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# PROCEEDINGS

OF THE

# ACADEMY OF NATURAL SCIENCES

OF

# PHILADELPHIA.

1899.

COMMITTEE ON PUBLICATION:

THOMAS MEEHAN, CHARLES E. SMITH,
EDWARD J. NOLAN, M.D., HENRY SKINNER, M.D.,
HENRY A. PILSBRY.

EDITOR: EDWARD J. NOLAN, M.D.

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THE ACADEMY OF NATURAL SCIENCES,
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1900.

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THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA,
February 14, 1900.

I hereby certify that printed copies of the PROCEEDINGS for 1899 have been presented to the meetings of the Academy and mailed as follows:—

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| " 113 to 176 | " | May | 26, 1899, | " | May | 30, 1899. |
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| " 217 to 256 | " | July | 7, 1899, | " | July | 11, 1899. |
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| " 385 to 400 | " | October | 5, 1899, | " | October | 10, 1899. |
| " 401 to 432 | " | October | 20, 1899, | " | October | 24, 1899. |
| " 433 to 464 | " | November | 9, 1899, | " | November | 14, 1899. |
| " 465 to 496 | " | January | 11, 1900, | " | January | 16, 1900. |
| " 496 to 544 | " | February | 12, 1900, | " | February | 13, 1900. |

EDWARD J. NOLAN,
*Recording Secretary.*

# LIST OF CONTRIBUTORS.

*With reference to the several articles contributed by each.*

For Verbal Communications, Announcements, etc., see General Index.

# PROCEEDINGS

OF THE

# ACADEMY OF NATURAL SCIENCES

OF

# PHILADELPHIA.

## 1899.

JANUARY 3.

MR. CHARLES MORRIS in the Chair.

Twenty-two persons present.

The Council reported that the following Standing Committees had been appointed to serve during the ensuing year:

ON LIBRARY.—Arthur Erwin Brown, Thomas A. Robinson, Henry C. Chapman, M.D., Dr. C. Newlin Peirce, and Charles Schaeffer, M.D.

ON PUBLICATIONS.—Thomas Meehan, Charles E. Smith, Henry Skinner, M.D., Henry A. Pilsbry, and Edward J. Nolan, M.D.

ON INSTRUCTION AND LECTURES.—Uselma C. Smith, Benjamin Smith Lyman, Samuel G. Dixon, M.D., Philip P. Calvert, Ph.D., and Charles Morris.

STANDING COMMITTEE OF COUNCIL ON BY-LAWS.—Isaac J. Wistar, Theodore D. Rand, Arthur Erwin Brown, and Benjamin Sharp, M.D.

The death of Theodore Caruel, a correspondent, was reported.

JANUARY 10

MR. ARTHUR ERWIN BROWN in the Chair.

Thirty-two persons present.

A paper entitled "New and Interesting Species in the Isaac Lea Collection of Eocene Mollusca," by Charles W. Johnson, was presented for publication.

The deaths of Francis M. Brooke and Mrs. Bloomfield H. Moore, members, were announced.

*The Calaveras Skull.*—MR. WILLIAM H. DALL called attention to the fact that the authenticity of the celebrated Calaveras skull, about which so much controversy had arisen in 1866, has recently again been called in question. It seemed to him, as the small number of persons who were cognizant of the facts when they occurred is already greatly reduced, that it would be desirable to put on record his own testimony as an eyewitness to some of them, which in his opinion are incompatible with the theory that a hoax had been perpetrated, or a skull from some recent burial place subject to the lime deposit from springs, fraudulently foisted upon Prof. J. D. Whitney and his associates in the State Geological Survey.[1]

Mr. Dall described briefly the nature of the formations which make up the table mountains of the region alluded to, consisting of beds of basaltic lava more or less alternated with gravel, which fill the prehistoric stream beds in which gold was sought by means of tunnels from the side, or shafts from above, and which are now practically abandoned since the returns do not pay for the labor.

He was in California at the time of the discovery and in June, 1866, examined the skull, then in the office of the State Geologist, in the presence of Prof. Whitney, William M. Gabb, W.

[1] The main facts as thoroughly investigated at the time are given by Prof. Whitney in his work on the auriferous gravels of California, *Memoirs of the Museum of Comparative Zoölogy* at Cambridge, Vol. vi, Part 1, pp. 267-273, 1879. The evidence has generally been regarded among scientific men as convincing and sufficient, the skull being shown by analysis to be in a fossilized condition, and to have been taken, according to his own statement, by a mine owner of respectability, from a bed of gravel 132 feet below the surface of the uppermost lava bed of Bald Hill, one of the "table mountains" of Calaveras County, Cal., and to have been so covered with cemented gravel that it was not recognized as a skull until the party to whom the original finder had given it in his presence, removed some of the covering, and that it passed without fee or reward into the hands of the State Geologist, who with his colleagues immediately investigated all the circumstances.

Ashburner, Dr. James Blake and others, of whom the speaker is the only present survivor.

The skull was then in the condition in which it was first obtained, except that a portion of the gravel which had originally covered the whole of it had been removed by Messrs. Mattison and Scribner (the finder and first receiver) from the anterior dome and right side of the cranium. The rest of it was still filled or covered by a hard mass of small gravel stones cemented together by iron oxide and calcareous cement, so that a tool was necessary to separate or remove the pebbles and other particles of which the conglomerate was made up. These pebbles were obviously water-worn, and mixed with them were particles of other human bones,[2] a perforated shell ornament or bead of small size and the fossilized remains of a thin and fragile snail shell, recognizable as the still existing *Helix* (*Epiphragmophora*) *mormonum*.

It was the speaker's opinion that by no artificial agency could such a conglomerate have been assembled about a recent skull, and the sight of it was sufficient proof of the fact to any reasonable person. Unfortunately, however, no photographs were taken of the specimen in this condition, or at least none are recorded; and when it was placed in the hands of the celebrated anatomist, Dr. Jeffries Wyman, the encrusting material was removed in order that the characters of the skull should be determined. The specimen is now in the Museum of Comparative Zoölogy, and it is probable that part of the matrix is also preserved there. At all events the recollection of the speaker was clear that the mass of the hard incrusting conglomerate was composed of small pebbles, with some ferruginous matter, entirely unlike the calcareous deposits from calciferous water in caves. The mass of the material was not limy, but gravel; in all essentials resembling the material taken from the gravel beds under the lava, of which specimens were at hand for comparison. Subsequent examination showed that the skull had been violently fractured and that portions of bones of the extremities and sternum had been crowded into its interstices with the gravel. It was found among a lot of wood also included in the gravel, as if the prehistoric stream in flood had washed away part of an ancient graveyard and crushed the bones and timber into a miscellaneous heap of *débris*, left behind, as the waters fell.

If, as has been intimated, the skull had been taken from some cave where the present Indians interred their dead, and where remains had been gradually covered with a stalagmitic crust, how is the peculiar agglomeration to be explained?

In the speaker's opinion, the attempts on the part of unscientific

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[2] Part of which from their size must have belonged to another individual.

persons of the vicinity to discredit the authenticity of the skull after it had attracted general attention were due to that spirit, unfortunately too common among ignorant persons, which leads them to disparage that in which they have no share. As the persons chiefly concerned made no attempt to utilize the discovery as a source of profit, and the coming of the specimen into scientific hands was due to circumstances which could not have been foreseen, the speaker believed that so far, no sufficient reason had been adduced for doubting the genuine character of the skull and its original situs below the lava; though the question of the coëxistence of man and the extinct mammals whose remains have been found in the same gravels is entirely distinct and may reasonably be left open.

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## January 17.

J. Cheston Morris, M.D., in the Chair

Twenty-three persons present.

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## January 24.

The President, Samuel G. Dixon, M.D., in the Chair.

Eighteen persons present.

A paper entitled "Contributions to the Life History of Plants, No. XIII," by Thomas Meehan, was presented for publication.

A paper entitled "The North American Species of Argia (Order Odonata)," by Philip P. Calvert, presented for publication August 17, 1897, was withdrawn by the author.

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## January 31.

Mr. Charles Morris in the Chair.

Fifteen persons present.

A paper entitled "A List of Fishes collected at Port Antonio, Jamaica," by Henry W. Fowler, was presented for publication.

Rev. A. B. Kendig was elected a member.

The following were ordered to be printed:

## A STUDY OF THE TYPE SPECIMENS OF BIRDS IN THE COLLECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, WITH A BRIEF HISTORY OF THE COLLECTION.

BY WITMER STONE.

The ornithological collection of the Academy of Natural Sciences of Philadelphia has long been known as one of the largest and most important in the world. It was reported by Dr. P. L. Sclater in 1857 to be "superior to that of any museum in Europe and therefore the most perfect in existence."[1]

Early ornithological activity in America naturally centred around this collection, and we find the names of all our earlier ornithologists connected with the Academy specimens, while the majority of their publications appeared in the *Proceedings* of the society.

Having been engaged for some years in cataloguing the collection and in identifying the type specimens which it contains, I wish to present in the present contribution the results of my investigations in order to record exactly what types are preserved, and the probable history of others which were supposed to be in this collection. The collection of birds was begun soon after the foundation of the Academy in 1812, and by the year 1837 contained about 1,000 specimens; these were contributed by various members, among whom Dr. Harlan, Dr. Trudeau and J. K. Townsend are best known to ornithologists, though Dr. Thomas McEwen seems to have been most active in the care of the collection.

During the succeeding ten years the additions amounted to about 550 specimens, received from John Cassin, S. F. Baird, A. L. Heermann, S. W. Woodhouse, Dr. Watson and R. C. Taylor.

In 1846 Dr. Thomas B. Wilson, afterwards President of the Academy, became interested in the collection, and took steps to enlarge it at his own expense. He entered into arrangements with a European dealer to furnish him with specimens of such species

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[1] *Proc. Zool. Soc. London*, 1857, p. 1, "Notes on the Birds in the Museum of the Acad. of Nat. Sci. Phila." An interesting account of the collection.

as the Academy lacked in lots of one hundred at so much per specimen, but upon asking the advice of Dr. J. E. Gray, of the British Museum, as to the terms asked, he was strongly advised to abandon this plan and to purchase an entire collection, several of which were then on the market, that of Victor Massena, Duc de Rivoli, Prince d'Esling, being especially recommended.

Accordingly Dr. Gray was authorized to proceed to Paris and secure the collection, which he promptly did, much to the chagrin of De Blainville and other French naturalists, who had fully expected that the French government would purchase the collection.[2]

The Rivoli collection, numbering about 12,500 specimens, arrived in Philadelphia in September, 1846, and was deposited by Dr. Wilson with the Academy; the old collection being merged with it.[3]

Dr. Wilson followed this purchase with that of the Bourcier collection of Parrots and Tanagers, while his brother, Mr. Edward Wilson, of London,[4] who was also interested in building up the collection, purchased many small collections from J. and E. Verreaux and other dealers, including a number of specimens from the museum of Temminck.

In the following year two more collections were purchased for Dr. Wilson in London: the Gould collection of Australian birds and the Boys Indian Collection.

The former formed the basis of Gould's magnificent work on the birds of Australia, and contained nearly all of his types of Australian birds. It was always Gould's desire that this collection should become the property of the British Museum, and he offered it to the trustees for the moderate sum of £1000. His offer was, however, refused, and his disappointment was so great that in a moment of chagrin he disposed of it to Dr. Wilson.[5]

The Boys collection consisted of a full series of the species collected by Capt. Boys, of the British army, during several years'

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[2] See *Ann. and Mag. Nat. Hist.*, 1869, Vol. iii, p. 317.

[3] See *Proc. Acad. Nat. Sci. Phila.*, 1846, pp. 75, 128, 131, 343.

[4] Mr. Wilson was the immediate agent of his brother in the purchase of the Rivoli and other foreign collections.

[5] See Sharpe's *Index to the Works of John Gould*, p. xviii.

residence in India. The duplicates of his collection were dispersed at auction, and Dr. Wilson obtained the only full set.[6]

Neither of these collections reached the Academy for a year or two afterward, the Gould collection being placed in Verreaux's hands for mounting and the Boys collection being loaned to Mr. Gould for use in preparing his *Birds of Asia.*

While Dr. Wilson was bringing together his enormous collection, many smaller additions were being made to the Academy's series.

Between the years 1846 and 1860 the collections of Gambel, Cassin, Edw. Harris, Kern, Krider, Dr. Kane, T. C. Henry, Dr. Heermann, Dr. Woodhouse and McCall were received, and materially increased the collection of North American birds.

On March 20, 1860, Dr. Wilson formally presented his entire collection, then estimated at 26,000 specimens, to the Academy.

The next ten years show comparatively little increase in the collection, the most important additions being the African birds received from the DuChaillu expeditions which were sent out partly under the auspices of members of the Academy,[7] and the D'Oca collection from Mexico.

Quite a number of specimens were received at this time by gift and exchange from the Smithsonian Institution. With the death of Dr. Wilson in 1865, and of John Cassin in 1869, active ornithological work at the Academy ceased, and with the exception of a few scattered specimens, no addition of importance was made to the collection until 1887.

The accessions since that date, as shown in the appended list, have been extensive and number to date about 17,500 specimens.

In the absence of any catalogue of the individual specimens, Cassin's estimate of the collection in 1860 can only be regarded as approximate, and seems to have been too great. He states that there were about 29,000 specimens in the collection at that time, while up to 1887, 2,500 more were received, but our catalogue of the specimens in the museum in 1887 shows only 25,945.

While no doubt a number of specimens were lost or exchanged, it seems hardly possible that as many as five thousand were dis-

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[6] See Jardine's *Contributions to Ornithology*, 1848, p. 23.

[7] *Proc. Acad. Nat. Sci. Phila.*, 1855, p. 410.

posed of or destroyed, especially in view of the fact that nearly every type specimen or other of especial note is still in our possession.[8]

The following is a summary of the several collections contained in the Academy's museum:

| | | | |
|---|---|---|---|
| | Academy collection in 1860, . . . . | 3,000 | |
| | Rivoli collection, first purchase, . . . | 12,500 | |
| | Rivoli collection, second purchase, . . | 2,500 | |
| | Gould collection (Australia), . . . . | 2,000 | |
| | Bourcier collection, . . . . . . . . | 1,000 | |
| | Boys collection (India), . . . . . | 1,000 | |
| | Collections obtained by Edward Wilson, . | 4,500 | |
| | Dr. Thomas B. Wilson's original collection, . . . . . . . . . . | 2,500 | |
| | | 29,000 | |
| 1860–64 | Du Chaillu collections (Africa) . . . | 428 | |
| 1864 | D'Oca collection (Mexico), . . . . . | | |
| | Miscellaneous, 1860–1887, . . . . | 1,522 | |
| 1880 | Frazer collection (Pennsylvania), . . | 300 | |
| 1887 | Butcher collection (North America), . | 300 | |
| | Total received to 1887, . . . . . . . | 31,550 | |
| | Actual number of specimens in museum, 1887, | | 25,945 |
| 1888 | W. L. Abbott (N. A. and W. Indies), . . . | | 2,659 |
| 1890 | F. C. Baker (Florida), . . . . . . . . . | | 70 |
| 1890 | Mexican Expedition,. . . . . . . . . . | | 220 |
| 1891 | S. N. Rhoads (Florida, Texas, Arizona), . . | | 875 |
| 1891 | West Greenland Expedition, . . . . . . . | | 163 |
| 1892 | Peary Relief and North Greenland Expeditions, | | 122 |
| 1893 | G. W. Carpenter (miscellaneous), . . . . . | | 237 |
| 1893 | S. N. Rhoads (Washington and British Columbia), . . . . . . . . . . . . . | | 1,065 |
| 1894 | R. B. Herron (California), . . . . . . . | | 205 |

[8] In *Proc. Acad. Nat. Sci.*, 1860, p. 86, the Wilson collection is stated as consisting of 26,000 mounted specimens and 2,000 skins. I feel convinced, however, that this is an error and that the estimate of 26,000 as given in detail by Cassin on the next page includes the "2,000 skins." The Academy collection at that date numbered about 3,000 specimens.

| | | |
|---|---|---|
| 1894 | Van Deker (Honduras), . . . . . . . . | 45 |
| 1895 | Mrs. M. J. Chase (mainly Trochilidæ), . . . | 120 |
| 1895 | T. H. Montgomery (Pennsylvania), . . . . | 77 |
| 1895 | S. N. Rhoads (Pennsylvania and New Jersey), | 680 |
| 1895 | S. N. Rhoads (Tennessee), . . . . . . . . | 58 |
| 1896 | Benjamin Sharp (Alaska), . . . . . . . . | 105 |
| 1896 | Dr. A. Donaldson Smith (Somaliland, East Africa), . . . . . . . . . . . . . | 138 |
| 1896–97 | R. T. Young (North America), . . . . . | 110 |
| 1898 | G. and J. E. Farnum and Dr. A. D. Smith (Mongolia), . . . . . . . . . . . | 58 |
| 1887–97 | Miscellaneous, . . . . . . . . . . . . | 658 |
| 1898 | Turnbull Collection (N. A.), . . . . . . . | 800 |
| 1899 | Josiah Hoopes' collection (N. A.), . . . . | 7,250 |
| | | 41,660 |
| 1897 | On deposit Stone collection (Pennsylvania and New Jersey), . . . . . . . . . . | 1,800 |
| | Total specimens, 1898, . . . . . . . . . | 43,460 |

As the collection was left by Dr. Wilson and John Cassin it was nearly all mounted and on exhibition in museum cases in accordance with the ideas prevalent at that time.

Since then, however, it has been clearly demonstrated that mounted specimens have but a limited existence, and sooner or later succumb to the ravages of light and dust, and for years the bulk of all the large collections has been preserved as skins in air-tight, light-proof cases. In accordance with this idea, the rearrangement of the Academy's collection was begun in 1891, and all the types and other valuable specimens as well as many duplicates have been unmounted, and placed in tight cabinets, leaving an ample exhibition series of about 10,000 specimens. Nearly all the recent additions have been skins and have been added to the study series.

In the list of type specimens contained in the Academy collection which follows, the species are arranged according to authors. In order to make the paper more complete, however, mention is made of every author who described new species of birds in the Academy's publications, whether their types are in the collection or not, and the present location of the types, so far as known, is indicated.

These authors are Bonaparte, Townsend, Leib, Gambel, Trudeau, Cassin, Dudley, Hoy, Jones, McCall, Heermann, Sclater, March, Suckley, Woodhouse, Couch, Kennerly, Xantus-De Vesey, Henry, Baird, Elliot, Lawrence, Coues, Cooper, Ridgway, Hoopes, Herrick, Ogden, Gentry, Rhoads and Stone.

Along with the above have been grouped the following American writers: Wilson, Audubon, Say, Nuttall, Cabot, Bryant and Krider, some of whose types are in the collection, but who published elsewhere than in the Academy's journals. The sequence is nearly chronological.

Cassin, being an equal contributor to the ornithology of the Old and New World, is placed at the end of this list, and following him are considered Peale's types and those of the various foreign authors contained in the collections purchased by Dr. Wilson, *i. e.*, Jardine, Strickland, Massena, Verreaux, Lafresnaye, Sir A. Smith, Gould, Lesson, Vieillot, Eyton, Heine, Prevost and Knip.

In nearly every case I have selected *one specimen* as the type in cases where the describer did not make a selection, giving preference to the male over the female if both are described. This practice seems preferable to considering all the specimens of the original lot to be "cotypes," especially as it is often impossible to ascertain how many of the specimens were in the describer's possession at the time the diagnosis was prepared.

However, in order to be as accurate as possible, I have, in every case, included mention of all the specimens which might be considered as "cotypes" or "paratypes," whether in the Academy's collection or not, so that those who do not agree in the above practice will find all the evidence before them.

Care in selecting a definite type and referring to it in the original publication cannot be too highly commended, as the confusion and difficulties that are presented by the carelessness of the older writers in this respect are only too apparent after having completed a study such as this.

The species are entered under the names by which they are generally known at the present time, the nomenclature following the American Ornithologists' Union Check List in the case of North American birds, and the British Museum Catalogue, in the main, in the case of foreign birds.

It is probable that some names here regarded as synonyms in accordance with current usage will eventually prove tenable, but to decide all such cases in a publication of this kind is manifestly impossible.

After the current name is given the name which the type represents and the reference to the original description, followed by the catalogue number and data of the type specimen and "paratypes."

Where specimens are stated to be in the British Museum, U. S. National Museum or other institution, the information is quoted respectively from the Catalogue of Birds, Baird, Cassin and Lawrence, *Birds of North America*, or the various descriptions of the authors themselves.[9]

## Alexander Wilson.

It is probable that all of Wilson's types that were preserved were deposited in Peale's Museum. The collections there contained were dispersed at auction upon the breaking up of the museum and such Wilson specimens as may have been there are probably lost.

Two of the types were, however, obtained in exchange by the Academy before the Peale collection was scattered. These are as follows:

**Buteo latissimus** (Wilson.)

*Falco latissimus* Wils. Am. Orn., vi., 1812, p. 92, pl. 54, fig. 1.

1,551. "Original specimen figured by Wilson."

**Ictinia mississippiensis** (Wilson).

*Falco mississippiensis* Wils. Am. Orn., iii, 1811, p. 80, pl. 25, fig. 1.

2,032. "Original specimen figured by Wilson."

## Thomas Say.

Say's types collected on Major Long's expedition to the Rocky mountains were apparently all deposited in Peale's Museum, and many of them are figured in Bonaparte's *American Ornithology* and definitely referred to by the Museum numbers.

As in the case of most of Wilson's types, they have been entirely lost sight of. There is no evidence that any of them came into possession of the Academy.[10]

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[9] Some data were also kindly furnished by Dr. C. W. Richmond, of the U. S. National Museum.

[10] Early references to the "Philadelphia Museum" refer to Peale's Museum, which bore this name after its reorganization, and not to the Academy, as is often supposed.

### Charles L. Bonaparte.

Bonaparte's types, described in his *American Ornithology*, were either deposited in Peale's Museum or in his own collection. None of them appear to have been in the Academy collection, nor is there any trace of the types of several species described in the *Journal* of the Academy, 1824–1827.

Several of his types of foreign birds were, however, received in later years from Verreaux or Massena. A list of them follows:

**Nothocercus julius** (Bp.).
*Tinamus julius* Bp. Compt. Rend., xxxvii (1853), p. 633.
12,914. ♂ Colombia. From Verreaux. *Type*.

