uncertain as is that of the deep chasm now separating Santa Cruz from St. Thomas.

I have shown, conclusively, I think, that the land-shells supply abundant evidence of the former connection of Santa Cruz with St. Thomas, and the other islands of the Virgin group, but none of its connection with Saba.

A variety of *B. fraterculus* occurs in Saba, and a *Succinea*, which I believe to be *Riisei*, with several of the widely distributed *Stenogyra*, and *Helicina picta*, Fér., belonging to the Caribbean fauna, is also found there. Very recently I have received from thence, through the kindness of my friend, Mr. F. A. Ober, many specimens of *Amphibulima patula*, Brug., hitherto known only from St. Christopher, Dominica and Marie-Galante.

The five-hundred-fathom line mentioned, embraces Anguilla, St. Martin, and St. Bartholomew, but their land-shells are far more allied to those of Porto Rico and the Virgin Islands than to Caribbean species. *Macroceramus signatus*, Guild., occurs in Anguilla and St. Bartholomew, in several of the Virgin Islands, and in Hayti,—the genus is not represented in the Caribbees.

Pineria Schrammi, Fisch., of Guadeloupe, which I believe to be identical with *P. Viequensis*, Pfr., of Viéque and Barbados, inhabits each of the three islands on the Anguilla bank.

With regard to changes of the flora and fauna of Santa Cruz, two causes have been suggested, but entirely under misapprehension, and I deem it desirable to place the facts on record.

The Rev. John P. Knox, in his "Historical Account of St. Thomas, W. I." (New York, 1852), relates circumstances connected with the establishment of a French colony in Santa Cruz, in 1650. The settlement, he says, proved at once very unhealthy. He adds:—"In order to arrest the mortality which was so rapidly thinning their numbers,—a mortality which arose from the dense and aged forests that covered the island, scarcely affording an opportunity for the winds to carry off the poisonous vapors with which its morasses clogged the atmosphere,—

the colonists who remained, set fire to the woods, and, going on board their ships, became spectators of the conflagration. They returned on shore after the flames were extinguished."

Mr. Alfred Newton, in "Observations on the Birds of St. Croix" (*Ibis*, I, 59, 1859): quotes Knox's account of the conflagration, and in his remarks rather amplifies it.

"That the simultaneous and sudden destruction by fire of all the woods on an island like this, would have a marked and lasting effect upon its fauna, no one can doubt; and one of its results may probably be traced in a fact ascertained by Herr Apothek Riise, of St. Thomas, that in St. Croix there occur the dead shells of about a dozen species of terrestrial molluscs, of which he has never found a single example inhabited by the living animal, though they are undoubtedly recent and not fossil forms. It is difficult to account for the extinction of so many species, unless it may be presumed that the changes brought about in the island by so great a fire, rendered it unsuitable for their longer habitation."

I called the attention of Baron Eggers to this subject, and he entirely discredits any such general conflagration. He informed me, that old Père Labat, when in 1700 he visited the island, after its having been given up and abandoned by the French in 1676, found it entirely covered with wood, as did also the first Danish settlers who, in 1739, went over there to found their plantations.

The destruction of the species of mollusca referred to, must rather be attributed to geological changes.

In the Bulletin of the Torrey Botanical Club (N. Y., IV, No. 2, July, 1873), a communication appeared from Mr. F. Hubbard, on the subject of the desiccation of Santa Cruz. He wrote:—"At my former visit, twenty-seven years ago, the dessication (of Santa Cruz) had undoubtedly made some progress, but it had not been sufficient to make itself manifest in a very marked degree. The change from fertility to barrenness, which at first must have been almost imperceptible, is no doubt taking place in an accelerating ratio." He adds:—"The final depopulation of this beautiful island seems now to be written indelibly among the decrees of fate."