**Platycercus amathusiæ** (Bp.).
*Platycercus amathusiæ* Bp. Compt. Rend., xxx (1850), p. 133.
22,860. Australia. *Type*.

Bonaparte quotes "Gould MSS." as authority for this species, but Gould had not at that time published the species, and when he did, in 1855 (Pt. 2, p. 166) he used another name, *P. cyanogenys*, so that Bonaparte remains as the authority for the species. Gould's type is in the British Museum.

**Ortygometra verreauxi** (Bp.) Compt. Rend., xliii, pp. 599, 600.
**Ortygometra sclateri** (Bp.) Compt. Rend., xliii, pp. 599, 600.

These are nomina nuda so far as I can ascertain. The species were later published by Sclater and Salvin as *O. castaneiceps* and *hauxwelli* respectively. The "type specimens" of Bonaparte are in the Academy collection received from Verreaux.

**Diphyllodes respublica** (Bp.). See under *Schlegelia wilsoni* of Cassin.

### John K. Townsend.

The new species of birds described by Townsend and Audubon from the Columbia river and Rocky mountains were obtained on an expedition undertaken by Townsend and Nuttall early in 1834.

Nuttall returned in October, 1835, via Hawaii and California, arriving home in August, 1836, while Townsend spent another year on the Columbia, visiting the South Pacific and Chile on his return.[11]

Nuttall met Audubon in Boston immediately after his return and gave him such notes as he had made on the Western birds for use in the *Ornithological Biography*. The only new birds which he seems

[11] See Narrative of a Journey Across the Rocky Mountains, etc.

to have obtained were *Agelaius tricolor* and *Pica nuttallii.* That he did not collect more was partly due to the fact that he was mainly engaged in collecting plants and partly, as Audubon states, to the fact that "he was not in the habit of carrying a gun on his rambles."

Townsend made the main ornithological collection, and apparently sent home by Nuttall all the specimens he had obtained up to the date of his departure, as the collection was in Philadelphia in 1836. Audubon, hearing of this, hastened to Philadelphia, and was much disgusted because Townsend's friends would not let him describe the new species. An arrangement was, however, effected by which the new birds were to be published by Nuttall and Audubon in a paper in the *Journal* of the Academy under Townsend's name, and then to be figured in the *Birds of America.* And as a part of the same arrangement, Audubon (or Edward Harris for him) purchased the duplicate specimens.[12]

The types of the species described by Townsend are most of them still preserved in the Academy's collection. The "*duplicates*" purchased by Audubon were afterwards given by him to Edward Harris and Spencer F. Baird, and were eventually deposited respectively in the Academy and in the U. S. National Museum.

In some cases there are specimens in the U. S National Museum of species which are not now contained in the Academy's series, in which case the former must be regarded as the types, otherwise the Academy specimens seem to have the best claim to be so considered.

The specimens collected by Townsend after Nuttall's departure fall into another category. They were apparently (with a few exceptions) sent direct to Audubon,[13] and were published by him in his *Ornithological Biography,* Vol. v, the types being subsequently given to Harris and Baird along with the others. Most of these are now in the Academy and National Museum, and the question as to which should be considered the types naturally arises. Fortunately there is only one species of which specimens are in both institutions, *i. e.*, *Dryobates villosus harrisii,* and of this there is little difficulty in fixing the type.

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[12] Ornith. Biog., iv, Preface, p. xi.

[13] Not, however, those obtained in the S. Pacific and Chile which are in the Academy collection.

Townsend, upon his return, published *Cypcelus vauxii*, *Sylvia tolmoei*, *Cinclus mortoni* and *Cinclus townsendi*, and a complete list of the birds observed by him in the West, noting all the species described by Audubon and himself. A list of all of Townsend's species follows with reference to the type specimens, as well as to such others as are still preserved.

**Ægialitis montana** (Towns.).
*Charadrius montanus* Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 192.
24,353. ♀ Rocky mountains. J. K. Townsend. *Type.*

**Chaetura vauxii** (Towns.).
*Cypcelus vauxii* Towns. Jour. Acad. Nat. Sci. Phila., viii, p. 148.
24,169. Columbia river. J. K. Townsend. *Type.*

**Junco hyemalis oregonus** (Towns.).
*Fringilla oregona* Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 188.
24,048. Columbia river. J. K. Townsend. *Type.*

Two specimens with same data are in the U. S. National Museum from Baird (Nos. 1,947 and 1,948).

**Calcarius ornatus** (Towns.).
*Plectrophanes ornatus* Towns. Jour. Acad. Nat. Sci. Phila., viii, p. 189.
24,099. ♂ Rocky mountains. J. K. Townsend. *Type.*

**Calamospiza melanocorys** Stejn.
*Fringilla bicolor* Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 189.
22,951. ♂ Rocky mountains. J. K. Townsend. *Type.*
23,953. ♀ Rocky mountains. J. K. Townsend.

Also one in U. S. National Museum, with same data (2,869).

**Dendroica auduboni** (Towns.).
*Sylvia auduboni* Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 191.
23,826. ♂ Columbia river. J. K. Townsend. *Type.*

Also three specimens in U. S. National Museum.

**Dendroica nigrescens** (Towns.).
*Sylvia nigrescens* Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 191.

Two specimens in the U. S. National Museum appear to be the only ones extant (Nos. 1,908 and 2,915).

1,908 (U. S. N. M.). ♂ June 16, 1835. Columbia river. J. K. Townsend. *Type.*

**Dendroica townsendi** (Towns.).
*Sylvia townsendi* Nutt., Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 191.

One specimen in the U. S. National Museum is the only one extant.

2,918 (U. S. N. M.). ♂ Oct. 28, 1835. Columbia River. J. K. Townsend. *Type.*

This specimen was unique and must have been purchased by Audubon along with the duplicates, or given to him later by Townsend.

**Dendroica occidentalis** (Towns.).

*Sylvia occidentalis* Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 190.

I can find no record of Townsend's specimen of this bird, and it is apparently not in the National Museum.

**Geothlypis tolmoei** (Towns.).

*Sylvia tolmoei* Towns. Appendix to Narrative of Journey Across Rocky Mountains, April, 1830, p. 343. Also Jour. Acad. Nat. Sci. Phila., viii, p. 149.

23,765. Columbia river. J. K. Townsend. *Type.*

Also, three specimens in U. S. Nat. Mus., from Baird (2,907, 1,910 and 1,861).

One of these specimens is the type of *Sylvia macgillivrayi* Aud. (see below), but in a paper in *Jour. Acad. Nat. Sci. Phila.*, viii, p. 159, Townsend insists that his name (*tolmoei*) should have priority. In this he was correct, though the fact has been universally overlooked.[14]

**Cinclus mexicanus** Sw.

*Cinclus montana* Towns.

*Cinclus townsendii* "Audubon" Towns.

These two species are described in the Appendix to Townsend's Narrative, p. 339, with reference to Audubon (Vol. iv, pl. 435). The first is based upon a single male, the latter upon a female. The descriptions were evidently prepared before Audubon's plate and descriptions appeared with the understanding that he would adopt the above names. He meanwhile, however, rightly surmised that they were both identical with *C. americanus* Sw. (= *mexicanus* Sw.), and published them under that name (*Orn. Biog.*, v, p. 303).

The types may possibly be in the U. S. National Museum.

**Oroscoptes montanus** (Towns.).

*Orpheus montanus* Towns. Jour. Acad. Nat. Sci. Phila, vii, p. 193.

23,728. J. K. Townsend. *Type.*

**Parus rufescens** Towns.

*Parus rufescens* Towns. Jour. Acad. Nat. Sci., Phila., vii, p. 190.

23,665. ♀ Columbia river. J. K. Townsend. *Type.*

Also in U. S. National Museum, two similar specimens (2,931 and 1,924).

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[14] See Stone "Auk," Jan., 1899.

**Psaltriparus minimus** (Towns.).
*Parus minimus* Towns. Jour. Acad. Nat. Sci. Phila., vii, p. 190.

Apparently no specimens are extant.

**Sialia mexicana occidentalis** (Towns.).
*Sialia occidentalis* Towns. Jour. Acad. Nat. Sci. vii, p. 188.

Two specimens are in the U. S. National Museum:

1,930 (U. S. N. M.). ♂ Columbia river. J. K. Townsend. *Type.*
2,949 (U. S. N. M.). ♀ Columbia river. J. K. Townsend.

## John James Audubon.

The history of the Townsend specimens has been explained above and it only remains to speak of such others of Audubon's types as have found their way to the Academy's collection.

Two of these, *Colaptes ayersii* and *Caprimulgus nuttallii*, were presented by Audubon himself in 1849.

*Columba trudeaui* was obtained from J. G. Bell, and the others were presented by Edward Harris in 1849, with the rest of his collection.

Cassin states that Harris' collection contains the types of *Quiscalus breweri*, *Sturnella neglecta*, *Fringilla harrisii*, *F. lincolni*,[15] *Alauda spraguei*, *Emberiza bairdii* and *Vireo belli*.

Of several of these latter, Audubon also gave specimens to Baird, and it is a question which of these shall be designated as the types. In the list below I have included both the Academy and National Museum specimens in all such cases.

Considering first the species based on Townsend's collection, we find that two of those credited to Audubon in Townsend's list were evidently so given by typographical error—*Icterus gubernator* and *Diomedia chlororhynca* being already described by other authors.

*Icterus tricolor* and *Pica nuttalli* (type 3,337, U.S.N.M.) were based on Nuttall's specimens, and *Picus gairdnerii* apparently on one received from Gairdner or Nuttall, while the following were names based on account of birds that had been seen but not secured, and have no standing except *Caprimulgus nuttallii*, which was rediscovered by Audubon himself in 1843, and properly described:

| | |
|---|---|
| *Phalacrocorax leucurus.* | *Picus pyrrhonotus.* |
| *Phalacrocorax leuconotus.* | *Turdus townsendii.* |
| *Phasianus americanus.* | *Caprimulgus nuttallii.* |

[15] Probably Cassin's error. A specimen from the Upper Missouri was presented by Harris, but Audubon's type came from Labrador and seems to be lost.

Of the other species, types of the following are in the U. S. National Museum:[16]

*Troglodytes parkmani* (probably No. 66,644).
*Ptilogonys townsendii* (No. 2,922).
*Sylvia delafieldii* (No. 2,905).
*Sylvia macgillivrayi* (No. 1,910).
*Fringilla townsendii* (No. 2,874).
*Fringilla chlorura* (No. 1,896).
*Larus occidentalis.*
*Diomedia fusca.*
*Phalacrocorax townsendii.*

Of the rest, the types are in the Academy collection, as follows, or else have been entirely lost sight of:[17]

**Dryobates villosus harrisii** (Aud.).
*Picus harrisii* Aud. Orn. Biog., v, p. 191.
1,923. ♂ Columbia river. J. K. Townsend. *Type.*
24,246. ♀ Columbia river. J. K. Townsend.

Another in the U. S. National Museum does not correspond with either of those mentioned by Audubon in date of capture, so that it is probable that the above pair are those from which he drew his description.

**Brachyspiza capensis peruviana** (Less.)?
*Fringilla mortoni* Aud. Orn. Biog., v, p. 312.
10,614. "Columbia river. J. K. Townsend." From Dr. Woodhouse. *Type.*

This specimen was evidently obtained in Chile, and was wrongly labelled.

The other types of Audubon in the Academy collection are:

**Melopelia leucoptera** (L.).
*Columba trudeauii* Aud. Bds. of Am., vii, p. 352.
30,034. "The type specimen described by Mr. Audubon. J. C." Texas. From Bell.

**Scolecophagus breweri** (Aud.).
*Quiscalus breweri* Aud. Bds. of Am., vii, p. 345.
3,840. Ft. Union. June 24, 1843. Edw. Harris. *Type.*

**Sturnella magna neglecta** (Aud.).
*Sturnella neglecta* Aud. Bds. of Am., vii, p. 339.

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[16] I am indebted to Dr. Charles W. Richmond for information relative to the Townsend specimens contained in the National Museum.

[17] The lost types are as follows—some of them may, however, be found among the material at the National Museum, part of which, Dr. Richmond informs me, is not at present accessible for examination:

*Uria townsendii.*
*Procellaria pacifica.*
*Procellaria tenuirostris.*
*Diomedia nigripes.*
*Phalacrocorax resplendens.*
*Hæmatopus townsendii.*
*Hæmatopus bachmani.*
*Aphriza townsendii.*

The specimen presented by Harris cannot now be found, and the type is therefore

1,939 (U. S. N. M.), June 30, 1843. J. J. Audubon. From S. F. Baird.

**Colaptes auratus × cafer.**

*Picus ayresei* (Aud.). Bds. of Am., vii, p. 348.

30,198. ♂ June 19, 1843. From J. J. Audubon, coll. by Bell. *Type.*

**Zonotrichia querula** (Nutt.).

*Fringilla harrisii* Aud. Bds. of Am., vii, p. 331.

24,073. ♂ From Edw. Harris.

24,074. ♀ From Edw. Harris.

Also one specimen in the National Museum:

1,940 (U. S. N. M.). ♄ "Kickapoo country, May 5, 1843. J. J. Audubon," from S. F. Baird.

**Vireo belli** (Aud.).

*Vireo belli* Aud. Bds. of Am., vii, p. 333.

23,880. ♀ From Edw. Harris.

Also one in the National Museum, viz.:

1,926. (U. S. N. M.) "Ft. Union, 1843. J. J. Audubon." From S. F. Baird.

**Anthus spraguei** (Aud.).

*Alauda spraguei* Aud. Bds. of Amer., vii, p. 334.

23,733. ♂ June 24, 1843. Ft. Union. Edw. Harris. *Type.*

There is also a specimen in the National Museum:

1,854 (U. S. N. M.). "Ft. Union, 1843. J. J. Audubon." From S. F. Baird.

The specimen described is the male.

**Ammodramus bairdii** (Aud.).

*Emberiza bairdii* Aud. Bds. of Amer., vii, p. 359.

24,085. Ft Union, 1843. Edw. Harris. *Type.*

24,086. Ft. Union, 1843. Edw. Harris.

There is also a specimen in the National Museum:

1,885 (U. S. N. M.). Ft. Union, 1843. J. J. Audubon, from Baird.

**Phalænoptilus nuttallii** (Aud.).

*Caprimulgus nuttallii* Aud. Bds. of Amer., vii, p. 350.

24,182. From J. J. Audubon. *Type.*

## Thomas Nuttall.

Nuttall's new species were all described in his *Manual*, though he was, in all probability, responsible for the names published under the ostensible authorship of Townsend and Gamble during their absence in the West. Several of Nuttall's species are based on specimens in the Academy's collection as follows:

**Zonotrichia coronata** (Pallas).
*Zonotrichia aurocapilla* Nutt.
24,067. ♂ Sept. 22, 1836. Columbia river. *Type.*

**Melospiza fasciata guttata** (Nutt.).
*Melospiza guttata* Nutt.

This species is based upon Audubon's description of *Fringilla cinerea* (*Orn. Biog.*, v, p. 22), which Nuttall rightly determined was not *Fringilla cinerea* of Gmelin. Audubon's description was based upon one of Townsend's specimens, which subsequently came into the Academy's possession through Edward Harris, and must of course be regarded as the type of Nuttall's *M. guttata.*

24,028. ♂ Columbia river. J. K. Townsend. From E. Harris. *Type.*

A female and an unsexed specimen are in the National Museum, also from Townsend.

**Zonotrichia leucophrys gambeli** (Nutt.).
*Fringilla gambeli* Nutt.

Also based on a Townsend specimen in the Academy collection, but the type cannot now be found.

**Turdus ustulatus** (Nutt.).
*Turdus ustulatus* Nutt.

Based on a Townsend specimen in the Academy collection which I have identified as

23,644. Columbia river. J. K. Townsend. *Type.*

## William Gambel.

Gambel's new species were based mainly upon collections made by him in California and presented to the Academy, where most of the specimens are still preserved, though several have found their way into the National Museum.

**Ptychoramphus aleuticus** (Pall.).
*Mergulus cassinii* Gambel. Proc. Acad. Nat. Sci. Phila., xx, 1845, p. 266.
30,073. California. W. Gambel. *Type.*

**Sterna antillarum** (Less.)
*Sterna frenata* Gambel. Proc. Acad. Nat. Sci. Phila., 1848, p. 128.
24,499. Atlantic ocean. Dr. Heermann. *Type.*

**Sterna maxima** (Bodd).
*Sterna regia* Gambel. Proc. Acad. Nat. Sci. Phila., 1848, p. 128.
30,071. Florida. Dr. Heermann. *Type.*

**Sterna elegans** (Gambel).
*Sterna elegans* Gambel. Proc. Acad. Nat. Sci. Phila., 1848, p. 128.
30,070. "Mazatlan, California." W. Gambel. *Type.*

**Dactylortyx thoracicus** (Gambel).

*Ortyx thoracicus* Gambel. Proc. Acad. Nat. Sci. Phila., 1848, p. 77.

12,405. Jalapa, Mex., D'Oca Coll.

12,404. Mexico, Pease Coll. *Type.*

**Callipepla gambelii** (Gambel).

*Lophortyx gambellii* "Nutt." Gambel. Proc. Acad Nat. Sci. Phila., 1843, p. 260.

24,327. ♂ California. W. Gambel. *Type.*

**Dryobates nuttallii** (Gambel).

*Picus nuttallii* Gambel. Proc. Acad. Nat. Sci. Phila., 1843, p. 259.

The types of this species seem to be in the National Museum labelled as presented by Dr. Thomas B. Wilson.

3337 (U. S. N. M.). ♂ California. W. Gambel. *Type.*

**Myiodynastes bairdii** (Gambel).

*Saurophagus bairdii* Gambel. Jour. Acad. Nat. Sci. Phila., New Series, i, p. 40.

Type loaned by Baird, and now in U. S. National Museum.

This species inhabits South America. This specimen was wrongly attributed to California.

**Oreospiza chlorura** (Aud.).

*Fringilla blandingiana* Gambel. Proc. Acad. Nat. Sci. Phila., 1843, p. 260.

The type of this species cannot be found.

**Harporhynchus redivivus** (Gambel).

*Harpes redivivus* Gambel. Proc. Acad. Nat. Sci. Phila., 1845, p. 264.

23715. California. W. Gambel. *Type.*

**Troglodytes aëdon** (Vieill.).

*Troglodytes sylvestris* Gambel. Proc. Acad. Nat. Sci. Phila., 1846, p. 113.

Proposed for *T. americana* Aud., which is preoccupied.

No type has been found.

**Chamæa fasciata** (Gambel).

*Parus fasciatus* Gambel. Proc. Acad. Nat. Sci. Phila., 1845, p. 265.

Type is in the National Museum.

3,339 (U. S. N. M.). California. Dr. Gambel. From Baird.

**Parus gambeli** Ridgw.

*Parus montanus* Gambel. Proc. Acad. Nat. Sci. Phila., 1843, p. 259.

The type of this species cannot be found.

**Parus inornatus** Gambel.

*Parus inornatus* Gambel. Proc. Acad. Nat. Sci. Phila., 1845, p. 265.

Type is in the National Museum.

3,340 (U. S. N. M.). California. Dr. Gambel. From Baird.

### JAMES TRUDEAU.

Trudeau described in the Academy's *Journal* for 1837 and 1839, *Picus auduboni* from New Orleans, *Pyranga leucoptera* from Mexico. Neither of his types, however, seem to have been presented to the Museum.

### EDWARD HARRIS.

Harris described but one species, the type of which is before me.

**Parus atricapillus septentrionalis** (Harris).
*Parus septentrionalis* Harris. Proc. Acad. Nat. Sci. Phila., 1845, p. 300.
29,792, juv. Yellowstone river, upper Missouri. E. Harris. *Type.*

### GEORGE A. McCALL.

Of McCall's types two are preserved in the collection.

**Otocoris alpestris occidentalis** (McCall).
*Otocoris occidentalis* McCall. Proc. Acad. Nat. Sci. Phila., 1851, p. 218.
14,883. Santa Fé, N. Mex. July, 1850. *Type.*

This name must supplant either *arenicola* or *adusta.*

**Carpodacus mexicanus frontalis** (Say).
*Carpodacus obscurus* McCall. Proc. Acad. Nat. Sci. Phila., 1851, p. 220.
24,141. ♀ Santa Fé, N. Mex. June, 1850. *Type.*

Of the other species described by him, the types cannot be found, viz.:

*Columba solitaria* (McCall). Proc. Acad. Nat. Sci. Phila., 1847, p. 233.

*Cyanocorax cassinii* (McCall). Proc. Acad. Nat. Sci. Phila., 1851, p. 216 (= *Cyanocephalus cyanocephalus*).

*Carpodacus familiaris* (McCall). Proc. Acad. Nat. Sci. Phila., 1852, p. 61.

### GEORGE C. LEIB.

**Camptolaimus labradorius** (Gm.).
*Fuligula grisea* Leib. Jour. Acad. Nat. Sci. Phila. (1st series), viii, p. 170.

Type is perhaps one of two old specimens in the collection without data, but this is by no means certain.

### WILLIAM DUDLEY.

**Grus americanus** (Linn.).
*Grus hoyianus* Dudley. Proc. Acad. Nat. Sci. Phila., vii, p. 64.

Type in Museum Wisconsin Natural History Society.

### PHILO R. HOY.

**Bubo virginianus arcticus** (Sw.).
*Bubo subarcticus* Hoy. Proc. Acad. Nat. Sci. Phila., vi, p. 211.
2,797. Racine, Wisconsin. Dr. Hoy. *Type.*

**Nyctala acadica** (Gm).
*Nyctale kirtlandii* Hoy. Proc. Acad. Nat. Sci. Phila., vi, p. 210.
2,718. Wisconsin. Dr. Hoy. *Type.*

**Buteo bairdii** (Hoy). See under Cassin.

## W. L. Jones.

**Dryobates pubescens** (L.).
*Picus lecontei* Jones. Ann. Lyc. N. H., iv (1848), p. 489.
30,199. ♂ Georgia. Apr. 14, 1847. Dr. W. L. Jones. *Type.*

## A. L. Heermann.

Three species were described by Heermann, the types being as follows:

**Podilymbus podiceps** (Linn.).
*Podilymbus lineatus* Heermann. Proc. Acad. Nat. Sci. Phila., 1847, p. 179.
4,738. California. A. L. Heermann. *Type.*

**Colymbus nigricollis californicus** (Heerm.).
*Podiceps californicus* Heermann. Pro. Acad. Nat. Sci. Phila., 1854, p. 179.
30,072. California. A. L. Heermann. *Type.*

**Tringytes subruficollis** (Heerm.).
*Actidurus nævius* Heerm. Proc. Acad. Nat. Sci. Phila., 1854, p. 178.
6,694 (U. S. N. M.). San Antonio, Tex. *Type.*

## George Suckley, S. W. Woodhouse, D. N. Couch, C. B. R. Kennerly, J. Xantus DeVesey, T. Charlton Henry.

These authors all described new species in the Academy's *Proceedings* (1852–1859) from collections made by them on the various Government surveys, and while many duplicates from the collections have been presented to the Academy by the Smithsonian Institution, the types, with one exception, were retained.