Baron Eggers informs me, that the year 1873 was an uncommonly dry one, as had been, also, 1872, and as was 1874. The effect of the drought was, he says, very plainly to be seen, but since, there have been not less than three or four very wet years, and the island at present (March, 1880) is as green as ever.

Baron Eggers remarks :—“There can be no doubt that, compared with St. Thomas, Santa Cruz is more favored with moisture than the reverse; its forests are still of some extent, and trees are not removed in the latter as in former times, when the land was continually cleared more and more to satisfy the increasing demand for sugar.”

At the end of last century, he says, there were 27,000 acres in cane cultivation, now there are only 17,000. The difference of 10,000 acres is again overgrown with trees, shrubs, grass, etc.

The so-called desiccation of the island of Santa Cruz can, in fact, be no more accepted than the conflagration caused by the French colonists, as sufficient sensibly to affect its flora or fauna.

[From the Annals of the N. Y. Academy of Sciences, Vol. II, No. 12. 1883.]

XXII.—Description of Two New Species of Zonites from Tennessee.

BY THOMAS BLAND.

Read May 21st, 1883.

Zonites Wheatleyi, nov. sp.

T. umblicata, depressa, tenuis, nitens, pellucida, fusculo-cornea, delicate striatula; spira sub-planulata; sutura leviter impressa; anfr. $4\frac{1}{2}$, convexiusculis, ultimus basi convexior, ad aperturam rapide accrescens, vix descendens; umbilicus pervius; apertura depressa, oblique lunaris; peristoma simplex, acutum, marginibus approximatis, callo tenui junctis.

Fig. I.



Z. Wheatleyi.

Shell umbilicated, depressed, thin, shining, pellucid, brownish horn-colored, finely striated; spire subplanulate, suture slightly impressed; whorls little convex, the last more convex at the base, rapidly increasing at the aperture, scarcely descending; umbilicus pervius; aperture depressed, obliquely lunate; peristome simple, acute, the margins approximating, joined by a thin callus.

Diam., major 5, min. $3\frac{1}{2}$; Alt., 2 mill.

Habitat.—The Cliffs, Knoxville, Tennessee, Mrs. George Andrews; also, Tiverton, Rhode Island, J. Thomson.

Remarks.—This, with the following species, was discovered and communicated to me, in 1879, by Mrs. Andrews, who thus described the locality in which the two species were found:—“The Cliffs rise up 200 feet on the south side of the river,—they are very steep and rocky, face the north, are almost always shady, damp, and covered with mosses and ferns. I collected the shells on the ledges of the rocks among the dead leaves, at an elevation above the river of about 100 feet. I have not found either of the species in any other locality.”

Mr. J. H. Thomson, to whom I submitted specimens, sent to me examples of the same species collected by him, “on a high rocky ledge, covered with old trees, at Tiverton, Rhode Island.”

This species, *Z. Wheatleyi*, is more nearly allied to *Z. viridulus*, Mke, than to any other North American form, but differs from it, especially in the form of aperture, in the descending last whorl, and in having a wider umbilicus.

I dedicate the species to the memory of my late valued and lamented friend, Chas. M. Wheatley.

***Zonites petrophilus*, nov. sp.**

T. late umbilicata, depresso-subglobosa, tenuis, nitens, translucens, albida, irregulariter striata; sutura mediocris; anfr. $5\frac{1}{2}$ —6, convexiusculis, ultimus convexior, non descendens; umbilicus extus late excavatus, perspectivus; apertura rotundato-lunaris; peristoma simplex, paululo subincrassatum, sæpe roseum, margine columellari reflexiusculo.

Fig. II.



Shell broadly umbilicate, depressed; subglobose, thin, shining, translucent, whitish, irregularly striated; suture moderately impressed; whorls $5\frac{1}{2}$ —6, rather convex, the last more convex, not descending; umbilicus widely excavated externally, pervious; aperture roundly lunate; peristome simple, somewhat thickened, often rose-colored, the columellar margin slightly reflected.