**Harporhynchus crissalis** (Henry).
*Toxostoma crissalis* Henry. Proc. Acad. Nat. Sci. Phila., 1858, p. 117.
23,713 (8,127). Ft. Thorn, N. Mex. T. C. Henry. *Type.*
(See also Baird, Rev. Amer. Bds., p. 48).

## Spencer F. Baird.

While a majority of Prof. Baird's new species were described in the Academy's *Proceedings*, most of his types were the property of the U. S. National Museum. Those in the Academy's collection are as follows:

**Anser albifrons gambeli** (Hartl.).

*Anser frontalis* Baird. Bds. of N. Am., p. 762.

6,055. New Mexico. Dr. T. C. Henry, marked by Cassin as "*Type* of species."

Two specimens are mentioned in the original description, and this is evidently one of them.

**Empidonax minimus** (Baird).

*Tyrannula minima* Baird. Proc. Acad. Nat. Sci. Phila., 1843, p. 284.

4,465 (1,161 S. F. B.). Carlisle, Pa. Aug. 16, 1843, from Baird. *Type.*

**Empidonax flaviventris** (Baird).

*Tyrannula flaviventris* Baird. Proc. Acad. Nat. Sci. Phila., 1843, p. 283.

The type of this species was also presented to the Academy (see *Proc. Acad. Nat. Sci. Phila.*, 1843, p. 289), but is not now extant.

**Lanius fallax**, or some allied Old World species.

*Collurio ludovicianus robustus* Baird. Baird, Brewer and Ridgway. N. A. Bds., i, p. 420 (1874).

15,303. ["California."] Dr. Gambel. *Type.*

The specimen probably came from the Old World (see Stejneger, Proc. Acad. Nat. Sci. Phila., 1885, p. 91).

**Vireolanius eximius** Baird.

*Vireolanius eximius* Baird. Rev. Amer. Bds., 1864, p. 398.

24,497. Bogota, from J. G. Bell. *Type.*

**Dendroica rufigula** Baird.

*Dendroica rufigula* Baird. Rev. Amer. Bds., 1864, p. 204.

8,675. Martinique. Rivoli coll. (?) *Type.*

**Platycichla brevipes** Baird.

*Platycichla brevipes* Baird. Rev. Amer. Bds., 1864, p. 32.

While the Academy specimen, 24,495, is mentioned in the description, the National Museum specimen, 23,954, seems to have the better claim to recognition as the type.

## George N. Lawrence.

As in the case of Baird, Lawrence was a frequent contributor to the *Proceedings*, though most of his types were preserved elsewhere. Only two are in the collection.

**Thamnophilus virgatus** Lawr.

*Thamnophilus virgatus* Lawr. Proc. Acad. Nat. Sci. Phila., 1868, p. 361.

24,500. ♂ Turbo, Panama. W. S. and C. J. Wood, Michler Exp. *Type.*

This species is wholly ignored in the *Catalogue of Birds* in the British Museum, but is reëstablished in the *Biologia Centr. Amer.*, ii., p. 199, after an examination of this specimen which seems to be unique.

**Auriparus flaviceps** (Sundev.).
*Conirostrum ornatum* Lawr. Ann: Lyc. N. Y., v, p. 112.
18,177. Rio Grande River. Capt. J. C. McCown. *Type.*

This specimen was apparently presented by Lawrence and is labelled as above in his hand.

D. G. Elliot, Elliot Coues,
J. G. Cooper, Robert Ridgway.

These authors all contributed diagnoses of new species to the *Proceedings,* but only two of their types are contained in the Academy's collection.

**Diomedia melanophrys** Boie.
*Diomedia gilliana* Coues. Proc. Acad. Nat. Sci. Phila., 1866, p. 181.
4,514. (No data.) *Type.*

**Glaucidium jardinii** (Bp.).
*Glaucidium langsbergii* Rdgw. Proc. Bost. Soc. N. H., xvi, p. 98.
2,586. ♂ Brazil. *Type.*
2,590. ♀ Caracas.

Though credited to "Leyd. Mus., T. B. Wilson," Ridgway seems to have been the first to publish this name.

## P. L. Sclater.

Dr. Sclater described several new species in Jardine's *Contributions to Ornithology,* based on specimens loaned him by Edward Wilson. The types, however, seem to have been afterwards secured by Dr. Sclater, and presented to the British Museum, and never reached the Academy collection.

Such species are:

*Euphonia frontalis.*
*Calliste lunigera.*
*Calliste xanthogastra.*

Some other specimens upon which he based descriptions were lost in shipment to Philadelphia (see *Contr. to Ornith.,* 1852, p. 59). Besides the birds loaned to him by Edward Wilson, Sclater described two new species during his visit to the Academy in 1856. His types in the collection are as follows:

**Glaucidium gnoma californicum** Scl.
*Glaucidium californicum* Scl. P. Z. S., 1857, p. 4.
2,559. ♀ California. Dr. A. L. Heermann. *Type.*

**Pygoptila margaritata** (Scl.).
*Myrmeciza margaritata* Scl. P. Z. S., 1854, p. 253.
8,111. ♂ Peru, from Verreaux. *Type.*

**Saltator atripennis** Scl.
*Saltator atripennis* Scl. Proc. Acad. Nat. Sci. Phila., 1856, p. 261.
7,800. ♂ "Popayan, N. Granada." Rivoli coll. *Type.*
7,801. ♂ "Popayan, N. Granada." Rivoli coll.

**Helodytes humilis** Scl.
*Campylorhynchus humilis* Scl. Proc. Acad. Nat. Sci. Phila., 1856, p. 263.
24,496. ♂ Mazatlan. Bell.
23,908. "California." Dr. Gambel.

## Henry Bryant.

**Tachycineta cyaneoviridis** (Bryant).
*Hirundo cyaneoviridis* Bryant. Proc. Bost. Soc. Nat. Hist., vii (1859), p. 111.
15,639. Nassau, New Providence, Bahamas. Pres. by Dr. Bryant, 1860. *Type.*

Most of Dr. Bryant's types are presumably in the collection of the Boston Society of Natural History, but this specimen was sent to the Academy immediately after it was described, and is distinctly marked as the type.

## W. T. March.

March described *Mimus hillii* in the Academy's *Proceedings* in 1863, but his type is in the U. S. National Museum.

## Samuel Cabot, Jr.

**Psilorhinus mexicanus** Rüpp.
*Corvus vociferus* Cabot. Jour. Bost. Soc. N. H., iv (1844), p. 464.
3,096. Yucatan. *Type.*

This is the only one of Cabot's specimens in the Academy, and is marked by Prof. Baird as the *type.*

## John Krider.

The well-known gunmaker and taxidermist of Philadelphia, though a great collector, was not much of a contributor to ornithological literature, and the only species described by him was the following, which proves to be merely a partly melanistic Common Quail:

**Colinus virginianus** (L.).
*Ortyx virginianus* var. *hoopesi* Krider. Forest and Stream, Vol. xvi, p. 243.
12,391. J. Krider. *Type.*

### Bernard A. Hoopes.

**Buteo borealis kriderii** (Hoopes).
*Buteo kriderii* Hoopes. Proc. Acad. Nat. Sci. Phila., 1873, p. 238.
1,493. ♂ Winnebago Co., Iowa. Sept., 1872. J. Krider. *Type.*

### Herold Herrick.

**Helminthophila lawrencei** (Herrick).
*Helminthophaga lawrencei* Herrick. Proc. Acad. Nat. Sci. Phila., 1874, p. 220.

Type probably in the American Museum of Natural History.

### J. A. Ogden.

**Chettusia crassirostris** De Fil.
*Chettusia nigrifrons* Ogden. Proc. Acad. Nat. Sci. Phila., 1871, p. 196.
11639. Fazogloa Africa. Rivoli coll. *Type.*

"*Chettusia cassini* Ogden" seems to be only a manuscript name. No. 11,641, ♀, Java, Rivoli Coll., is labelled as the type with the above name.

**Ptilorhis magnifica** (Vieill.).
*Ptilorhis wilsoni* Ogden. Proc. Acad. Nat. Sci. Phila., 1875 (Jan., 1876), p. 451.
3,124. New Guinea. Rivoli coll. *Type.*

### Alan F. Gentry.

**Cyanocorax heilprini** Gentry.
*Cyanocorax heilprini* Gentry. Proc. Acad. Nat. Sci. Phila., 1885, p. 90.
3,055. ♂ Rio Negro. Rivoli coll. *Type.*

Apparently unique, perhaps a hybrid.

### Witmer Stone.

**Anous atrofuscus** Stone.
*Anous atrofuscus* Stone. Proc. Acad. Nat. Sci. Phila., 1894, p. 117.
5,027 Mer de Montevideo. Rivoli coll. *Type.*

**Bubo virginianus** (Gm.).
*Bubo* v. *occidentalis* Stone. Auk, 1896, p. 155.
26,435. Mitchell Co., Iowa. Dr. W. L. Abbott. 1880. *Type.*

This specimen proved not to be the "Western Horned Owl," but intermediate between *virginianus* and *arcticus*. The "Western Horned Owl" was subsequently named *Bubo* v. *pallescens* Stone (type in U. S. National Museum).

**Sturnella magna hoopesi** Stone.
*Sturnella magna hoopesi* Stone. Proc. Acad. Nat. Sci., 1897, p. 149.
786 (Coll. Josiah Hoopes). ♂ Brownsville, Tex. Mar. 13, 1892.
F. B. Armstrong. *Type.*

### Samuel N. Rhoads.

**Parus hudsonicus columbianus** Rhoads.

*Parus hudsonicus columbianus* Rhoads. Auk, 1893, p. 23.

31,493. ♂ Field, B. C. Aug. 30, 1892. Coll. S. N. Rhoads. *Type.*

### John Cassin.

As the ornithologist of the Academy for over twenty-five years of its greatest ornithological activity, it is not surprising that Cassin described more new species from the collection than any one else, nor is it a matter of wonder that with such a collection constantly at hand he pursued his studies among the birds of all parts of the world with equal freedom. Cassin's publications consisted mainly of his papers in the *Proceedings* and *Journal* of the Academy.

Besides these he published the *Birds of California and Texas*, *Birds of the Japan Expedition*,[18] *U. S. Astronomical Expedition*,[18] the second edition of the *Birds of the U. S. Exploring Expedition*, and contributed the Raptores, Grallæ and Alcidæ to Baird's *Birds of North America.*

The types of new species described in the Government publications are all in the National Museum, while the vast majority of those described in these *Proceedings* are in the Academy collection. In a few of the species described in the latter, as well as those in the *Birds of California and Texas*, he frequently says "specimens in the Acad., Phila., and Nat. Mus., Wash.," which occasions some ambiguity. In such cases I have given preference to the Academy specimens as being probably those before him at the time of writing, especially when these are labelled by Cassin himself, but in some instances, as seen below, the National Museum specimens have the better claim.

A word of explanation as to Cassin's connection with the *Birds of the U. S. Exploring Expedition* may not be out of place, as the matter is not generally clearly understood.

The original report was prepared by Titian R. Peale, who accompanied the expedition, but only ninety copies of this work were issued. These which were distributed to the leading libraries but without plates. Subsequently, in consideration of the importance of the work, a new report was prepared by Cassin, accompanied by a volume of plates which had been originally intended to accompany the first edition.

[18] In these reports no new species are proposed.

Cassin had the original Peale collection submitted to him upon which to prepare his report. These specimens were mainly returned to the National Museum, but a small number, including some types, were presented to the Academy. Peale's work is remarkable for the number of names it adds to the synonymy, for out of 109 species described as new, only thirty-three are accepted in Cassin's edition. The few novelties described by Cassin from the collection are originally described in the Academy *Proceedings*.

Cassin's types have been grouped geographically in the following list and all the species proposed by him are included whether the types are in the Academy or not.

## Cassin's North American Types.

**Cerorhina monocerata** (Pall.).

*Cerorhina suckleyi* Cass. Baird's Bds. of Am., p. 906.

4,579 (U. S. N. M.). Ft. Steilacoom, Washington T. Dr. G. Suckley. *Type.*

**Larus heermanni** Cass.

*Larus heermanni* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 187.

Type cannot be found.

**Fulmarus glacialis rodgersii** (Cass.).

*Fulmarus rodgersii* Cass. Proc. Acad. Nat. Sci. Phila., 1862, p. 326.

Type in U. S. National Museum.

**Merganser americanus** (Cass.).

*Mergus americanus* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 187.

No type mentioned, based partly on Wilson's plate.

**Oidemia deglandi** Bp.

*Oidemia velvetina* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 126.

5,540. Egg Harbor, N. J. E. J. Lewis, M.D. *Type.*

**Chen hyperborea** (Pall.).

*Anser albatus* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 41.

6,045. Philadelphia market. *Type.*

**Chen rossii** (Cass.).

*Anser rossii* Cass. Proc. Acad. Nat. Sci. Phila., 1861, p. 73.

Type in U. S. National Museum.

**Branta canadensis** (L.).

*Anser parvipes* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 187.

6,019. Vera Cruz. Dr. Burrough. *Type.*

**Grus canadensis** L.

*Grus fraterculus* Cass. Baird's Bds. of Am., p. 656.

10,378 (U. S. N. M.). Albuquerque, N. Mex. Lt. Whipple. *Type.*

**Tringa alpina pacifica** (Coues).
*Tringa alpina americana* Cass. Baird's Bds. of Am., p. 719.

No type mentioned; name proposed for the American bird as distinct from the European.

**Aegialitis nivosa** Cass.
Baird's Bds. of Am., p. 696.
6,600 (U. S. N. M.). Presidio, Cal. Lt. Trowbridge. *Type.*

**Buteo cooperi** Cass.
*Buteo cooperi* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 253.

Type in U. S. National Museum.

**Buteo borealis calurus** (Cass.).
*Buteo calurus* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 281.
1,516. N. Mexico. Dr. T. C. Henry. *Type.*

**Buteo lineatus elegans** (Cass.).
*Buteo elegans* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 281.
1,544. ♂ California. *Type.*

**Buteo swainsoni** Bp.
*Buteo oxypterus* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 282.
1,465. N. Mexico. Dr. T. C. Henry. *Type.*

Another specimen (8,550) in the National Museum is recorded by Ridgway as the type, but it is from Ft. Fillmore, while the type is from Ft. Webster. Our specimen is marked *type* by Cassin.

*Buteo insignatus* Cass. Bds. of Cal. and Tex., p. 102.

"Type is in the Museum of the Nat. Hist. Soc. of Montreal."

This was a melanistic specimen.

*Buteo bairdii* "Hoy" Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 451.
1,469. Wisconsin. Dr. Hoy. *Type.*

This is a very light-colored individual.

**Falco mexicanus** Schleg.
*Falco polyagris* Cass. Bds. of Cal. and Tex., p. 88.
2,175. Source of the Platte. J. K. Townsend. *Type.*

**Falco peregrinum anatum** (Bp.).
*Falco nigriceps* Cass. Bds. of Cal. and Tex., p. 87.
2,072. Bear creek, Cal. Kern. *Type.*

**Polyborus cheriway** (Jacq.).
*Polyborus auduboni* Cass. Proc. Acad. Nat. Sci., 1865, p. 2.

Type in U. S. National Museum.

**Megascops asio trichopsis** (Wagl.)
*Scops mccallii* Cass. Bds. of Cal. and Tex., p. 180.

The only specimen in the Academy which could have been examined by Cassin is a very young bird, so that the type should be selected from the National Museum series.

**Bubo virginianus pacificus** Cass.

*Bubo virginianus pacificus* Cass. Bds. of Cal. and Tex., p. 178.

This name was proposed for all Horned Owls of the Pacific slope, and no type was designated. As restricted by Stone (*Auk*, 1896, p. 153), the typical specimen is 27,905, ♂, San Bernardo, Cal., April, 1887, R. B. Herron.

**Bubo virginianus** (Gm.).

*Bubo virginianus atlanticus* Cass. Bds. of Cal. and Tex., p. 178.

Proposed for Horned Owls of the Atlantic slope. No type designated.

**Xenopicus albolarvatus** (Cass.).

*Leuconerpes albolarvatus* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 106.

19,338. ♂ California. J. Bell. *Type.*

19,335 is the female specimen mentioned.

**Sphyrapicus thyroides** (Cass.).

*Picus thyroides* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 349.

24,214. ♀ California. J. Bell. Type.

24,213 is another female with same data.

**Chordeiles virginianus henryi** (Cass.).

*Chordeiles henryi* Cass. Bds. Cal. and Tex., p. 233.

24,179. Rio Grande, Lat. 32°. Dr. T. C. Henry. *Type.*

Another with same data is in the National Museum (No. 6,005).

**Spinus lawrencei** (Cass.).

*Carduelis lawrencei* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 105.

24,120. ♂ California. J. G. Bell. Type.

24,121 is a female with same data.

**Ammodramus rostratus** (Cass.).

*Emberiza rostrata* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 184.

24,087. California. Dr. Heermann. *Type.*

24,088 is another collected at the same time.

**Spizella breweri** Cass.

*Spizella breweri* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 40.

24,050. Black Hills, Dak. J. K. Townsend. *Type.*

**Amphispiza bilineata** (Cass.).

*Emberiza bilineata* (Cass). Proc. Acad. Nat. Sci., Phila., 1850, p. 104.

24,038. Rio Grande, Tex. J. W. Audubon. *Type.*

**Amphispiza belli** (Cass.).

*Emberiza belli* Cass. Proc. Acad. Nat. Sci., 1850, p. 104.

24,036. California. J. G. Bell. *Type.*

24,034 is another specimen with same data.

**Peucæa ruficeps** (Cass.).
*Ammodramus ruficeps* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 184.
24,031. California. Dr. A. L. Heermann.
3,831 (U. S. National Museum) has the same data.

**Vireo flavoviridis** (Cass.).
*Vireosylvia flavoviridis* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 152.
Cassin refers to specimens from Panama and Nicaragua, but none of these seem to be extant.

**Vireo philadelphica** (Cass.).
*Vireosylvia philadelphica* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 153.
23,891. Philadelphia, Sep., 1842. J. Cassin. *Type.*

**Vireo huttoni** Cass.
*Vireo huttoni* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 150.
3,725 (U. S. N. M.). Monterey, Cal. Hutton. *Type.*
The specimen from Georgetown, Cal., collected by Bell, cannot be found.

**Sitta carolinensis aculeata** (Cass.).
*Sitta aculeata* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 254.
23,684. ♂ California. Dr. Gambel. *Type.*

**Parus atricristatus** Cass.
*Parus atricristatus* (Cass.). Proc. Acad. Nat. Sci. Phila., 1850, p. 103.
23,676. Rio Grande, Tex. J. W. Audubon. *Type.*

**Parus wollweberi** Bp.
*Parus annexus* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 103.
23,674. Rio Grande, Tex. J. W. Audubon. *Type.*

## Cassin's Mexican and Tropical American Types.

**Cathartes burrovianus** Cass.
*Cathartes burrovianus* Cass. Proc. Acad. Nat. Sci., Phila., 1845, p. 212.
58. Vera Cruz. Dr. Burrough. *Type.*

**Regerhinus wilsoni** (Cass.).
*Cyminidis wilsonii* Cass. Proc. Acad. Nat. Sci. Phila., 1847, p. 199.
1,944. ♂ Gibara, Cuba. R. C. Taylor. *Type.*
1,945 is a female with same data.

**Micrastur guerilla** Cass.
*Micrastur guerilla* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 87.
243. Mexico. Coll. by Pease. *Type.*
244 from same locality and collector.

**Nyctalatinus harrisii** Cass.
*Nyctale harrisii* Cass. Proc. Acad. Nat. Sci. Phila., 1849, p. 157.
2,723. S. America (?) from J. G. Bell. *Type.*

**Ciccaba albogularis** (Cass.).
*Syrnium albogularis* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 124.
2,689. S. America. Rivoli coll. *Type.*
2,688 is another specimen with same data.

**Ciccaba virgata** (Cass.).
*Syrinium virgatum* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 124.
2,688. S. America. Rivoli colln. *Type.*

**Megascops brasilianus** (Gm.)?.
*Ephialtes watsonii* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 123.
2,445. S. America. *Type.*

Another specimen mentioned is 2,444 from the Orinoco.

**Ara auricollis** Cass.
*Ara auricollis* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 372.
22,358. S. America. Rivoli coll. *Type.*

The other specimens mentioned are 22,359 and 22,357.

**Chrysotis viridigenalis** Cass.
*Chrysotis viridigenalis* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 371.
22,506. ♂ Brazil? Rivoli coll. *Type.*

**Bolborhynchus lineolus** (Cass.).
*Psittacula lineola* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 372.
22,984. Mexico (National Bridge). Pease coll. *Type.*

**Brotogeris tuipara** (Gm.).
*Brotogeris aurifrons* Cass. Jour. Acad. Nat. Sci. Phila., 1855, p. 155.
22,458. S. America. *Type.*

**Selenidera spectabilis** Cass.
*Selenidera spectabilis* Cass. Proc. Acad. Nat. Sci. Phila., 1857, p. 214.
20,432. ♂ Veragua, N. Grenada. R. W. Mitchell. *Type.*

**Ramphastos toco** Müll.
*Ramphastos albogularis* Cass. Proc. Acad. Nat. Sci., Phila., 1867, p. 101.
20,392. Central America. Rivoli coll. *Type.*

**Campephilus bairdii** Cass.
*Campephilus bairdii* Cass. Proc. Acad. Nat. Sci. Phila., 1863, p. 322.
19,610. ♂ Cuba. R. C. Taylor. *Type.*

Specimens also in U. S. National Museum.

**Celeus loricatus** (Reichb.).
*Celeus mentalis* Cass. Proc. Acad. Nat. Sci. Phila., 1860, p. 137.
19,548. ♂ Atrato River, N. Grenada. Lt. Michler. *Type.*

19,547, ♀, Turbo, is the other specimen mentioned.

These were received from the Smithsonian Institution.

**Dryobates orizabae** (Cass.).
*Picus orizabae* Cass. Proc. Acad. Nat. Sci. Phila., 1863, p. 196.
19,267. ♂ Jalapa, Mex. D'Oca collection. *Type.*

19,266, a female, with same data.

**Dryobates vagus** Cass.
*Picus vagus* Cass. Proc. Acad. Nat. Sci. Phila., 1863, p. 196.
19,264. ♂ Mexico? *Type.*

Also 19,265, ♀, both from the Rivoli collection.

**Galbula cyaneicollis** Cass.

*Galbula cyaneicollis* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 154.

20,736. Para, Brazil. J. G. Bell. *Type.*

20,737 and 20,738 are other Bell specimens.

**Bucco ordii** Cass.

*Bucco Ordii* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 154.

20,773. Rio Negro. *Type.*

**Monasa pallescens** Cass.

*Monasa pallescens* Cass. Proc. Acad. Nat. Sci. Phila., 1860, p. 134.

20,830. ♂ Truando. Lt. Michler. *Type.*

20,829 is a female with the same data.

**Macropsalis forcipata** (Nitzsch).

*Hydropsalis limbatus* Cass. Proc. Acad. Nat. Sci. Phila., 1849, p. 236.

21,946. ♂ S. America. *Type.*

21,943 is the female also described.

**Macropsalis segmentata** Cass.

*Hydropsalis segmentatus* Cass. Proc. Acad. Nat. Sci. Phila., 1849, p. 238.

21,939. ♂ Bogota. Rivoli coll. *Type.*

21,941, ♀, is the other specimen described by Cassin.

**Antrostomus serico-caudatus** Cass.

*Antrostomus serico-caudatus* Cass. Proc. Acad. Nat. Sci. Phila., 1849, p. 238.

21,905. S. America. *Type.*

21,904 is the younger bird mentioned in the description.

**Chætura cinericauda** (Cass.)

*Acanthylis cinericauda.* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 58.

21,780. S. America, from Edw. Wilson. *Type.*

21,781 is the other specimen mentioned. This is not a synonym of *C. pelagica* as given in the British Museum Catalogue.

**Claudia squamata** (Cass.).

*Cypselus squamatus* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 369.

21,770. Guiana. "Dr. Dawson." *Type.*

In the description the specimen is said to be from "Dr. Dalton."

**Pittasoma michleri** Cass.

*Pittasoma michleri* Cass. Proc. Acad. Nat. Sci. Phila., 1860, p. 189.

Type in U. S. National Museum.

**Gymnocichla nudiceps** (Cass.).

*Myiothera nudiceps* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 106.

8,102. ♂ Panama. J. G. Bell. *Type.*

**Chiromachæris flaveola** (Cass.).

*Manacus flaveolus* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 349.

8,536. ♂ Bogota. *Type.*

**Cyanocorax violaceus** DuBus.
*Cyanocorax harrisii* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 26.
3,061. Guayaquil, Ecuador. Rivoli coll. *Type.*

**Aphelocoma unicolor** (DuBus).
*Cyanocorax concolor* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 26.
3,39. S. America. Rivoli coll. *Type.*

**Cassicus flavicrissus** Scl.
*Cassicus melanurus* Cass. Proc. Acad. Nat. Sci. Phila., 1867, p. 66.
3,828. Guayaquil, Ecuador, from Dr. T. B. Wilson. *Type.*

**Molothrus rufoaxillaris** Cass.
*Molothrus rufoaxillaris* Cass. Proc. Acad. Nat. Sci. Phila., 1866, p. 23.

Type in U. S. National Museum.

**Molothrus cabanisii** Cass.
*Molothrus cabanisii* Cass. Proc. Acad. Nat. Sci., 1866, p. 22.
Type. 3,651. Rivoli coll. *Type.*

**Idiopsar brachyurus** Cass.
*Idiopsar brachyurus* Cass. Proc. Acad. Nat. Sci., 1866, p. 414.

Type in U. S. National Museum.

**Icterus giraudii** Cass.
*Icterus giraudii* Cass. Proc. Acad. Nat. Sci. Phila., 1847, p. 333.
3,434. ♂ Bogota. *Type.*

Several other specimens are in the collection.

**Icterus sclateri** Cass.
*Icterus sclateri* Cass. Proc. Acad. Nat. Sci. Phila., 1867, p. 49.
3,423. ♂ Nicaragua, from Dr. Wilson. Type.

3,424 is a female bearing the same data.

**Icterus auricapillus** Cass.
*Icterus auricapillus* Cass. Jour. Acad. Nat. Sci. Phila., 1848, p. 137.
3,431. ♂ Central America. *Type.*

**Icterus graceannæ** Cass.
*Icterus grace-annæ* Cass. Proc. Acad. Nat. Sci. Phila., 1867, p. 52.
3,432. Western S. America. Mr. Clay. *Type.*

**Icterus maculi-alatus** Cass.
*Icterus maculi-alatus* Cass. Proc. Acad. Nat. Sci. Phila., 1847, p. 332.
3,453. Coban Vera Paz. Rivoli coll. *Type.*

Cassin gives "Vera Cruz" as the locality, evidently a misquotation of the label.

**Icterus mesomelas** (Wagl.).
*Icterus salvinii* Cass. Proc. Acad. Nat. Sci. Phila., 1867, p. 51.
3,449. Costa Rica, from Dr. Wilson. *Type.*

Another specimen is 3,452, from the Rivoli collection.

**Icterus graysoni** Cass.
*Icterus graysoni* Cass. Proc. Acad. Nat. Sci. Phila., 1867, p. 49.

Type in U. S. National Museum.

**Quiscalus lugubris** Sw.
*Quiscalus mexicanus* Cass. Proc. Acad. Nat. Sci. Phila., 1866, p. 408.
3,681. "Mexico." *Type.*

**Quiscalus fortirostris** Lawr. ? ?
*Quiscalus rectirostris* Cass. Proc. Acad. Nat. Sci. Phila., 1866, p. 409.
3,684. Rivoli coll. *Type.*

**Quiscalus gundlachii** Cass.
*Quiscalus gundlachii* Cass. Proc. Acad. Nat. Sci. Phila., 1866, p. 406.
3,673. ♂ Cuba. R. C. Taylor. *Type.*

**Quiscalus brachypterus** Cass.
*Quiscalus brachypterus* Cass. Proc. Acad. Nat. Sci. Phila., 1866, p. 406.
3,671. North side of Porto Rico. Geo. Latimer. *Type.*

Also 3,672. Porto Rico. R. Swift.

**Spinus xanthogaster** (DuBus).
*Chrysomitris bryanti* Cass. Proc. Acad. Nat. Sci., 1865, p. 91.

Type in U. S. National Museum.

**Paroaria nigrogenys** (Lafr.).
*Tanagra nigro-aurita* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 85.
10,720. Para. Mr. Wülf. *Type.*

The specimen from Rio Negro which might have better claims to being considered the type cannot be found.

**Chlorothraupis olivaceus** Cass.
*Orthogonys olivaceus* Cass. Proc. Acad. Nat. Sci. Phila., 1860, p. 140.
7,572. Truando River, Panama. Lt. Michler. *Type.*

**Calospiza cyaneicollis** (Lafr.).
*Calliste hannahiæ* Cass. Proc. Acad. Nat. Sci. Phila., 1864, p. 287.
7,284, from Mr. Geo. Robbins. "Maracaibo." *Type.*

The specimen is clearly marked as the *type*, though Cassin gives the locality as Merida mountains, Venezuela. Probably it was obtained in Maracaibo, and the exact habitat ascertained later.

**Calospiza lavinia** (Cass.).
*Calliste lavinia* Cass. Proc. Acad. Nat. Sci. Phila., 1858, p. 178.

The type of this species cannot be found.

**Chlorophanes spiza melanops** Cass.
*Chlorophanes melanops* Cass. Proc. Acad. Nat. Sci. Phila., 1864, p. 268.
3,977. ♀ Rio Negro. Rivoli coll. *Type.*

The other specimen does not seem to have been preserved.

**Chlorophanes spiza cærulescens** Cass.
*Chlorophanes cærulescens* Cass. Proc. Acad. Nat. Sci. Phila., 1864, p. 268.
3,976. ♂ Juracares, Bolivia. Rivoli coll. *Type.*

This and 3,975, ♀, from same locality, are from D'Orbigny's collection ("No. 149").

**Euphonia anneæ** Cass.
*Euphonia anneæ* Cass. Proc. Acad. Nat. Sci. Phila., 1865, p. 172.

Type in U. S. National Museum.

**Buarremon crassirostris** Cass.
*Buarremon crassirostris* Cass. Proc. Acad. Nat. Sci. Phila., 1865, p. 170.

Type in U. S. National Museum.

**Arremon aurantiirostris** Lafr. ?
*Arremon rufidorsalis* Cass. Proc. Acad. Nat. Sci. Phila., 1865, p. 170.

Type in U. S. National Museum.

**Pitylus poliogaster** DuBus.
*Pitylus flavocinereus* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 67.
7,905. ♂ S. America. Rivoli coll. *Type.*

**Atticora cinerea** (Gm.).
*Petrochelidon murina* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 370.
15,741. Ecuador, from Edw. Wilson. *Type.*

**Dendroica vieilloti** Cass
*Dendroica vieilloti* Cass. Proc. Acad. Nat. Sci. Phila., 1860, p. 192.

Type is 10,211 (U. S. National Museum); *fide* Baird, *Rev. Amer. Birds.*

## Cassin's Types of African Birds.

Cassin published more upon the birds of Africa than those of any of the other continents, being influenced largely by the many collections received from Gaboon and other parts of the continent, especially from Du Chaillu and Dr. McDowell.

**Anas hartlaubii** (Cass.).
*Querquedula hartlaubii* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 175.
5,736. River Camma, W. Africa. DuChaillu. *Type.*
5,737. River Camma, W. Africa. DuChaillu.

**Phasidus niger** Cass.
*Phasidus niger* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 322.
12,613. ♂ Cape Lopez, W. Africa. DuChaillu. *Type.*

**Guttera plumifera** (Cass.).
*Numida plumifera* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 321.
12,576. Cape Lopez, W. Africa. DuChaillu. *Type.*

**Francolinus squamatus** Cass.
*Francolinus squamatus* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 321.
12,163. ♂ Cape Lopez, W. Africa. DuChaillu. *Type.*
12,162. Cape Lopez, W. Africa. DuChaillu.

**Turturœna iriditorques** (Cass.).
*Columba iriditorques* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 254.
13,296. W. Africa. Dr. McDowell. *Type.*

**Columba unicincta** Cass.

*Columba unicincta* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 143.

13,280. ♂ Ogobai river, W. Africa. DuChaillu. *Type.*

**Spizætus africanus** (Cass.).

*Limnætus africanus* Cass. Proc. Acad. Nat. Sci. Phila., 1865, p. 4.

1,778. Ogobai river, W. Africa. DuChaillu. *Type.*

1,779. Ogobai river, W. Africa. DuChaillu.

**Megascops scops hendersonii** (Cass.).

*Ephialtes hendersonii* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 186.

2,404. ♂ Off Novo Redondo, W. Africa. Dr. Henderson. *Type.*

2,403. ♀ Off Novo Redondo, W. Africa. Dr. Henderson.

**Ortholophus albocristatus** (Cass.).

*Buceros albocristatus* Cass. Proc. Acad Nat. Sci. Phila., 1847, p. 330.

24,498. St. Paul's river, W. Africa. Dr. McDowell. *Type.*

**Bycanistes fistulator** (Cass.).

*Buceros fistulator* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 68.

9,539. W. Africa, Verreaux. *Type.*

**Lophoceros camurus** (Cass.).

*Tockus camurus* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 319.

9,520. Cape Lopez, W. Africa. DuChaillu. *Type.*

**Mesopicus elliotii** (Cass.).

*Polipicus elliotii* Cass. Proc. Acad. Nat. Sci. Phila., 1863, p. 197.

19,455. Muni river, W. Africa. DuChaillu. *Type.*

**Campothera malherbei** (Cass.).

*Chrysopicus malherbei* Cass. Proc. Acad. Nat. Sci. Phila., 1863, p. 198.

18,997. ♂? Zanzibar. *Type.*

**Campothera abingdoni** (Smith).

*Campethera chrysura lineata* Cass. Proc. Acad. Nat. Sci. Phila., 1863, p. 327.

18,982. ♂ Port Natal. *Type.*

**Campothera maculosa.**

*Campethera vestita* Cass. Proc. Acad. Nat. Sci. Phila., 1863, p. 197.

18,996. St. Paul's river, W. Africa. Dr. McDowell. *Type.*

**Myioceyx lecontei** (Cass.).

*Ispidina lecontei* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 158.

21,275. W. Africa. DuChaillu. *Type.*

This specimen seems to be still unique. A drawing of it was sent by Turnbull to Mr. Bowdler Sharpe. The figure in the latter's *Monograph of Alcedinidæ* is taken from it. It is an excellent representation of the bird.

**Indicator exilis** (Cass.).

*Melignothes exilis* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 157.

19,801. Moonda river, W. Africa. DuChaillu. *Type.*

**Indicator conirostris** (Cass.).

*Melignothes conirostris* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 156.

19,802. Moonda river, W. Africa. DuChaillu. *Type.*

**Prodotiscus insignis** (Cass.).
*Hetærodes insignis* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 157.
19,804. Moonda river, W. Africa. DuChaillu. *Type.*

**Heliobucco bonapartii** (Hartl.).
*Barbatula fuliginosa* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 324.
20,629. Moonda river, W. Africa. DuChaillu. *Type.*

**Barbatula duchaillui** Cass.
*Barbatula duchaillui* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 324.
20,656. ♂ Moonda river, W. Africa. DuChaillu. *Type.*

**Merops mulleri** (Cass.).
*Meropiscus mulleri* Cass. Proc. Acad. Nat. Sci. Phila., 1857, p. 37.
21,547. Muni river, W. Africa. DuChaillu. *Type.*

**Merops breweri** (Cass.).
*Meropogon breweri* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 34.
21,620. ♂ Ogobai river, W. Africa. DuChaillu. *Type.*

21,621 is a female specimen from the same locality.

**Malimbus scutatus** (Cass.).
*Sycobius scutatus* Cass. Proc. Acad. Nat. Sci. Phila., 1849, p. 157.
14,104. ♂ W. Africa. Dr. McDowell. *Type.*
14,105. ♀ W. Africa. Dr. McDowell.

**Malimbus racheliæ** (Cass.).
*Sycobius racheliæ* Cass. Proc. Acad. Nat. Sci. Phila., 1857, p. 36.
14,100. ♂ Muni river, W. Africa. DuChaillu. *Type.*
14,101. Muni river, W. Africa. DuChaillu.

**Pyrenestes coccineus** Cass.
*Pyrenestes coccineus* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 67.
14,694. W. Africa. Dr. McDowell. *Type.*

**Hyphantornis badius** Cass.
*Hyphantornis badius* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 57.
14,052. Fazogloa, E. Africa. Rivoli coll. *Type.*

**Hyphantornis collaris** (Vieill.).
*Hyphantornis cinctus* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 133.
14,065. ♀ Camma river, W. Africa. DuChaillu. *Type.*

**Pyromelana nigriventris** (Cass.).
*Euplectes nigroventris* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 66.
14,301. ♂ Zanzibar. Rivoli coll. *Type.*

**Penthetria ardens** (Bodd.).
*Vidua concolor* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 66.
14,215. Africa. Rivoli coll. *Type.*

**Steganura paradisea** (L.).
*Vidua verreauxii* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 56.
14,177. ♂ Abyssinia. *Type.*
14,193. ♀ Abyssinia.

There are two other males bearing the same data, but 14,177 is evidently the one described.

**Penthetria albonotata** (Cass.).
*Vidua albonotata* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 65.
14,226. ♂ Port Natal, from Edw. Wilson. *Type.*

**Spermestes nigriceps** Cass.
*Spermestes nigriceps* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 185.
14,358. ♂ Zanzibar. Rivoli coll. *Type.*
14,359. ♀ Zanzibar. Rivoli coll.

**Buchanga assimilis** Bechst.
*Dicrurus aculeatus* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 348.
286. Fazogloa. Rivoli coll. *Type.*

**Graucalus azureus** Cass.
*Graucalus azureus* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 348.
402. W. Africa. Dr. McDowell. *Type.*

**Lanius pallidirostris** Cass.
*Lanius pallidirostris* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 244.
15,306. E. Africa. Rivoli coll. *Type.*

**Lanius pallens** Cass.
*Lanius pallens* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 245.
15,308. Fazogloa, E. Africa. Rivoli coll. *Type.*
15,307. Fazogloa, E. Africa. Rivoli coll.

**Laniarius quadricolor** (Cass.).
*Lanius quadricolor* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 245.
15,136. ♂ Port Natal, Africa. *Type.*
15,138, juv. ♂ Port Natal, Africa. *Type.*

**Nicator chloris** (Less.).
*Laniarius lepidus* Cass. Proc. Acad. Nat. Sci., Phila., 1855, p. 327.

The type of this species cannot be found.

**Dryoscopus sublacteus** Cass.
*Dryoscopus sublacteus* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 246.
15,162. E. Africa? Rivoli coll. *Type.*

**Dryoscopus leucorhynchus** (Hartl.).
*Laniarius carbonarius* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 347.
15,275. W. Africa. Dr. McDowell. *Type.*

**Dryoscopus atrialatus** Cass.
*Dryoscopus atrialatus* Cass. Proc. Acad. Nat. Sci. Phila., 1851, p. 246.
15,172. E. Africa? Rivoli coll. *Type.*

"**Eopsaltria cinerea**" Cass.
Proc. Acad. Nat. Sci. Phila., 1856, p. 253.

The type of this species cannot be found, and I do not find the name quoted in synonymy. Its true relationship seems uncertain.

**Pholidornis rushiæ** (Cass.).
*Dicaeum rushiæ* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 325.
15,553. ♂ Moonda river, W. Africa. DuChaillu. *Type.*
15,554. ♀ Moonda river, W. Africa. DuChaillu.

**Parmoptila woodhousei** Cass.

*Parmoptila woodhousei* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 40.
15,555. ♀ Camma river, W. Africa. DuChaillu. *Type.*

Apparently unknown, except from the two specimens described by Cassin, of which the male seems to have been lost.

**Psalidoprocne nitens** (Cass.).

*Atticora nitens* Cass. Proc. Acad. Nat. Sci. Phila., 1857, p. 38.
15,774. Muni river, W. Africa. DuChaillu. *Type.*

**Psalidoprocne holomelas** Sund.

*Atticora hamigera* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 57.
15,771. Port Natal. *Type.*

**Hirundo dimidiata** Sund.

*Hirundo scapularis* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 59.
15,672. E. Africa. *Type.*

**Ægithalus flavifrons** Cass.

*Ægithalus flavifrons* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 325.
9,390. Moonda river, W. Africa. DuChaillu. *Type.*

**Alseonax comitatus** (Cass.).

*Butalis comitatus* Cass. Proc. Acad. Nat. Sci. Phila., 1857, p. 35.
576. Muni river, W. Africa. DuChaillu. *Type.*

**Alseonax epulata** (Cass.).

*Butalis epulatus* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 326.
577. Moonda river, W. Africa. DuChaillu. *Type.*

**Artomyias fuliginosa** Verr.

*Butalis infuscatus* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 326.
601. Moonda river, W. Africa. DuChaillu. *Type.*

**Leoptilus olivaceus** (Cass.).

*Parisoma olivaceus* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 52.
806. ♂ Camma river, W. Africa. DuChaillu. *Type.*

This appears to be unique.

**Parisoma plumbeum** (Hartl.).

*Parisoma melanurum* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 51.
811. Camma river, W. Africa. DuChaillu. *Type.*

**Erythrocercus mccallii** (Cass.).

*Pycnosphrys mccallii* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 326.
887. Moonda river, W. Africa. DuChaillu. *Type.*

**Trochocercus nitens** Cass.

*Trochocercus nitens* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 50.
894. ♂ Camma river, W. Africa. DuChaillu. *Type.*
893. ♀ Camma river, W. Africa. DuChaillu.

**Terpsiphone cristata** (Gm.).

*Muscipeta duchaillui* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 48.
986. "♂" Camma river, W. Africa. DuChaillu. *Type.*
985. "juv." Camma river, W. Africa. DuChaillu.
984. "♀" Camma river, W. Africa. DuChaillu.

*Muscipeta speciosa* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 48.
990. "♂" Camma river, W. Africa. DuChaillu. *Type.*

The perplexing variations in plumage exhibited by this species are the cause of its many synonyms. It does not yet seem to be properly understood.

**Burnesia bairdii** (Cass.).

*Drymoica bairdii* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 327.

17,502. Moonda river, W. Africa. DuChaillu. *Type.*

**Hylia prasina** (Cass.).

*Sylvia prasina* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 325.

17,479. ♂ Moonda river, W. Africa. DuChaillu. *Type.*

17,498. Moonda river, W. Africa. DuChaillu.

**Eremomela caniceps** (Cass.).

*Camaroptera caniceps* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 38.

17,471. ♂ Cape Lopez, W. Africa. DuChaillu. *Type.*

**Euprinodes schistaceus** Cass.

*Euprinodes schistaceus* Cass. Proc. Acad. Nat. Sci. Phila., 1858, p. 38.

17,468. ♂ River Camma, W. Africa. DuChaillu. *Type.*

**Sylvietta virens** (Cass.).

*Sylvietta virens* Cass. Proc. Acad. Nat. Sci. Phil., 1859, p. 39.

13,906. Cape Lopez, W. Africa. DuChaillu. *Type.*

**Camaroptera brevicaudata** (Cretzch.).

*Syncopta tincta* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 325.

17,475. Moonda river, W. Africa. DuChaillu. *Type.*

**Turdinus fulvescens** (Cass.).

*Turdirostris fulvescens* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 54.