Diam., major 6, min. 5,— $5\frac{1}{4}$; Alt. fere 3 mill.

Z. petrophilus.

Habitat.—The Cliffs, Knoxville, Tennessee, found with *Z. Wheatleyi*, Mrs. Geo. Andrews.

Remarks.—This species is, in general form, nearly allied to *Z. arboreus*, but the color is different, the striæ are more developed, and the umbilicus is much wider.

My friend, Mr. W. G. Binney, examined the dentition of *Z. petrophilus*, and favored me with notes on the subject. He found the teeth 15—1—15, with two perfect laterals, one only on each side. *Z. viridulus* has the same number of laterals, but many more marginals.

I would express my deep obligation to Mrs. Andrews for her uniform kindness and liberality in supplying me, during many years, with numerous rare and interesting species.

[From the Annals of the N. Y. Academy of Sciences, Vol. II, No. 12. 1883.]

*Description of Two Species of Land Shells from
Porto Rico, W. I.*

BY PROFESSOR EDWARD V. MARTENS.

[Communicated by Thomas Bland.]

Read May 21st, 1883.

NOTE BY THOS. BLAND.

In 1882 I forwarded to Prof. v. Martens several shells received long since from my late friend, Mr. Robert Swift, collected, I believe, in Porto Rico, and which I was unable satisfactorily to determine.

I had submitted the shells to Mr. G. W. Tryon, Jr., asking him to compare them with specimens in the Swift Collection, the property of the Academy of Natural Sciences, Philadelphia. Mr. Tryon found no similar forms in the Academy collections, but pointed out the alliance of one of the species with *Chondropoma Tortolense*, Pfr., especially with specimens so labelled, from the island of Anegada:—of this I informed Prof. v. Martens, when presenting the shells to the Berlin Zoological Museum.

In my correspondence with Prof. v. Martens, I mentioned that I was preparing notes on the Geographical Distribution of the Land Shells of the West Indies, with complete lists of the species of each island. He was kind enough to forward to me the descriptions subjoined, for insertion in my proposed paper.

The completion of that paper has, from various causes, been delayed; but I deem it desirable that the publication of the contribution of Prof. v. Martens should be no longer postponed.

Cistula consepta, nov. sp.

Testa ovato-conica, umbilicata, verticaliter confertim tenuiter et inæqualiter lamellata, pallide brunnea, fasciis compluribus rufis ornata; anfr. 7, priores duo læves, sequentes 4 regulariter crescentes, convexi, sutura profunda, *utrinque prolongationibus lamellarum albis consepta*; anfractus ultimus in $\frac{1}{4}$ peripheriæ solutus, oblique descendens; apertura subverticalis, fere ovata; peristoma duplex, externum late expansum, subundulatum, rufo-maculatum, internum distincte porrectum. Operculum paucispirum, oblique radiatim striatum.

Longitudo 13; diam. $8\frac{1}{2}$; aperturæ longitudo, incluso peristomate externo, 6, latitudo $5\frac{1}{2}$; excluso, 4 et $2\frac{1}{2}$ mill.

Porto Rico. R. Swift.

Chondropoma Tortolense, Pfr.

(Mon. Pneum., Suppl. I, p. 142.)

Var. *Major*.

Testa paulum majore, fere unicolore, denticulis suturæ paulo magis prominentibus et magis fasciculatis, peristomatis externi lobo superiore et lobo columellari majoribus, distinctius pliculosis.

Longitudo 18; diameter 18; aperturæ longitudo, incluso peristomate 7; latitudo 6; excluso, 5 et 4 mill.

Porto Rico.

1/2 brown morocco
antique
sprinkled edges
paper sides

Mark

=====
Papers
by
Bland
=====

—
—
W.H. Dall

SMITHSONIAN INSTITUTION LIBRARIES



3 9088 00283277 2

nhmoll QL31.B5B64
Papers of Bland.