13,846. ♂ Camma river, W. Africa. DuChaillu. *Type.*

17,369. ♀ Camma river, W. Africa. DuChaillu.

**Macrosphenus flavicans** Cass.

*Macrosphenus flavicans* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 42.

17,350. ♂ Camma river, W. Africa. DuChaillu. *Type.*

17,349. ♀ Camma river, W. Africa. DuChaillu.

**Xenocichla notata** (Cass.).

*Tricophorus notatus* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 159.

17,113. ♂ Moonda river, W. Africa. DuChaillu. *Type.*

17,115. ♀ Moonda river, W. Africa. DuChaillu.

**Xenocichla leucopleurus** (Cass.).

*Phyllostrophus leucopleurus* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 328.

17,031. River Muni, W. Africa. DuChaillu. *Type.*

**Xenocichla indicator** (Verr.).

*Tricophorus leucurus* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 328.

The type of this species cannot be found.

**Criniger tricolor** (Cass.).

*Tricophorus tricolor* Cass. Proc. Acad. Nat. Sci. Phila., 1857, p. 33.

17,012. Muni river, W. Africa. DuChaillu. *Type.*

17,013. Muni river, W. Africa. DuChaillu.

**Criniger xanthogaster** Cass.

*Criniger xanthogaster* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 327.

17,022. Moonda river, W. Africa. DuChaillu. *Type.*

17,023. Moonda river, W. Africa. DuChaillu.

17,024. Moonda river, W. Africa. DuChaillu.

**Criniger calurus** (Cass.).

*Tricophorus calurus* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 158.

16,997. Muni river, W. Africa. DuChaillu. *Type.*

16,998. Muni river, W. Africa. DuChaillu.

**Criniger chloronotus** (Cass.).

*Tricophorus chloronotus* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 43.

16,996. Camma river, W. Africa. DuChaillu. *Type.*

16,995. Camma river, W. Africa. DuChaillu.

**Andropadus curvirostris** Cass.

*Andropadus curvirostris* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 46.

16,993. Camma river, W. Africa. DuChaillu. *Type.*

16,994. Camma river, W. Africa. DuChaillu.

**Andropadus virens** Cass.

*Andropadus virens* Cass. Proc. Acad. Nat. Sci. Phila., 1857, p. 34.

16,989. ♂ Muni river, W. Africa. DuChaillu. *Type.*

16,988. ♀ Muni river, W. Africa. DuChaillu.

**Alethe castanea** (Cass.).

*Napothera castanea* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 158.

16,894. Camma river, W. Africa. DuChaillu.

16,528. Camma river, W. Africa. DuChaillu.

**Geocichla compsonota** Cass.

*Geocichla compsonota* Cass. Proc. Acad. Nat. Sci. Phila., 1859, p. 42.

16,250. ♂ Camma river, W. Africa. DuChaillu. *Type.*

## Cassin's Types from Asia, Australia, Etc.

**Zapornia tabuensis** (Gm.).

*Zapornia umbrina* Cass. Proc. Acad. Nat. Sci. Phila., 1856, p. 255.

Type in U. S. National Museum (Coll. Expl. Exped.).

**Megascops sagittatus** (Cass.).

*Ephialtes sagittatus* Cass. Proc. Acad. Nat. Sci. Phila., 1848, p. 121.

2,410. Malacca. Rivoli coll. *Type.*

**Megascops elegans** (Cass.).

*Ephialtes elegans* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 185.

2,418. Off coast of Japan, lat. 29° 47′ N., long. 126° 13′ 30″ E. From Verreaux. *Type.*

**Carpophaga paulina** Bp.[19]

*Carpophaga rufinuchalis* Cass. Proc. Acad. Nat. Sci. Phila., 1854, p. 228

13,160. Rivoli coll. No data. *Type.*

**Carpophaga vanwycki** Cass.

*Carpophaga van wyckii* Cass. Proc. Acad. Nat. Sci. Phila., 1862, p. 320

[19] Bonaparte's description appeared Nov. 8. Cassin's Dec. (after the 19th).

Type in U. S. National Museum (Coll. Expl. Exped.).

**Carpophaga pickeringii** Cass.
*Carpophaga pickeringii* Cass. Proc. Acad. Nat. Sci. Phila., 1854, p. 228.

Type in U. S. National Museum (Coll. Expl. Exped.).

**Globicera rubricera** Bp.[20]
*Carpophaga lepida* Cass. Proc. Acad. Nat. Sci. Phila., 1854, p. 230.
13,159. Off north coast of Australia. From Edw. Wilson. *Type.*

**Prioniturus flavicans** Cass.
*Prioniturus flavicans* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 373.
24,492. ♀ Celebes. Rivoli coll. *Type.*

**Palæornis calthropæ** Layand.
*Palæornis viridicollis* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 373.
22,699. ♂ India. From Edw. Wilson. *Type.*
22,698. Himalayas.

**Alcyone lessoni** Cass.
*Alcyone lessoni* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 69.
21,239 ♂ Havre d'Dory. New Guinea. From Edw. Wilson. *Type.*

**Micropus leucopygialis** (Cass.).
*Cypselus leucopygialis* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 58.
19,482. ♀ Sumatra (?) From Edw. Wilson. *Type.*

This may be identical with *M. subfurcatus* Blyth (= *affinis* Strick.), but Cassin states distinctly that it is not.

**Schlegelia wilsonii** (Cass.).
*Paradisea wilsonii* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 67.
3,152. ♂ New Guinea (?) Rivoli coll. *Type.*

This specimen is stated by Sclater (*P. Z. S.*, 1857, p. 2) to have been the type of Bonaparte's *res-publica,* but in view of his wretched description it is best to adopt Cassin's name.

**Rhipidura cyaniceps** (Cass.).
*Muscipeta cyaniceps* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 438.

Type in U. S. National Museum (Coll. Expl. Exped.).

**Melanopyrrhus anais** Bp.
*Pastor nigrocinctus* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 68.
16,020. New Guinea. J. G. Bell. *Type.*

**Uroloncha fuscans** (Cass.).
*Spermestes fuscans* Cass. Proc. Acad. Nat. Sci. Phila., 1852, p. 185.
14,584. ♀ Borneo. Rivoli coll. *Type.*

**Acrulocercus braccatus** (Cass.).
*Mohoa braccata* Cass. Proc. Acad. Nat. Sci. Phila., 1855, p. 440.
18,581. Hawaiian Isl. J. K. Townsend. *Type.*

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[20] Bonaparte's descriptions appeared Nov. 8. Cassin's Dec. (after the 19th).

**Hirundo badia** (Cass.).

*Cecropis badius* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 371.

15,786. Malacca, from J. G. Bell. *Type.*

15,787. Malacca, from J. G. Bell.

**Atticora tibialis** (Cass.).

*Petrochelidon* (?) *tibialis* Cass. Proc. Acad. Nat. Sci. Phila., 1853, p. 370.

15,742. S. America. Rivoli coll. Type.

15,743, juv. Brazil. Rivoli coll.

**Tachycineta leucorrhoa** Vieill.

*Hirundo gouldii* Cass. Proc. Acad. Nat. Sci. Phila., 1850, p. 69.

Proposed for *H. frontalis* Gould, which was preoccupied by *H. frontalis* Q. and G.

15,631. Austra'ia. Gould coll. *Type.*

**Locustella lanceolata** (Temm.) (?)

*Lusciniopsis hendersonii* Cass. Proc. Acad. Nat. Sci. Phila., 1858, p. 194.

30,069. Hakodadi, Japan. Mr. A. A. Henderson. *Type.*

**Locustella ochotensis** (Midd.) (?).

*Lusciniopsis japonica* Cass. Proc. Acad. Nat. Sci. Phila., 1858, p. 193.

30,068. Hakodadi, Japan. Mr. A. A. Henderson. *Type.*

This is probably a distinct species, as suggested by Stejneger (*Proc. U. S. Nat. Mus.*, 1893, p. 634).

## Titian R. Peale.

Peale's descriptions of new birds are confined, so far as I am aware, to the Ornithological and Mammalogical *Report of the U. S. Exploring Expedition,* he being one of the naturalists composing the party. A good deal of obscurity seems to envelop the history of this publication. It is quite a rare volume.

Some light is shed on the matter, however, by an article in Jardine's *Contributions to Ornithology,* 1852, p. 89. It is here stated that only one hundred copies of the *Reports* were issued by the Government, but each author was permitted to order as many more as he chose for his "personal benefit." All the contributors availed themselves of this privilege, with the single exception of Peale, but not one extra copy of his volume was issued, and the work was never for sale.

About ninety of the hundred copies were distributed by the Government, and the rest were destroyed by fire. Subsequently Cassin was engaged to prepare a new edition of the work, and an atlas of plates was issued to accompany it. No plates were issued with Peale's report, though reference is made to plates in the text, and it is probable that many at least of the plates accompanying Cassin's report were originally intended for Peale's, but were held back when it was decided to republish the work.

The new edition was desirable for many reasons, especially from the fact that of the 109 new species described by Peale only about thirty-three were entitled to recognition.

It has been claimed by some that he was denied the opportunity of consulting the collection at Philadelphia, but in any case his report is a notorious addition to ornithological synonymy.

While most of Peale's types remain in the National Museum, some of them were presented to the Philadelphia Academy.

A few more of these types are also in the Academy collection, being contained in the collection made by J. K. Townsend in Hawaii. Peale used this material, as most of the Hawaiian specimens obtained by the Exploring Expedition were lost in the wreck of the *Peacock*.

The following list includes all of Peale's types now in the Academy collection. In some cases specimens of the same species are preserved in the National Museum:

**Onychotes solitarius** (Peale).
*Buteo solitarius* Peale. Birds U. S. Expl. Exp., 1848, p. 62.
2,304. Hawaii. J. K. Townsend. *Type.*

**Accipiter rufitorques** (Peale).
*Aster rufitorques* Peale. Birds U. S. Expl. Exp., 1848, p. 68.
1,227, ad. Feejee Isls. U. S. Expl. Exp. *Type* (?)
1,228, juv. Feejee Isls.

There seem to have been at least five specimens of this bird collected by the Expedition.

**Ptilinopus coralensis** Peale.
*Ptilinopus coralensis* Peale. Birds U. S. Expl. Exp., 1848, p. 190.
13,098. Paumotu Isl. U. S. Expl. Exp. T. R. Peale. *Type.*
13,099. Paumotu Isl. U. S. Expl. Exp. T. R. Peale.

Manuscript notes in the Academy's copy of Peale's *Report* apparently indicate the number of specimens of many of the species which were obtained. There were three of this form.

**Ptilinopus fasciatus** Peale.
*Ptilinopus fasciatus* Peale. Birds U. S. Expl. Exp., 1848, p. 193.
13,080. Samoa Isl. U. S. Expl. Exp. T. R. Peale. *Type.*

Apparently there were three specimens obtained. The above is an adult, like the one described, and is probably the type.

**Ptilinopus perousei** (Peale).

*Ptilinopus perousii* Peale. Birds U. S. Expl. Exp., 1848, p. 195.

13,096. Feejee Isls. U. S. Expl. Exp. T. R. Peale. *Type.*

Three specimens obtained, but the above is evidently the type, as can be seen by comparison with the original description.

**Ptilinopus purpuratus** (Gm.).

*Ptilinopus furcatus* Peale. Birds U. S. Expl. Exp., 1848, p. 191.

13,140. Society Isls. U. S. Expl. Exp. T. R. Peale.

Three specimens were obtained, and as the above is a dull-colored, immature bird, and does not agree very well with the description, one of the National Museum specimens had better be regarded as the type.

**Globicera auroræ** (Peale).

*Carpophaga auroræ* Peale. Birds U. S. Expl. Exp., 1848, p. 201.

Only one of the four specimens collected by the expedition is in the Academy (13,156). The type is one of the Washington specimens.

**Carpophaga latrans** Peale.

*Carpophaga latrans* Peale. Birds U. S. Expl. Exp., 1848, p. 200.

13,189. Feejee Isls. U. S. Expl. Exp. T. R. Peale. *Type.*

Two specimens seem to have been obtained. This one is a male and agrees well with the description.

**Columba castaneiceps** Peale.

*Columba castaneiceps* Peale. Birds U. S. Expl. Exp., 1848, p. 187.

13,285. Upolu, Samoa. U. S. Expl. Exp. T. R. Peale. *Type.*

13,286. Upolu, Samoa. U. S. Expl. Exp. T. R. Peale.

Only two specimens were secured on the expedition.

**Todirhamphus recurvirostris** Lafr.

*Dacelo minima* Peale. Birds U. S. Expl. Exp., 1848, p. 159.

21,448. ♂ Upolu, Samoa. U. S. Expl. Exp. T. R. Peale.

**Halcyon sacer** (Gm.).

*Dacelo coronata* Peale. Birds U. S. Expl. Exp., 1848, p. 160.

21,429. Samoa Islands. U. S. Expl. Exp. T. R. Peale.

*Dacelo vitiensis* Peale. Birds U. S. Expl. Exp., 1848, p. 156.

21,430. Tongataboo. U. S. Expl. Exp. T. R. Peale.

I have no means of ascertaining how many specimens of Kingfishers were obtained. The Washington examples are as likely to be the types as the above.

**Corvus hawaiiensis** Peale.

*Corvus hawaiiensis* Peale. Birds U. S. Expl. Exp., 1848, p. 106.

2,830. Hawaii. J. K. Townsend. *Type.*

2,831. Hawaii. J. K. Townsend.

**Myzomela nigriventris** Peale.
*Myzomela nigriventris* Peale. Birds U. S. Expl. Exp., 1848, p. 150.
18,209. Samoan Isl. U. S. Expl. Exp. T. R. Peale.

Four of these were collected.

**Myzomela jugularis** Peale.
*Myzomela jugularis* Peale. Birds U. S. Expl. Exp., 1848, p. 150.
18,223. Feejee Isls. U. S. Expl. Exp. T. R. Peale.

Four specimens of this species were in the collection.

## Sir Wm. Jardine and H. E. Strickland.

Many of the birds purchased for the Academy in Europe by Mr. Edward Wilson were submitted to Jardine and Strickland, who were also allowed to publish any which were undescribed in the *Contributions to Ornithology*. The types, of course, were returned to Mr. Wilson. A few species were loaned to Sclater for description in the same publication.

**Monacha flavirostris** (Strickl.).
*Monasa flavirostris* Strickl. Contr. Orn., 1850, p. 47.
20,822. Peru. *Type.*

**Heterocercus lineatus** (Strickl.).
*Elænia lineata* Strickl. Contr. Orn., 1850, p. 121.
8,550. ♂ Upper Amazon. *Type.*

**Icterus prosthemelas** (Strickl.).
*Xanthornis prosthemelas* Strickl. Contr. Orn., 1850, p. 120.
3,457. *Type.*

**Tachyphonus rufiventer** Spix.
*Tachyphonus serrirostris* Strickl. Contr. Orn., 1850, p. 49.
7,659. *Type.*

**Todirostrum chrysocrotaphum** Strickl.
*Todirostrum chrysocrotaphum* Strickl. Contr. Orn., 1850, p. 48.
4,177. ♂ Peru. Edw. Wilson. *Type.*

**Pachycephala orpheus** Jardine.
*Pachycephala orpheus* "Verr. MSS." Jardine. Contr. Orn., 1849, p. 129.
15,270. ♀ Timor, from Verreaux. *Type.*

**Pachycephala macrorhyncha** Strickl.
*Pachycephala macrorhyncha* Strickl. Contr. Orn., 1849, p. 91.
15,222. ♂ "Amboine," from Verreaux. *Type.*

This is distinct from *P. melanura*, with which it is united in the British Museum *Catalogue.*

**Pericrocotus minutus** Strickl.
*Pericrocotus minutus* Strickl. Contr. Orn., 1849, p. 94.
498. ♀ Borneo, from Verreaux. Dr. Wilson.
499. ♂ Borneo, from Verreaux. Dr. Wilson.
500. ♂ Borneo, from Verreaux. Dr. Wilson. *Type.*

**Euphonia rufiventris** (Vieill.).
*Euphonia bicolor* Strickl. Contr. Orn., 1850, p. 48.
7,130. ♂ Peru. Edw. Wilson. *Type.*

**Trichostoma rostratum** Blyth.
*Trichostoma umbratile* Strickl. Contr. Orn., 1849, p. 126.
17,383. Borneo.

**Trichostoma celebense** Strickl.
*Trichostoma celebense* Strick. Contr. Orn., 1849, p. 127.
17,370. Celebes, from Verreaux. *Type.*

**Amuropsis malaccensis** (Hartl.).
*Brachypteryx poliogenis* "Boie" Strickl. Contr. Orn., 1849, p. 93.
17,415. Borneo. From Edw. Wilson. *Type.*

## Jules and Edward Verreaux.

Edward Wilson obtained a number of specimens from Verreaux brothers, the famous French bird dealers, and quite a number of these were types of Verreaux's species.

The Verreauxs had the unfortunate practice of sending out specimens with manuscript names which were often never published. Many specimens loaned to Strickland by Mr. Wilson were of this character, and, when describing any of them as new species, to avoid confusion he nearly always adopted Verreaux's manuscript names. In the case of a small collection from the interior of Gaboon, however, the Verreauxs, unknown to Strickland, published all the new species in the *Revue et Magasin de Zoologie,* while the latter published them almost simultaneously in the *Contributions to Ornithology,* fortunately using the supposed manuscript names which he found on the labels. These doubly type(!) specimens are as follows :

**Hoploterus dinghani** (Verr.).
*Chettusia dinghani* Verr. Rev. et Mag. de Zool., 1855.
11,677. S. Africa. Rivoli coll. *Type.*

**Excalfactoria adansoni** (Verr.).
*Coturnix adansoni* Verr. Rev. et Mag. de Zool., 1851, p. 515.
12,339. ♀ Gaboon. *Type.*

**Turturœna malherbii** (Verr.).
*Columba malherbii* Verr. Rev. et Mag. de Zool., 1851, p. 514.
13,459. Gaboon. *Type.*

A specimen of this bird received by the British Museum from Verreaux is catalogued as "probably the type." This is an error, as the Academy specimen is marked "type" by Verreaux.

**Trachyphonus purpuratus** (Verr.).
*Trachyphonus purpuratus* Verr. Rev. et Mag. de Zool., 1851, p. 260.
20,599. ♂ Interior of Gaboon. *Type.*

**Dendropicus gabonensis** (Verr.).
*Dendrobates gabonensis* Verr. Rev. et Mag. de Zool., 1851, p. 513.
19,359. ♂ W. Africa. *Type.*

**Melittophagus variegatus** (Vieill.).
*Melittophagus cyanipectus* Verr. Rev. et Mag. de Zool., 1851, p. 269.
21,514. ♂ Gaboon. *Type.*
21,532. juv. Gaboon.

**Halcyon badia** Verr.
*Halcyon badia* Verr. Rev. et Mag. de Zool., 1851, p. 264.
21,307. Gaboon. *Type.*

**Barbatula leucolaima** Verr.
*Barbatula leucolaima* Verr. Rev. et Mag. de Zool., 1851, p. 263, co. ii 1851.
20,680. Gaboon. *Type.*

**Barbatula subsulphurea** (Fraser).
*Barbatula flavimenta* Verr. Rev. et Mag. de Zool., 1851, p. 262.
20,676. Gaboon. *Type.*

**Lamprocolius purpureiceps** Verr.
*Lamprocolius purpureiceps* Verr. Rev. et Mag. de Zool., 1851, p. 418.
16,005. Interior of Gaboon. *Type.*

**Dryoscopus sabinei** (Gray).
*Hapalophus melanoleucus* Verr. Rev. et Mag. de Zool., 1851, p. 512.
15,173. ♂ Interior of Gaboon. *Type.*

**Dryoscopus coracinus** Verr.
*Dicrourus coracinus* Verr. Rev. et Mag. de Zool., 1851, p. 311.
256. ♂ Interior of Gaboon. *Type.*

This has been treated as a synonym of *D. modestus* Hartl, but may prove separable. The type of *modestus* is from Prince's Island.

**Nigrita luteifrons** Verr.
*Nigrita luteifrons* Verr. Rev. et Mag. de Zool., 1851, p. 420.
14,477. ♂ Gaboon. *Type.*

**Chelidon griseopyga** Sund.
*Atticora melbina* Verr. Rev. et Mag. de Zool., 1851, p. 310.
15,682. Gaboon. *Type.*

**Anthothreptes aurantium** Verr.
*Anthreptes aurantium* Verr. Rev. et Mag. de Zool., 1851, p. 417.
18,175. ♂ Interior of Gaboon. *Type.*

**Cinnyris johannæ** (Verr.).
*Cinnyris johannæ* Verr. Rev. et Mag. de Zool., 1851, p. 314.
18,176. Interior of Gaboon. *Type.*

**Hyliota violacea** Verr.

*Hyliota violacea* Verr. Rev. et Mag. de Zool., 1851, p. 308.

786. ♂ Gaboon. Type.

**Ixonotus guttatus** Verr.

*Ixonotus guttatus* Verr. Rev. et Mag. de Zool., 1851, p. 306.

17,091. Gaboon. *Type.*

**Pratincola salax** Verr.

*Pratincola salax* Verr. Rev. et Mag. de Zool., 1851, p. 307.

722. ♂ Gaboon. *Type.*

Given as *P. olax* Verr., "MS." by Strickl.

### Other Types of Verreaux.

**Pœocephalus fuscicapillus** (Verr. and Des Murs).

*Pionus fuscicapillus* Verr. et Des Murs. Rev. et Mag. de Zool., 1849, p. 58.

22,632. ♀ Zanzibar. Rivoli coll.

22,633. ♂ Zanzibar. Rivoli coll. *Type.*

**Palæornis modesta** Fras.

*Palæornis lucianæ* Verr. Rev. et Mag. de Zool., 1850, p. 598.

22,697. ♂ "Moluccas." From Verreaux. *Type.*

### F. de Lafresnaye.

Among the collections purchased by Dr. Wilson in Paris was that of M. Delatre, obtained in Peru, Bolivia, Colombia and Panama. This contained many novelties, and these were submitted to Lafresnaye for publication before the collection was shipped to America. His paper appeared in the *Revue Zoologique*, March, 1847, pp. 67–79, and in it eighteen new species were proposed. The types of all of these are preserved in the collection, and their study proves of interest, as some of Lafresnaye's names seem to have been entirely overlooked.

**Grallaria monticola** Lafr.

*Grallaria monticola* Lafr. Rev. Zool., 1847, p. 68.

8,199. Ecuador. Delatre coll. *Type.*

**Hypocnemis nævioides** (Lafr.).

*Conopophaga nævioides* Lafr. Rev. Zool., 1847, p. 69.

8,588. S. America. Delatre coll. *Type.*

**Ochthœca frontalis** (Lafr.).

*Tyrannula frontalis* Lafr. Rev. Zool., 1847, p. 70.

4,083. ♂ Pasto "Peru." Delatre coll. *Type.*

Lafresnaye's excellent description seems to have been entirely overlooked and the bird has gone by the name of *O. citrinifrons* Sclater, *P. Z. S.*, 1862, p. 113, which must, however, become of a synonym of *O. frontalis* Lafr.

**Pœcilothraupis palpebrosa** (Lafr.).
*Tanagra palpebrosa* Lafr. Rev. Zool., 1847, p. 71.
7,374. ♂ Peru. Delatre coll. *Type.*

**Calospiza nigrocincta** (Bp.).
*Aglaia wilsonii* Lafr. Rev. Zool., 1847, p. 71.
7,275. ♂ Peru. Delatre coll. *Type.*

**Calospiza larvata fanny** (Lafr.).
*Aglaia fanny* Lafr. Rev. Zool., 1847, p. 72.
7,277. ♀ Delatre coll. *Type.*

**Tachyphonus delatrii** Lafr.
*Tachyphonus delatrii* Lafr. Rev. Zool., 1847, p. 72.
7,660. ♂ St. Bonaventure. Delatre coll. *Type.*

**Arremon aurantiirostris** Lafr.
*Arremon aurantiirostris* Lafr. Rev. Zool., 1847, p. 72.
7,789. ♂ Panama. Delatre coll. *Type.*

**Saltator albicollis** Vieill.
*Saltator striatipictus* Lafr. Rev. Zool., 1847, p. 73.
7,852. ♂ N. Grenada. Delatre coll. *Type.*

**Saltator albicollis** Vieill.
*Saltator maculipectus* Lafr. Rev. Zool., 1847, p. 73.
7,924. ♀ Delatre coll. *Type* (?).

This is apparently the *type* of this species, though most of the data have been lost.

**Cardinalis phœnicurus granadensis** (Lafr.).
*Cardinalis granadensis* Lafr. Rev. Zool., 1847, p. 74.
9,962. ♂ N. Grenada. Delatre coll. *Type.*

This name has been entirely overlooked. Mr. Robert Ridgway considers it a distinct race from the *C. phœnicurus* of Venezuela.

**Guiraca cyanoides** Lafr.
*Coccoborus cyanoides* Lafr. Rev. Zool., 1847, p. 74.
9,775. ♀ Panama. Delatre coll. *Type.*

**Sporophila analoides** (Lafr.).
*Linaria analoides* Lafr. Rev. Zool., 1847, p. 75.
9,914. ♂ Lima, Peru. Delatre coll. *Type.*

**Sporophila inornata** (Lafr.).
*Linaria inornata* Lafr. Rev. Zool., 1847, p. 75.
9,818. ♂ Bolivia. Delatre coll. Type.

**Geositta peruviana** Lafr.
*Geositta peruviana* Lafr. Rev. Zool., 1847, p. 75.
6,784. ♀ Lima, Peru. Delatre coll. *Type.*

**Dendroplex picirostris** Lafr.
*Dendroplex picirostris* Lafr. Rev. Zool., 1847, p. 76.
6,979. N. Grenada. Delatre coll. *Type.*

**Picumnis granadensis** Lafr.
*Picumnus granadensis* Lafr. Rev. Zool., 1847, p. 78.
19,751. N. Granada. Delatre coll. *Type.*
19,757. [N. Granada.] Delatre coll.

**Malacoptila panamensis** Lafr.
*Malacoptila panamensis* Lafr. Rev. Zool., 1847, p. 79.
20,805. juv. ♂ Panama. Delatre coll. *Type.*

## Lafresnaye and D'Orbigny.

The types of the species usually credited to the above authors are generally admitted to be the specimens in the Boston Society of Natural History contained in the Lafresnaye collection.

There are, however, specimens of many of them in the Academy collection, which were originally in D'Orbigny's collection, and subsequently in that of Prince Massena, Duc of Rivoli. These were regarded by Cassin as types, and while they probably have not as good a claim as those in the Boston Society they are in any case paratypes, and are valued accordingly.

Such specimens as are clearly labeled "D'Orbigny's Collection" are the following, though there are doubtless others among the Rivoli specimens:

13,508. **Columbigallina cruziana** (d'Orb.). "Zacua No. 17, d'Orbigny."
6,998. **Dendrornis.** Chiquitos. d'Orbigny.
6,999. **Dendrornis.** Chiquitos. d'Orbigny.
3,775. **Ostinops atrovirens** (d'Orb.). "Yungas, No. 61, d'Orbigny."
10,647. **Emberizagra olivascens** (d'Orb.). "Suarba, No. 95, d'Orbigny."
10,646. **Emberizagra olivascens** (d'Orb.). "Esquichia, No. 95, d'Orbigny."
10,626. **Poöspiza hypochondria** (d'Orb.). S. America, "No. 98, d'Orbigny."
10,627. **Poöspiza hypochondria** (d'Orb.). "Chiquitos, No. 98, d'Orbigny."
10,621. **Poöspiza melanoleuca** (d'Orb.). "Chiquitos, No. 114, d'Orbigny."
10,622. **Poöspiza melanoleuca.** No. 114, d'Orbigny.
10,713. **Schistospiza griseocristata** (d'Orb.). "No. 104, d'Orbigny."
10,714. **Schistospiza griseocristata** (d'Orb.). "No. 114, d'Orbigny."

## Massena and Sonancé.

Apparently Prince Massena continued to collect specimens of the *Psittacidæ* after the disposal of his main collection to Dr. Wilson, as in the *Revue et Magasin de Zoologie* for 1854, p. 71, there is a paper under the joint authorship of Massena and Sonancé[21] in

[21] Though both names appear as authors, Massena is given as authority for all the species.

which are described nine new Parrots, while in the same journal for 1856 there is a Catalogue of Parrots in the Massena collection, by M. Sonancé, in which two hundred and eighteen species are enumerated, some being described as new.

The types of these latter species seem to have been purchased by the British Museum, as with a few exceptions they are all listed in the *Catalogue of Birds in the British Museum*, Vol. xx. The Academy has no specimens of them from the Massena collection.

Specimens of all but three of the species described in the former of the papers above mentioned are, however, in the Academy's collection labeled as types of "Massena and Sonancé."

As the original manuscript catalogue contains these specimens it would seem that they were shipped about the same time as the rest of the collection, which reached Philadelphia in 1846, in which case the labels must have been written long before the names were published. It is possible, however, that they were not sent over until after the paper by Massena and Sonancé was prepared.

In any case, the specimens have practically as much claim to being considered the types as those in the British Museum, and a list of them is therefore appended.

**Ara auricollis** Cass.
*Ara auritorques* Mass. Rev. et Mag. de Zool., 1854, p. 71.
22,358. ♂ S. America. Rivoli coll. *Type.*
22,359. ♂ S. America. Rivoli coll.

No type of this is in the British Museum.

**Gnathosittacea icterotis** (Mass.).
*Conurus icterotis* Mass. Rev. et Mag. de Zool., 1854, p. 71.

Type in British Museum. No specimen in the Academy collection.

**Conurus rubrolarvatus** Mass.
*Conurus rubrolarvatus* Mass. Rev. et Mag. de Zool., 1854, p. 71.
22,348. ♂ Guayaquil. Rivoli coll. *Type.*

A type also in British Museum (*Cat. of Bds.*, xx, p. 183).

**Conurus æruginosus** (L.).
*Conurus chrysogenys* Mass. Rev. et Mag. de Zool., 1854, p. 72.
22,333. ♀ Colombia. Rivoli coll. *Type.*

A specimen is also in the British Museum (*Cat. of Bds.*, xx, p. 197), which is evidently one of the type lot, though not so marked by the compiler.

**Pyrrhura calliptera** (Mass.).

*Conurus callipterus* Mass. Rev. et Mag. de Zool., 1854, p. 72.

22,385. ♀ Bogota. Rivoli coll.

22,386. ♀ Bogota. Rivoli coll.

22,387. ♂ Bogota. Rivoli coll. *Type.*

No Massena specimen is in the British Museum collection.

**Pyrrhura devillei** (Mass.).

*Conurus devillei* Mass. Rev. et Mag. de Zool., 1854, p. 73.

There is no specimen of this bird in the Academy.

The type is in the British Museum (*Cat. of Bds.*, xx, p. 227).

**Pyrrhura molinæ** (Mass.).

*Conurus molinæ* Mass. Rev. et Mag. de Zool., 1854, p. 73.

22,388. ♀ (?) Chiquitos. Rivoli coll.

22,389. ♂ (?) Chiquitos. Rivoli coll. *Type.*

A type is in the British Museum (*Cat. of Bds.*, xx, p. 227).

**Pionus selinoides** (Mass.).

*Psittacus selinoides* Mass. Rev. et Mag. de Zool., 1854, p. 73.

22,542. ♂ Bogota. Rivoli coll. *Type.*

A type is in the British Museum (*Cat. of Bds.*, xx, p. 226).

**Pionus cobaltinus** (Mass.).

*Psittacus cobaltinus* Mass. Rev. et Mag. de Zool., 1854, p. 74.

22,536. juv. ♂ S. America. Rivoli coll. *Type.*

A type is in the British Museum (*Cat. of Bds.*, xx, p. 325).

## John Gould.

As already explained, Dr. Wilson secured Gould's entire collection of Australian birds, including nearly all of the types of species described up to and including the seventh volume of his *Birds of Australia.* The types of the species described in the supplement, as well as such additional specimens as were procured after Dr. Wilson's purchase, went to the British Museum. Several specimens apparently from this subsequent collection are given in the *Catalogue of Birds,* as *types* of species described long before Dr. Wilson's purchase, whereas the Academy specimens have the better claim, the others being, so far as I can judge, topotypes secured some time afterward. There is no reason to suppose that Gould withheld any of the specimens he possessed at the time of the sale.

Gould's collection, after purchase, was sent to Verreaux for mounting, and the original labels were removed, and their contents (or part of it) transcribed on the base of the stands, every specimen being marked "Type. Gould's *Birds of Australia,*" no matter whether the species was Gould's or not!

Gould's original descriptions were for the most part published in the *Proceedings of the Zoological Society*, and are generally very meagre, so that it is impossible to tell how many of the numerous "type specimens" of each species he had at the time he prepared the diagnoses.

By careful study and comparison with the original descriptions it is possible to select the specimen which agrees in plumage, measurements and locality with the description in nearly every case, and such ones I have designated as the types.

Of the 391 names proposed by Gould for Australian birds (including those published in his *Handbook*) the types of 321 are in the Academy collection. Of the rest, fifty-six are in the British Museum, or other collections stated by Gould, while of fourteen the actual type seems to have been lost, though paratypes or cotypes are still preserved in the Academy.

A complete manuscript catalogue of the Gould Australian specimens has been prepared, and may be published at some future time.

Below are given such of his types from localities other than Australia as are preserved in the Academy collection:

**Nestor productus** (Gould).
*Plyctolophus productus* Gould, P. Z. S., 1836, p. 19.
22,082. New Zealand. Gould coll. *Type.*

**Ramphastos brevicarinatus** Gould.
*Ramphastos brevicarinatus* Gould. Mon. Ramph., ii Ed., pl. iii (1854).
20,375. Mexico. Rivoli coll. *Type.*

**Ramphastos citreolæmus** Gould.
*Ramphastos citreolæmus* Gould. P. Z. S., 1843, p. 147.
20,391. Bogota. Rivoli coll. Type.

**Todirhamphus recurvirostris** Lafr.
*Halcyon platyrostris* Gould, P. Z. S., 1842, p. 72.
21,449. Navigator Islands. J. Gould. *Type.*

**Chamæza nobilis** Gould.
*Chamæza nobilis* Gould. Ann. and Mag. Zool., xv, 2d Series, 1855, p. 344.
8,517. Peru. "No. 2 Chamæza nobilis, sp. nov., Gould. Type."

The above data are in Gould's hand. The British Museum *Catalogue* contains another specimen with the same data, which is recorded as the type.

**Heteralocha acutirostris** (Gould).
*Neomorpha acutirostris* Gould. P. Z. S., 1836, p. 144.
16,023. ♀ New Zealand. J. Gould. *Type.*
*Neomorpha crassirostris* Gould. P. Z. S., 1836, p. 145.
16,021. ♂ New Zealand. J. Gould. *Type.*

If we regard *Neomorpha* and *Neomorphus* as distinct names, *Neomorpha* should stand for this bird. Otherwise it is antedated by *Neomorphus* Gloger in the *Cuculidæ.*

**Zosterops albigularis** Gould.
*Zosterops albigularis* Gould. P. Z. S., 1836, p. 75.
18,257. Norfolk Isl. J. Gould. *Type.*

**Zosterops tenuirostris** Gould.
*Zosterops tenuirostris* Gould. P. Z. S., 1836, p. 76.
18,255. Norfolk Isl. J. Gould.
18,256. Norfolk Isl. J. Gould.

**Petroica multicolor** (Gm.).
*Petroica modesta* Gould. P. Z. S., 1837, p. 147.
662. ♀ Norfolk Isl. J. Gould. *Type.*
*Petroica pulchella* Gould. P. Z. S., 1839, p. 142.
661. ♂ Norfolk Isl. J. Gould. *Type.*

## Sir A. Smith.

A number of specimens received from Jules Verreaux are marked by him both on the stands and in the catalogue "Type de Smith," referring to the publications of Sir A. Smith in the *Report of the S. African Expedition* and *Illustrations of the Zoölogy of South Africa.* The types of most of Smith's species are recorded as being in the British Museum, but where this is not the case the Academy specimens must be considered as the types. No particulars are preserved as to how many of Smith's specimens Dr. Wilson procured.

In all cases the Academy specimens are cotypes, and I therefore give a full list of them below, which their importance seems to warrant.

Being unable to consult the *Rep. S. Afr. Exp.*, I quote the references from the British Museum *Catalogue of Birds.*

**Sarothrura elegans** (Smith).
*Gallinula elegans* Smith. Ill. Zool. S. Afr., 1839, pl. 22.
6,291. ♂ Cape of Good Hope. "Type de Smith."

None of Smith's specimens are in the British Museum.

**Thalassornis leuconotus** (Eyt.).
*Clangula leuconota* "Smith." Eyton Mon. Anat., 1838, p. 168.
5,517. ♂ Cape of Good Hope. "Type de Smith and Eyton."

Three specimens marked type are in the British Museum (*Cat. of Bds.*, xxvii, p. 438).

**Caprimulgus lentiginosus** Smith.
*Caprimulgus lentiginosus* Smith. Ill. Zool. S. Africa, 1845, pl. 101.
21,839. ♀ Cape of Good Hope. "Type de Smith.".

Another type specimen is in the British Museum (*Cat. of Bds.*, xvi, p. 537).

**Caprimulgus rufigenus** Smith.
*Caprimulgus rufigena* Smith. Ill. Zool. S. Afr., 1845, pl. 100.
21,830. ♂ Cape of Good Hope. "Type de Smith."
21,831. ♀ Cape of Good Hope. "Type de Smith."
21,834. jr. ♂ Cape of Good Hope. "Type de Smith."
21,835. ♂ Cape of Good Hope. "Type de Smith."

Two specimens from Smith in the British Museum are not marked as types (*Cat. of Bds.*, xvi, p. 533).

**Caprimulgus natalensis** Smith.
*Caprimulgus natalensis* Smith. Ill. Zool. S. Afr., 1845, pl. 99.
21,884. ♀ Port Natal. "Type de Smith."

Two specimens marked type in British Museum (*Cat. of Bds.*, xvi, p. 564).

**Alæmon nivosa** (Sw.).
*Alauda lagepa* Smith. Ill. Zool. S. Afr., 1845, pl. 87, fig. 2.
14,729. ♂ Cape of Good Hope. "Type de Smith."

Two types in British Museum (*Cat. of Bds.*, xiii, p. 524).

**Alæmon semitorquata** (Smith).
*Certhilauda semitorquata* Smith. Rep. Exp. S. Afr., 1836, p. 47.
14,727. ♀ Cape of Good Hope. "Type de Smith" (fide Verreaux).

Type in British Museum (*Cat. of Bds.*, xiii, p. 522).

**Mirafra africanoides** Smith.
*Mirafra africanoides* Smith. Rep. Exp. S. Afr., 1836, p. 47.
14,764. ♂ Cape of Good Hope. "Type de Smith."

Type in British Museum (*Cat. of Bds.*, xiii, p. 616).

**Mirafra sabota** Smith.
*Mirafra sabota* Smith. Rep. Exp. S. Afr., 1836, p. 47.
14,761. ♂ Cape of Good Hope. "Type de Smith."

A specimen from Smith is in the British Museum, though it is not marked as the type (*Cat. of Bds.*, xiii. p. 618).

**Pyrrhulauda verticalis** (Smith).
*Megalotis verticalis* Smith. Rep. Exp. S. Afr., 1836, p. 48.
14,865. ♀ Cape of Good Hope. "Type de Smith."
14,866. ♀ Cape of Good Hope. "Type de Smith."
14,871, juv. ♂ Cape of Good Hope. "Type de Smith."
14,850. ♂ Cape of Good Hope. "Type de Smith."

A specimen from Smith is also in the British Museum, but is not marked type (*Cat. of Bds.*, xiii, p. 656).

**Pyrrhulauda smithii** Bp. Consp. Av. 1, p. 512, 1850.
*Pyrrhulauda leucotis* Smith (nec. Stanley).
14,872. ♀ Cape of Good Hope. "Type de Smith."
14,841, juv. ♀ Cape of Good Hope. "Type de Smith."
14,843. ♀ Cape of Good Hope. "Type de Smith."
14,848. ♂ Cape of Good Hope. "Type de Smith."

Based by Bonaparte on Smith's specimens. Two of these in British Museum are marked types (*Cat. of Bds.*, xiii, p. 658).

**Pyrrhulauda australis** (Smith).
*Megalotis australis* Smith. Rep. Exped. S. Afr., 1836, App., p. 49.
14,874. ♀ Cape of Good Hope. "Type de Smith."
14,876. ♂ Cape of Good Hope. "Type de Smith."

A type specimen also in the British Museum (*Cat. of Bds.*, xiii, p. 652).

**Fringillaria tahapisi** (Smith).
*Emberiza tahapisi* Smith. Rep. S. Afr. Exp., 1836, App., p. 48.
10,569. ♀ Cape of Good Hope. "Type de Smith."
10,574. ♂ Cape of Good Hope. "Type de Smith."

No Smith specimen in the British Museum.

**Fringillaria impetuani** (Smith).
*Emberiza impetuani* Smith. Rep. S. Afr. Exp., 1836, App., p. 48.
10,578. ♂ Cape of Good Hope. "Type de Smith."
10,579. ♀ Cape of Good Hope. "Type de Smith."

Two types are also in the British Museum (*Cat. of Bds.*, xii, p. 564).

**Passer diffusus** (Smith).
*Pyrgita diffusa* Smith. Rep. S. Afr. Exp., 1836, App., p. 50.
10,174. ♂ Cape of Good Hope. "Type de Smith."
10,165. ♂ Cape of Good Hope. "Type de Smith."
10,170. ♀ Cape of Good Hope. "Type de Smith."

Two types also in British Museum (*Cat. of Bds.*, xii, p. 337).

**Poliospiza gularis** (Smith).
*Linaria gularis* Smith. Rep. S. Afr. Exp., 1836, App., p. 49.
10,070. ♀ Cape of Good Hope. "Type de Smith."
10,072. ♂ Cape of Good Hope.

Two specimens are in the British Museum, but are not marked as types (*Cat. of Bds.*, xii, p. 344).

**Serinus albogularis** (Smith).

*Crithaga albogularis* Smith. S. Afr. Quart. Jour., 1833, p. 48.
*Crithaga selbyi* Smith. Rep. S. Afr. Exp., 1836, App., p. 50.
10,246. ♂ Cape of Good Hope. "Type de Smith."

This specimen is marked as type of *C. selbyi*. There is also a specimen in the British Museum, but it is not marked type (*Cat. of Bds.*, xii, p. 360).

**Estrilda erythronota** (Vieill.).

*Estrelda lipiniana* Smith. Rep. Expl. S. Afr., 1836, App., p. 49.
14,669. ♂ Cape of Good Hope. "Type de Smith."
14,671. ♀ Cape of Good Hope. "Type de Smith."

A specimen is in the British Museum, but not marked as the type (*Cat. of Bds.*, xiii, p. 398).

**Sporopipes squamifrons** (Smith).

*Estrelda squamifrons* Smith. Rep. Exp. S. Afr., 1836, p. 49.
13,911. ♀ Cape of Good Hope. "Type de Smith."

Type in British Museum (*Cat. of Bds.*, xiii, p. 408).

**Lagonosticta brunneiceps** Sharpe. Cat. of Bds., xiii, p. 277.

*Estrelda vieillotti* Smith. [MSS. ?]
14,389. ♀ Cape of Good Hope. "Type de Smith."

I find no mention of this name of Smith's, but not having access to the *Rep. S. Afr. Exp.*, cannot ascertain whether it is published or not. If it is, it will, of course, antedate *brunneiceps* of Sharpe.

**Penthetriopsis macroura** (Gm.).

*Euplectus booriensis* Smith. [MSS. ?]
14,238. ♂ Cape of Good Hope. "Type de Smith."
14,292. ♀ Cape of Good Hope.
14,293. ♀ Cape of Good Hope.

This is another name which has apparently not been published, but I am unable to satisfy myself upon this point.

**Plocepasser mahali** Smith.

*Plocepasser mahali* Smith. Rep. Exp. S. Afr., 1836, App., p. 51.
14,256. ♂ Cape of Good Hope. "Type de Smith."
14,257. ♀ Cape of Good Hope. "Type de Smith."

Two types in British Museum (*Cat. of Bds.*, xiii, p. 246).

**Pyromelana taha** (Smith).
*Euplectes taha* Smith. Rep. Exp. S. Afr., 1836, p. 50.
14,294. ♂ Cape of Good Hope. "Type de Smith."
14,296. ♂ Cape of Good Hope. "Type de Smith."
14,297. ♀ Cape of Good Hope. "Type de Smith."
14,298. ♀ Cape of Good Hope. "Type de Smith."
14,299. ♂ Cape of Good Hope. "Type de Smith."

Two types also in British Museum (*Cat. of Bds.*, xiii, p. 243).

**Hyphantornis** Sp.?
*Ploceus obscurus* Smith. [MSS. ?]
14,708. "♂" Cape of Good Hope. "Type de Smith."
14,027. "♂" Cape of Good Hope.

No. 14,027 is marked "*P. tahatali* Smith," but it is evidently this species. These birds seem to be a female and young of some large species of *Hyphantornis* with wing measuring 3.25 ins.

**Hyphantornis velatus** (Vieill.).
*Ploceus tahatali* Smith. Rep. Exp. S. Afr., 1836, p. 50.
14,707. ♀ Cape of Good Hope. "Type de Smith."

A type specimen in the British Museum (*Cat. of Bds.*, xiii, p. 466).

**Hyphantornis velatus mariquensis** (Smith).
*Ploceus mariquensis* Smith. Ill. Zool. S. Afr., 1845, pl. 103.
14,049. jun. ♂ Cape of Good Hope. "Type de Smith."

Series of types in the British Museum (*Cat. of Bds.*, xiii, p. 467).

**Quelea quelea** (L.).
*Loxia latharni* Smith. Rep. S. Afr. Exp., 1836, App., p. 51.
14,340. ♀ Cape of Good Hope. "Type de Smith."
14,345. ♀ Cape of Good Hope. "Type de Smith."

No type in British Museum.

**Philæterus socius** (Lath.).
*Philæterus lepidus* Smith, in Charlesw. Mag., 1837, p. 536.
14,327. ♂ Cape of Good Hope. "Type de Smith."
14,333. jun. ♀ Cape of Good Hope.

Three types are in the British Museum (*Cat. of Bds.*, xiii, p. 250).

**Cinnyris mariquensis** Smith.
*Cinnyris mariquensis* Smith. Rep. S. Afr. Exp., 1836, App., p. 53.
18,025. ♂ Cape of Good Hope. "Type de Smith."
18,026. ♀ Cape of Good Hope. "Type de Smith."
18,181. ♂ Cape of Good Hope. "Type de Smith."

No type in the British Museum.

**Cinnyris olivacea** Smith.

*Cinnyris olivacea* Smith. Ill. S. Afr. Zool., 1839, in text to pl. 57.

18,037. ♂ Cape of Good Hope. "Type de Smith."

No type in British Museum.

**Cinnyris leucogaster** Vieill.

*Nectarinia talatala* Smith. Rep. Exp. S. Afr., 1836, App., p. 58.

18,120. ♀ Cape of Good Hope. "Type de Smith."

18,121. ♂ Cape of Good Hope. "Type de Smith."

No type in British Museum.

## Other Authors.

A few types of other authors were contained in the collections purchased by Dr. Wilson, as given below:

**Cassicus montezumæ** (Less.).

*Cacicus montezumæ* Less. Cent. Zool., p. 33 (1830).

3,769. Mexico. ♂ *Type.*

This specimen is stated by Cassin to be the type (*Proc. Acad. Nat. Sci. Phila.*, 1867, p. 71).

**Polyplectrum napoleonis** Less.

*Polyplectrum napoleonis* Less. Traité d'Orn., 1831, pp. 487, 650.

12,732. "♂ des Isles de Indes (?) ou des Moloques."

"Type de Less. et de Temm." Rivoli coll.

**Neorhynchus naseus** (Bp.).

*Neorhynchus peruvianus* Less. Gray Handlist Birds (1870), i, p. 107.

9,811. "Perou. Type de la description de Lesson."

I cannot find the original place of publication of this species, and it may be only a manuscript name.

**Picathartes gymnocephalus** Temm.

*Corvus gymnocephalus* Temm. Pl. Col. 327.

3,091. "Type de Temminck."

Apparently one of the specimens purchased by Dr. Wilson from Temminck's collection.

**Trogon meridionalis** Swains.

*Trogon affinis* Des. & Dev.

21,003. ♂ Trinidad. Rivoli coll. "Type de Des. & Dev." (Verreaux).

21,002. ♂ Cayenne. Rivoli coll. "Type de Des. & Dev."

I do not find the name *affinis*, and it seems to have existed only in manuscript.

**Ptilopus rivolii** Prev. & Knip.

*Columba rivolii* Prev. & Knip. Pig. II, pl. 57 (1838–43).

13,119. Rivoli coll. "P. rivolii Prev., Original Specimen."

**Eupetomena macrurus** (Gm.).

*Trochilus hirundinaceus* "Vieill."

23,341. *Type* of Vieill. (fide Verreaux).

Vieillot called the bird " Oiseau-Mouche a queue fourchue de Cayenne," and it was Lesson who bestowed the name *hirundinaceus* upon it. Whether this is Lesson's type is perhaps questionable.

**Drymornis bridgesi** Eyt.

*Nasica bridgesi* Eyt. Contr. Orn., 1849, p. 130.

6,925. Bolivia (?). " *Type.*"

The type of this species is recorded as being in the British Museum (*Cat. of Bds.*, xv, p. 157).

**Muscicapa lugens** (Hartl.).

*Muscicapa cassini* Heine. Jour. für Orn., 1860, p. 428.

619. ♂ Camma river, W. Africa. DuChaillu coll. *Type.*

620, juv. Camma river, W. Africa. DuChaillu coll.

Based on Cassin's description of the above specimens.

## SYNOPSIS OF THE UNITED STATES SPECIES OF THE HYMENOPTEROUS GENUS CENTRIS Fabr. WITH DESCRIPTION OF A NEW SPECIES FROM TRINIDAD.

BY WILLIAM J. FOX.

This genus of bees is of tropical origin and, north of Mexico, is only found along the extreme southern border of the United States. Of the eleven species herein noted ten are from the region bordering the Rio Grande, and one only is found east of Texas, *C. errans*, from the vicinity of Biscayne Bay, Florida, a species probably introduced from the West Indies. Ten of these eleven species have been first described within the past two years.

The author is indebted to Mrs. A. T. Slosson and Messrs. Cockerell, Ashmead and Griffith for the loan of material, which has been of much assistance.

FEMALES.

1. Abdomen green-black, with reddish maculation, entirely reddish testaceous beneath; (face with pale markings, an inverted T-shaped mark on clypeus; pubescence of thorax above pale fulvous, on sides, beneath, and on head in front pale gray; a stripe of black hairs crossing the vertex), *errans* n. sp.

   Abdomen deep black, more or less pubescent, . . . . . 2

2. Griseous pubescence covering the entire body, that on thorax above and vertex slightly fulvous, while the hair on legs from middle of tibiæ to apex of two hind pairs and anterior tarsi, black; abdomen pruinose; labrum in perfect specimens densely pilose; a triangular yellow spot on clypeus; antennæ entirely black, the first joint of flagellum distinctly longer than the united length of four following joints, *pallida* n. sp.

   Abdomen, at most, with pale pubescence on first and second dorsal segment, generally quite nude, . . . . . . . . . 3

3. Only the first dorsal segment pubescent, . . . . . . . . 4

   "The second abdominal segment, as well as the first, delicately pruinose,"

   *Hoffmannseggiæ* Ckll. (=*lanosa* Ckll. ♀ non Cress.)

4. First dorsal segment not densely pubescent; (front broader, if anything, than the distance between the anterior ocellus and apex of clypeus; the latter as well as the labrum, mandibles except apex, and inner orbits narrowly beneath, orange; legs black, with black pubescence), . . . . *cæsalpiniæ* Ckll.

   First dorsal segment more or less densely pubescent, . . . 5

5. Clypeus and labrum pale, . . . . . . . . . . . . 6

   Clypeus and labrum black, the former with a carina extending from base almost to apex; mandibles and scape black; (labrum acuminate at tip; first joint of flagellum a little shorter than the united length of the four following joints; pubescence of four hind legs entirely black), *subhyalina* n. sp.

6. Width of front, if anything, greater than the distance between the anterior ocellus and apex of clypeus; greater part of legs red, their pubescence black, except on anterior femora and tibiæ; apical margins of dorsal abdominal segments 2 and 3 laterally with pale pubescence; (clypeus, labrum, inner orbits beneath and mandibles, except apex, orange), *rhodopus* Ckll.

   Width of front less than the distance between the anterior ocellus and apex of clypeus; legs black, or dark brown, . 7

7. Width of clypeus anteriorly scarcely greater than its length in the middle; labrum comparatively small, subtriangular, subacuminate at tip; pubescence on thorax beneath pale, *Cockerellii* n. n. (=*Hoffmannseggiæ* Ckll. ♀.)

   Width of clypeus anteriorly greater than its length in the middle; labrum larger, semilunate, its apex broadly and roundly slightly emarginate; pubescence on thorax beneath dark brown or blackish, . . . . . . . . *atriventris* n. sp.

MALES.

1. Apex of dorsal segments broadly margined with testaceous. 2

   Abdomen deep black, margins of segments not at all testaceous, 3

2. First and second segments broadly fasciate with pale reddish-yellow, which color also marks the sides of abdomen; segments 3–5 pale testaceous at apex; pubescence very dense, completely concealing sculpture of thorax. Length 21 mm., *Morsei* Ckll.

All the dorsal segments margined apically with pale testaceous; pubescence sparser, the sculpture of dorsulum and mesopleuræ more or less obvious. Length 16 mm.
*marginata* n. sp. (or var. of *Morsei.*)

3. Eyes strongly converging above: first joint of flagellum as long as four following united; abdomen pruinose above, especially on first two segments, the others sparsely; clypeus and labrum white, . . . . . . . . . . . . *Hoffmanseggiæ* Ckll.

Eyes not or scarcely converging above, . . . . . . . . 4

4. Front broad, . . . . . . . . . . . . . . . . . 5

Front narrow, the distance between the anterior ocellus and apex of clypeus much greater than the greatest width of front, . . . . . . . . . . . . . . . . 6

5. "Scape wholly dark; mandibles dark reddish brown, with black tips;" legs dark, . . . . . . . *cæsalpiniæ* Ckll.

Scape beneath and mandibles more or less yellowish; legs reddish; abdomen, at least laterally, with bands of pale hairs at apex of dorsal segments 2–4, . . . . *rhodopus* Ckll.

6. Pubescence of thorax beneath dark brown or blackish, that on four hind legs entirely black; first joint of flagellum shorter than the following two united, . . . . *atriventris* n. sp.

Pubescence of thorax pale beneath, the medial tibiæ outwardly and base of hind tibiæ externally with pale hairs; first joint of flagellum nearly as long as the three following united,
*lanosa* Cress.

**1. Centris errans** n. sp.

♀.—Head and thorax black; abdomen green-black, the apical margin of segments 1–4, or 2–4, the remainder and ventral surface entirely, an irregular mark on dorsals 2 and 3 laterally, tegulæ and the legs, reddish-brown, the anterior femora more or less black; scape beneath, sometimes obscurely, base of mandibles, labrum, an inverted T-shaped mark on clypeus, inner orbits as far as insertion of antennæ, whitish yellow; head with pale pubescence, that on cheeks palest, the vertex crossed from eye to eye by a stripe of black hairs; thorax above with pale fulvous pubescence, that on the sides and beneath similar to that of the head in front; fore legs fringed with pale hairs, the short pubescence fulvous; brush of hind legs of a paler fulvous than the pubescence of thorax above; first hind tarsal joint covered with appressed, fiery-red, or coppery, bristles, oblong, truncate, longer and wider than the hind tibiæ; abdomen on first segment anteriorly, ventrally and at apex with some pale hairs, otherwise nude; wings subhyaline, a dark streak in the marginal cell originating at base, and a similar streak extending from the apex of the same cell in the form of an appendiculation. Length 12 mm.

Florida: Biscayne Bay. Two specimens collected by Mrs. A. T. Slosson, who, I believe, has other specimens of the species. *C. errans*, whose origin is undoubtedly tropical, as the present specimens should be considered wanderers from the West Indies, who may or may not have taken up their abode in Florida, is most closely related to *C. apicalis* and *C. insularis* from Saint Bartholomew and St. Domingo respectively, with either of which it may be identical, but from the descriptions of these two species the present one differs in several respects, which may, however, be due to lack of greater detail.

**2. Centris pallida** n. sp.

♀.—Black, densely clothed with grayish white pubescence, that on vertex and thorax above slightly pertaining to fulvous; median and hind legs with black pubescence on tibiæ and first tarsal joint; remaining tarsal joints reddish; clypeus with a triangular yellow mark; labrum covered with dense pile, that on base whitish, at apex brownish; mandibles black, with pale pile at base externally; first joint of flagellum slender, almost as long as the five following joints; tegulæ testaceous; fore tarsi fringed with pale fuscous hairs, the pubescence of the inner side of first joint brownish; abdomen with the pubescence of dorsal surface short, hoar-frost-like, except on apical half of fifth segment where it is black; ventral segments 2–4 fringed at apex with long white hairs, the fringe of segment 5 being dark brown; the ventral segments medially are supplied with darker dense pubescence, which, when viewed from the side, extends from base of second segment to apex of fourth; sixth segment with brownish pubescence, the pygidium elongate, narrow, reddish at base, with a broad flat fold or swelling running from apex to near base; wings subhyaline. Length 16–17 mm.

Arizona: Phœnix. Five specimens given to me by Dr. H. G. Griffith, by whom they were collected in May, 1898, on the flowers of the "Palo Verde," *Parkinsonia Torreyana.* Dr. Griffith states the bees were abundant and easily captured, allowing the collecting bottle to be slipped up quite close to them and the stopper then used in such a manner as to knock them into the bottle. This apparent lethargic condition of the specimens is quite unusual for species of *Centris*, as from all accounts they are usually very rapid flyers and easily disturbed, after the manner of Odonata. I can testify from experience as to the alertness of two of the West Indian species, *C. hæmorrhoidalis* and *C. fasciata.* The abdomen is densely pruinose above.

**3. Centris Morsei** Ckll.

*Centris Morsei* Cockerell, Proc. Acad. Nat. Sci. Phila., 1897, 355, ♂.

New Mexico: Mesilla. Quite distinct by its large size (21 mm.) and the pale reddish-yellow bands on dorsal segments 1 and 2.

**4. Centris marginata** n. sp.

♂.—Black; ventral segments laterally testaceous-yellow, all the dorsals at apex broadly margined with testaceous; flagellum slightly brownish beneath; clypeus, labrum and spot between antennæ at base of clypeus, bright lemon-yellow; mandibles reddish-brown, with black tips; entire insect covered with pale gray pubescence, except the abdomen above, which is quite bare, excepting the extreme base of first segment; the pubescence inclining to fulvous on top of head and thorax, and sufficiently thin on dorsulum and mesopleuræ to display the sculpture; front broad; first joint of flagellum about as long as the three following united; legs robust; pubescence of anterior tibiæ and tarsi internally reddish-brown, that on first joint of hind tarsi internally, dark; wings subhyaline, nervures blackish. Length 16 mm.

New Mexico: "Las Cruces (August 23) on flowers of *Cevallia sinuata.*" One specimen received from Mr. Cockerell and bearing the label "*C. cæsalpiniæ* ♂," which name was probably attached to it by error, as it neither agrees with the description of the male of *C. cæsalpiniæ*, nor is it even closely allied to the female of that species. Its affinities are to *C. Morsei*, from which it does not differ structurally.

**5. Centris cæsalpiniæ** Ckll.

*Centris cæsalpiniæ* Cockerell, Ann. and Mag. N. H., Ser. 6, xix, 394, ♀ ♂, 1897.

New Mexico: Las Cruces. I have not seen the male of this species, a specimen received from Mr. Cockerell, marked "*C. cæsalpiniæ* ♂," differing so obviously from the description that I have concluded that it was so labelled by mistake, and have described it as new (see *C. marginatus*).

**6. Centris rhodopus** Ckll.

*Centris cæsalpiniæ* var. *rhodopus* Cockerell, *Ibid.*, 395, ♀ ♂, 1897.

New Mexico: Las Cruces. It seems better to regard this as a distinct species from *C. cæsalpiniæ;* it has well-marked differences. One male, sent by Mr. Cockerell, has the abdominal hair-bands more distinct and regular, and the pubescence of first hind tarsal joint, instead of being entirely dark, is about evenly divided between dark-brown and whitish.

**7. Centris Hoffmannseggiæ** Ckll.

*Centris Hoffmannseggiæ* Cockerell, *Ibid.*, 395, ♂ (non ♀), 1897.
*Centris lanosa* Cockerell (not Cresson), *Ibid.*, 397, ♀ (non ♂), 1897.

New Mexico: Mesilla Valley. To my mind Mr. Cockerell has confused the sexes of *Hoffmannseggiæ* and *lanosa*, judging from his descriptions. Cotypes of *Hoffmannseggiæ* ♀ differ at once from the described male in their bare abdomen beyond the first segment, the ♂ having the abdomen pubescent on all the segments, especially the two first. Now, the ♀ *lanosa* described by Cockerell, has "the second abdominal segment, as well as the first, delicately pruinose." In the male *lanosa* the first segment only is pruinose.

**8. Centris Cockerellii** n. n.

*Centris Hoffmannseggiæ* Cockerell, *Ibid.*, 395, ♀ (non ♂), 1897.

New Mexico: Mesilla Valley. I propose this name for the species described as the female of *Hoffmannseggiæ*, which is apparently distinct from the latter.

**9. Centris atriventris** n. sp.

♀.—Black; head in front and cheeks with grayish pubescence, that on vertex pale fulvous; clypeus yellow, broader than long, strongly punctured but smooth down middle; labrum yellow, semilunate, strongly punctured, its apex broadly and roundly slightly emarginate; flagellum testaceous beneath from apex of first joint, the latter distinctly shorter than the four following joints; scape entirely dark; thorax above with pale fulvous pubescence, that on sides slightly paler, beneath the pubescence is black, or blackish-brown; legs reddish-brown, the pubescence of the anterior ones fuscous brown, with that on tarsi black; on the other legs it is black, except on the medial tibiæ outwardly, where it is rather similar to that of the fore legs; abdomen shining black, the first segment anteriorly with pale pubescence; the apex of first and the second to fourth dorsal segments quite nude; the apex of fifth dorsal fringed with dark hairs; second to fourth ventrals fringed apically and clothed medially with long black hairs; sixth segment with black hairs, the pygidium triangular, with a triangular raised area at base which sends out a carina from its apex which reaches nearly to tip of pygidium; wings subhyaline. Length 12 mm.

♂.—Similar to ♀ in coloration, but with the mandibles within toward the base, the inner orbits as high as insertion of antennæ and a line on scape, yellow; first joint of flagellum not as long as two following united; labrum semicircular, not emarginate; dark pubescence of ventral surface of thorax not so evident as in the ♀. Length 12 mm.

Texas. One female and two male specimens. A female specimen from lower California agrees in coloration with this species, but there is a slight difference in the shape of pygidium. I am not quite certain that it is the same, however, as the first abdominal segment is scarcely pubescent.

**10. Centris lanosa** Cress.

*Centris lanosa* Cresson, Trans. Am. Ent. Soc., iv, 284, ♂.
*Centris lanosa* Cockerell, l. c., 397, ♂ (non ♀), 1897.

Texas; New Mexico: Las Cruces. The pale patch at base of hind tibiæ externally is characteristic of this species. The pubescence of femora varies from brown to pale.

**11. Centris subhyalina** n. sp.

♀.—Black, including clypeus and labrum; head in front and on cheeks with grayish pubescence, that on vertex pale fulvous; clypeus strongly punctured, with a raised smooth line down centre, the fore margin narrowly reddish-testaceous; labrum semicircular, strongly punctured, its outer margin narrowly reddish-testaceous; flagellum obscurely testaceous beneath from apex of second joint, the latter a little longer than the following three joints united; scape not pale; thorax with pale fulvous pubescence above extending half way on sides, where it is met by black-brown pubescence which clothes the under surface; pubescence of middle segment and first segment of abdomen paler; legs dark red, or black, the pubescence of four posteriors entirely black, that of the anteriors brownish; abdomen shining black, the apex of first, and the second to fourth dorsals bare; fifth dorsal as well as the second to fifth ventrals fringed with black hairs; sixth segment with dark-brown pubescence, the pygidium almost as in *atriventris;* wings subhyaline. Length 12 mm.

Texas. Three specimens. This species is apparently quite close to *C. mexicana* Smith, but in that species the wings are described as fuscous. *C. subhyalina* may subsequently prove to be the female of *C. lanosa* Cress.

### Description of a New Species of Centris from the Island of Trinidad, W. I.

**Centris xylocopoides** n. sp.

♀.—Deep black, clothed throughout with black pubescence; space between eye and mandible reddish; eyes slightly diverging above; clypeus medially flattened and impunctate, otherwise strongly punctured; labrum strongly punctured, covered with long hairs, acuminate apically; second joint of flagellum about as long as the third, fourth, fifth and half of sixth joints united; a small bare spot on dorsulum medially and at base of scutellum; abdomen above only pubescent on apical segments, beneath on all segments medially and apical margins of segments 4–6; pygidium triangular, somewhat depressed, with a similarly shaped raised area basally; wings black, variegated with brilliant shades of blue, green and purple. Length 28 mm.

Island of Trinidad, West Indies. November, 1892. Two specimens. The immense size and entirely black color remind one of the species of *Xylocopa.*

## NEW AND INTERESTING SPECIES IN THE "ISAAC LEA COLLECTION OF EOCENE MOLLUSCA."

BY CHAS. W. JOHNSON.

Through the kindness of Rev. L. T. Chamberlain, D.D , Curator of the "Isaac Lea Collection of Eocene Mollusca" in the Academy of Natural Sciences, I have been permitted to describe the following new species, which have been collected by Mr. Thomas A. Morgan, Mr. Frank Burns and the writer, in Alabama, Mississippi, Louisiana, and Texas, during explorations made under the direction and at the expense of Dr. Chamberlain.

**Volvaria reticulata** n. sp. Plate I, fig. 1.

Shell cylindrical, spire prominent, whorls five, the three apical whorls smooth, the body and adjoining whorl reticulated by numerous, raised, revolving and longitudinal lines, the revolving lines equidistant, while the longitudinal ones, which represent lines of growth, are finer and irregular ; columella with two moderate folds. Length 7½ mm., greatest diameter 3 mm.

One specimen collected by the writer, from the Lower Claiborne at Moseley's Ferry, Brazos river, Burleson Co., Texas.

**Mitra grantensis** n. sp. Plate I, fig. 2.

Shell fusiform, specimen showing eight whorls (apex wanting), the first whorl below the apex smooth, the two following whorls show only the numerous longitudinal ribs, while the remaining whorls have equally prominent revolving ridges, which are somewhat larger on the anterior portion of the body whorl, while the third and fourth ridge below the suture are slightly smaller, the interstices formed by the two series of ridges consists of deep square pits, interior of the outer lip with numerous small ridges, columella with four folds, the anterior one very small. Length 14 mm., greatest diam. 5 mm.

One specimen collected by the writer from the Jacksonian Eocene at Montgomery, Grant Parish, La.

**Fusus apicalis** n. sp. Plate I, fig. 3.

Shell with ten convex whorls, apical whorl smooth, and the three subapical whorls with numerous fine longitudinal raised lines, but no revolving sculpture, the other six whorls with six large longitudinal ribs, these are crossed by seven revolving ridges on the spiral whorl and about 22 on the body whorl; the second and third ridges below the suture somewhat smaller than the others; between the longitudinal ribs and on the narrow anterior portion of the body whorl the revolving ridges become nodulose. Length 31 mm., greatest diam. 10 mm.

Three specimens collected by the writer from the Lower Claiborne at "Alabama Bluff," Trinity river, Houston Co., Texas.

This locality, which is fifteen miles southwest of Crockett, is better known as Alabama Crossing.

**Fusus houstonensis** n. sp. Plate I, fig. 4.

Shell showing eight convex whorls, which are somewhat angular toward the apex (apical whorl wanting), whorls with eight prominent longitudinal ribs, and eight revolving ridges on the spiral whorls, the body whorl has about 30 revolving ridges, which become smaller on the anterior portion, the two peripheral ridges are more prominent, between and above which are small intermediate raised lines, these are obsolete or wanting between the other ridges. Length of the type specimen 44 mm., greatest diam. 14 mm.

Collected by the writer from the Lower Claiborne at "Alabama Bluff," Trinity river, Houston Co., Texas.

**Fusus ludovicianus** n. sp. Plate I, fig. 5.

Shell with eleven very convex whorls, the two apical whorls smooth, the following whorl with numerous oblique longitudinal ridges, which soon assume the general sculpture of the shell, spiral whorls with six revolving ridges, the two lower ones the most prominent, on the body whorl are 23 revolving ridges, the six large longitudinal ribs on each whorl are interrupted by a broad deep sutural area. Length of the type 29 mm., greatest diam. 9 mm.

One specimen collected by the writer from the Lower Claiborne at St. Maurice, Winn Parish, La.

**Fusus perobliquus** n. sp.

Whorls very oblique and angular (apical and body whorls wanting) with seven longitudinal ribs on each whorl and nine revolving ridges, one on the angle of the periphery, five above and three below, the one at the suture very small and becoming obsolete on the upper whorls, the second one below the suture about one-half the size of the others, between the ridges the lens shows very fine revolving and longitudinal lines. Length of specimen 25 mm., diam. 9 mm.

One specimen collected by the writer from the Lower Claiborne at Moseley's Ferry, Brazos river, Burleson Co., Texas.

**Latirus obtusus** n. sp. Plate I, fig. 7.

Shell fusiform, with $6\frac{1}{2}$ whorls including the nucleus, embryonic whorl large, smooth and obtuse, the following whorl commences with numerous longitudinal ribs, but soon assumes the general sculpture of the shell, which consists of six large rounded ribs on each whorl, which are crossed on the spiral whorls by eight revolving ridges, on the body whorl the revolving ridges exceed 30 in number, on the anterior portion they alternate and become very small, under the lens there is also visible, especially between the larger ribs, small longitudinal raised lines, representing probably lines of growth; columella shows but one small fold. Length 16 mm., greatest diam. 4 mm.

Two specimens collected by the writer, from the Lower Claiborne, at Hurricane Bayou, Houston Co., Texas.

**Latirus suturalis** n. sp. Plate I, fig. 6.

Shell fusiform, whorls seven, the three apical whorls smooth, the lower one with a few smooth longitudinal ribs, followed by the general sculpturing of the shell which consists of eight longitudinal ribs, which are crossed by prominent revolving ridges, three on the spiral whorls and eight on the body whorl, small revolving raised lines alternate with the ridges, junction of the revolving ridges and longitudinal ribs subnodose, longitudinal ribs interrupted above the suture, forming a deep sutural area, interior of the outer lip with five teeth-like ridges, columella with three prominent plaits. Length 8 mm., greatest diam. 4 mm.

Three specimens from the material collected by Thomas A. Morgan at Jackson, Miss.

**Latirus harrisii** n. sp. Plate I, fig. 8.

*Latirus singleyi* var. Harris. Proc. Acad. Nat. Sci., 1895, p. 71, pl. 6, fig. 13a.

A study of an almost perfect specimen of this species from

Berryman's Place, three miles northeast of Alto, Cherokee Co., Texas, and a good series of *L. singleyi* Harris, from Bald Mound, nine miles southeast of Jewett, Texas, proves that the form referred to as a variety of *L. singleyi* is a distinct species. It is smaller and more slender, the specimen in hand is 20 mm. in length, with a max. diam. of 6 mm., while *L. singleyi* is 37 mm. in length with a max. diam. of 12 mm., both species have about the same number of whorls (9 to 10), the revolving ridges are somewhat rugose below the suture, and the small alternating raised lines more prominent than in *L. singleyi.*

**Latirus sexcostatus** n. sp. Plate I, fig. 9.

Shell fusiform, spire somewhat longer than the aperture and anterior canal, whorls nine, the three apical whorls smooth, the other with six longitudinal ribs, which are crossed on the spiral whorls by two prominent revolving ridges, on the body whorl the number is about ten, the interstices have numerous fine revolving raised lines and fine longitudinal lines of growth, interior of the outer lip with six short ridges and the columella with three small plaits. Length of type 14 mm., greatest diam. 6 mm., a larger but imperfect specimen has a diam. of 8 mm. and a probable length of 18 or 19 mm.

The type with eight additional specimens was collected by the writer from the Lower Claiborne at "Alabama Bluff," Trinity river, Houston Co., Texas. Specimens were also collected at Hurricane Bayou, Houston Co., Texas.

**Metula brazosensis** n. sp. Plate II, fig. 1.

Shell subfusiform, whorls six, apical whorl smooth, the three prominent varices are continuous from the body whorl to the smooth apical whorl, between the varices are numerous small longitudinal ribs that become obsolete toward the base of the body whorl, these are crossed by numerous fine revolving raised lines, inner margin of the outer lip but slightly crenulated. Length 8 mm., greatest diam. $3\frac{1}{2}$ mm.

Two specimens collected by the writer from the Lower Claiborne at Black Shoals, Brazos river, Burleson Co., Texas.

The localities, "Brazos river, about one mile below the Milam-Burleson county line," and "Collier's Ferry, Burleson Co.," given by Prof. Harris (Proc. Acad. Nat. Sci., 1895, pp. 73, 78, 79) are the same as Black Shoals.

**Metula gracilis** n. sp. Plate II, fig 3.

Shell slender, fusiform, whorls eight, convex, the three apical whorls smooth, the others cancellated by about 29 revolving ridges on the body whorl, 10 on the spiral whorls and about 38 longitudinal ribs, forming at their junctions small nodules, body whorl with a prominent varix, aperture narrow, contracted at the anterior into a moderate canal, lip thickened, interior with 14 teeth-like ridges. Length 14 mm., greatest diam. 6 mm.

One specimen collected by the writer from the Lower Claiborne, at Alabama Bluff, Trinity river, Houston Co., Texas.

**Metula subgracilis** n. sp. Plate II, fig. 2.

Shell similar to the preceding, but with 6½ whorls, only 1½ of the apical whorls being smooth, slightly convex and showing a slight angle below the sutures, spiral whorls showing 8 and the body whorl about 24 revolving ridges, the first two below the suture more prominent than the others, longitudinal ribs of uniform size and about 40 in number, anterior canal much shorter, lip thickened, interior with 16 teeth-like ridges. Length 11 mm., greatest diam. 5 mm.

From the material collected by Mr. Thomas A. Morgan at Jackson, Miss. Two specimens.

**Metula johnsoni** (Vaughan).

*Phos johnsoni* Vaughan. Bull. 142. U. S. Geol. Sur., 36, pl. 3, fig. 3, 1896.

One specimen of this species was also found by the writer at Montgomery, Grant Parish, La. The specimen measures 20 mm., a little smaller than the type, the specimen, though not entirely perfect, indicates the presence of smooth apical whorls.

**Phos hilli** Harris, var. **magnocostatus** n. var. Plate I, fig. 10.

Shell elongate, spire acute, whorls eight, the three apical whorls smooth, on the adjoining whorl the oblique longitudinal ribs are small, gradually becoming larger. On the remaining four whorls the longitudinal ribs are very large, six to each whorl; the entire shell is covered with fine, somewhat alternating, revolving raised lines, a ridge runs obliquely from the end of the anterior canal to the middle of the peristome. Length 15 mm., greatest diam. 7 mm.

One specimen (figured) collected by the writer from the Jacksonian Eocene at Montgomery, Grant Parish, La., and numerous specimens from Jackson, Miss.

The types of this and the following variety seem very distinct from *P. hilli,* but among the large series before me are specimens that practically run the three together, *P. hilli* occupying an intermediate position. The type of *Phos hilli* is from the Jacksonian Eocene at Vince Bluff, Saline river, Cleveland Co., Ark. The typical form is also common at Jackson, Miss.

**Phos hilli** Harris var. **jacksonensis** n. var. Plate I, fig. 11.

The type of this variety may be described as follows: Shell with 8 whorls, apex smooth, the following whorl with only oblique ribs that soon assume the general sculpture of the shell, which consists of about 14 longitudinal ribs (on the body and first spiral whorl a number of these are united, forming, wide ribs or varices), these are crossed by prominent revolving ridges (5 on the spirals and about 18 on the body whorl) that form conspicuous nodules, there are also fine alternating revolving raised lines; above the basal fold of the columella a smaller one is present. Length 12 mm., greatest diam. 5 mm.

Numerous specimens from Jackson, Miss.

**Columbella punctostriata** n. sp. Plate II, fig. 4.

Shell subfusiform, spire prominent (apical whorls wanting), whorls convex, with several varices, reticulated by seven revolving ridges and numerous fine longitudinal ribs; these become obsolete or wanting on the body whorl. Anterior half of the body whorl with numerous revolving, punctated striæ; aperture narrow, contracted, outer lip thick, sinuous, inner margin crenulated with 18 teeth-like ridges, inner lip smooth except at the anterior and posterior ends, where it is slightly rugose. Length 10 mm. (with apical whorls probably 12), greatest diam. 5 mm.

One specimen collected by the writer from the Lower Claiborne at Berryman's Place, three miles northeast of Alto, Cherokee Co., Texas.

**Typhis dentatus** n. sp. Plate I, fig. 13.

Shell with seven whorls, including the two smooth apical whorls, each whorl with four varices or ribs, those of the body whorl serrated with six, partly open, teeth-like projections, the one at the shoulder large and irregular, the varices in all cases extend more than half-way up the spiral whorls, the large tubular spine at the shoulder midway between the varices extends outward and slightly forward, aperture ovate. Length 16 mm., greatest diam. 10 mm.

One adult and three young specimens, from the material collected by Thomas A. Morgan, at Jackson, Miss.

**Morio planotecta** (Meyer and Aldrich). Plate I, fig. 12.

*Cassidaria planotecta* Meyer and Aldr. Jour. Cin. Soc. Nat. Hist., ix, 43, pl. 2, fig. 14, 1886.

A large and handsome specimen of this species was collected by Mr. Thomas A. Morgan at Jackson, Miss. The beautiful drawing by Dr. J. C. McConnell will show all the important adult characters not given by Messrs. Meyer and Aldrich, who described the species from a young specimen, from Newton, Newton Co., Miss. Length of specimen figured 64 mm., greatest diam. 51 mm.

**Cassis** (**Phalium**) **taitii** (Conrad). Plate II, fig. 5.

*Cassis Taitii* Conr. Jour. Acad. Nat. Sci., vii, 145, 1834.
*Semicassis Taitii* Conr. Amer. Jour. Conch., i, 26, 1865.

A fragment consisting of the outer lip and portion of the body whorl, 53 mm. in length, was found by the writer, at Jackson, Miss., in the fall of 1894. Since then the specimen figured, which measures 35 mm. in length, was found by Mr. Thomas A. Morgan, at the same locality. The type which is in the Academy of Natural Sciences is from Claiborne, Ala. In the Jackson specimen the nodulose character of the revolving ridges is only present in the outer half of the body whorl, and obsolete or wanting near the columella.

**Cypræa jacksonensis** n. sp.

This is the largest species of *Cypræa* from the Eocene of North America. It is represented only by parts of perhaps three individuals (five specimens). The part of the outer lip measures 68 mm. A perfect specimen would probably exceed 90 mm. A specimen representing the dorsal surface has a diameter of 55 mm. Shell smooth and polished, lip thick, reflected, teeth large and occasionally bifurcate.

Collected by Mr. Thomas A. Morgan and the writer at Jackson, Miss.

**Cypræa ludoviciana** n. sp. Plate II, fig. 6.

Shell ovate, somewhat flattened, slightly prolonged at the extremities, smooth with a prominent broad medial dorsal groove.

Aperture narrow, having on each side 21 teeth, toward the ends these extend entirely across the base. Represented by four specimens, three of which measure as follows:

Largest, length 17 mm., greatest diam. 12 mm.

Specimen figured, length 15 mm., greatest diam. 10 mm.

Smallest, length 13 mm., greatest diam. 9 mm.

Collected by the writer from the Jacksonian Eocene at Montgomery, Grant Parish, La.

**Cypræa vaughani** n. sp. Plate II, fig. 7.

Shell small, ovate, globose, smooth, ends slightly prolonged, base rounded, aperture narrowed from the middle toward the posterior, outer lip with 19 and the inner lip with 16 teeth, the latter end abruptly and do not extend within the aperture, as in *Cypræa dalli*, to which it is nearest related. it is also at once separated from the latter by its smaller size.

Length 9 mm., greatest diam. 6 mm.

From the Lower Claiborne at Hammett's Branch, near Mt. Lebanon, La. One specimen.

This species is dedicated to Mr. T. Wayland Vaughan of the U. S. Geological Survey, through whose kindness in giving such explicit information of the Eocene localities of Louisiana I was able to collect this and many other interesting forms.

**Cypræa attenuata** n. sp. Plate II, fig. 8.

Shell elongate, anterior and posterior ends greatly attenuated and curved upward, smooth, with the exception of a few raised, revolving lines at each end, which are almost hidden by the heavy marginal callus, base smooth. Outer lip with 24 and the inner lip with 25 teeth, the central ones of the latter extending for some distance within the aperture. Length 20 mm., greatest diam. 8 mm.

One specimen collected by Mr. Frank Burns from the Lower Claiborne, at Lisbon Bluff, Clarke Co., Ala.

**Cypræa** (Cypraedia) **subcancellata** n. sp. Plate II, fig. 9.

Shell ovate, dorsal surface with 24 prominent revolving ridges, alternated by a smaller one; in the two middle interstices and all the interstices on the base of the shell, the smaller ridges are wanting; the entire shell has also small longitudinal raised lines, that are entirely interrupted by the prominent revolving ridges, lips thickened, having about 40 ridges, owing to nearly all of the revolving ridges becoming a uniform size. Length 16 mm., greatest diam. 10 mm.

One specimen collected by the writer from the Lower Claiborne at Smithville, Bastrop Co., Texas.

**Ovula** (Simnia) **texana** n. sp.

Shell narrow, attenuate (anterior part of the shell wanting), resembling in form the recent *O aciculari*s Lam. of the West Indies; dorsal surface of the attenuated portion of the posterior, with fine revolving lines, the remainder of the shell smooth; outer lip thickened, showing a few crenulations toward the anterior, inner lip smooth with a raised callus at the posterior, on which are three or four transverse grooves. Length 11 mm. (its original length was probably about 14 mm.), greatest diam. 4 mm.

One specimen collected by the writer from the Lower Claiborne at "Alabama Bluff," Trinity river, Houston Co., Texas.

**Ovula** (Simnia) **subtruncata** n. sp.

Shell elongate, subtruncate, resembling somewhat the recent *O. uniplicata* Sowerby, of Florida. Smooth with numerous fine revolving lines around the angular or subtruncated posterior, posterior canal extending beyond the truncated portion forming a deep excavation, lip thin, but in a more adult specimen would probably be much thicker. Length 15 mm., greatest diam. $4\frac{1}{2}$ mm.

One specimen collected by the writer from the Lower Claiborne, at Hammetts Branch, near Mt. Lebanon, La.

**Rimella rugostoma** n. sp. Plate II, fig. 10.

Shell subfusiform, whorls eight, slightly convex, the two apical whorls smooth, the others beautifully reticulated as follow: The three spiral whorls below the smooth apical whorls, have seven equidistant, flat, revolving ridges, which are crossed by small interrupted longitudinal ribs, obsolete on the upper of the three whorls. The body whorl above the periphery and the first and second spiral whorls have revolving ridges that are divided by a small groove into five pairs, on the body whorl below the periphery are twenty single revolving ridges, which become gradually small toward the base, just above the suture one of the single revolving ridges is also exposed on the first and second spiral whorls; longitudinal ribs prominent, about twenty to each whorl, becoming nodulose where they cross the revolving ridges. Aperture narrow, ovate, outer lip thick, and deeply notched, lobe acute, inner margin crenulated by about twenty short ridges; inner lip thin, expanded, bearing a rugose callous ridge which curves gradually downward toward the posterior end of the aperture, above which, at the posterior commissure is a small rugose triangle, the posterior canal extending to the base of the fourth spiral whorl. Length 20 mm., greatest diam. 9 mm.

One specimen from the material collected by Thomas A. Morgan, at Jackson, Miss.

**Potamides** (Telescopium) **chamberlaini** n. sp. Plate II, fig. 11.

Shell acute (apex wanting), whorls flat, slightly concaved ornamented by revolving rows of nodules, one above and a double or geminate row below the suture, on the body whorl the nodules become obsolete on the periphery, on the spiral whorls between the nodules are from two to four revolving ridges and on the body whorl six, just below the periphery is a prominent low ridge with two small raised lines between it and the periphery, the base of the shell is covered with numerous minute revolving lines; columellar fold at the base broad, rounded and carinated on the lower edge, a break on the second spiral whorl shows that the same is there narrow and sharply keeled. Length of the specimen figured 35 mm., greatest diam. 14 mm.

Two specimens collected by Mr. Frank Burns, from the Midway Eocene, at Matthew's Landing, Ala.

This beautiful shell is named in honor of Rev. L. T. Chamberlain, D.D., to whose untiring interest and generous aid the present status of the "Isaac Lea Collection of Eocene Mollusca" is due.

**Ampullina morgani** n. sp. Plate II, fig. 12.

Shell globose, spire prominent, whorls convex, somewhat flattened below the suture, smooth, with numerous, very close, fine lines of growth, and obsolete revolving raised lines on same portion of the shells, umbilicus of moderate width surrounded by a reflected polished callus, that extends to the anterior portion of the aperture, pillar-lip thin not reflected over the umbilicus. Length 31 mm., greatest diam. 27 mm.

Two specimens collected by Thomas A. Morgan, at Jackson, Miss.

This species is distinguished from *A. streptostoma* Heilp. by the more prominent spire, flattened area below the suture, larger umbilicus and *non*-reflected pillar-lip.

**Adeorbis infraplicatus** n. sp. Plate II, figs. 13, 14.

Shell small, spire depressed, nucleus smooth, whorls three, with two prominent revolving ridges, one at the periphery and one midway between the periphery and the suture, both are very minutely crenulated, between the two ridges smooth or with very fine revolving lines, from the smooth nucleus radiate fine raised lines that increase in size on the body whorl, these are crossed by fine revolving lines, base of the shell with numerous fine revolving lines, umbilicus of moderate size, margin smooth, nearly half-way across the base from the margin of the umbilicus extend numerous radiating plications, crossed by very fine revolving lines. Alt. $1\frac{1}{2}$ mm., greatest diam. 3 mm.

Four specimens from the material collected by Thomas A. Morgan, at Jackson, Miss.

## EXPLANATION OF PLATES.

### Plate I.

Fig. 1. *Volvaria reticulata* n. sp. Length $7\frac{1}{2}$ mm.
Fig. 2. *Mitra grantensis* n. sp. Length 14 mm.
Fig. 3. *Fusus apicalis* n. sp. Length 31 mm.
Fig. 4. *Fusus houstonensis* n. sp. Length 44 mm.
Fig. 5. *Fusus ludovicianus* n. sp. Length 29 mm.
Fig. 6. *Latirus suturalis* n. sp. Length 8 mm.
Fig. 7. *Latirus obtusus* n. sp. Length 16 mm.
Fig. 8. *Latirus harrisii* n. sp. Length 20 mm.
Fig. 9. *Latirus sexcostatus* n. sp. Length 14 mm.
Fig. 10. *Phos hilli* Har. var. *magnocostatus* n. v. Length 15 mm.
Fig. 11. *Phos hilli* Har. var. *jacksonensis* n. var. Length 12 mm.
Fig. 12. *Morio planotecta* (Meyer and Aldrich). Length 64 mm.
Fig. 13. *Typhis dentatus* n. sp. Length 16 mm.

### Plate II.

Fig. 1. *Metula brazosensis* n. sp. Length 8 mm.
Fig. 2. *Metula subgracilis*, n. sp. Length 11 mm.
Fig. 3. *Metula gracilis* n. sp. Length 14 mm.
Fig. 4. *Columbella punctostriata* n. sp. Length 10 mm.
Fig. 5. *Cassis* (*Phalium*) *taitii* (Conrad). Length 35 mm.

Fig. 6. *Cypræa ludoviciana* n. sp. Length 15 mm.
Fig. 7. *Cypræa vaughani* n. sp. Length 9 mm.
Fig. 8. *Cypræa attenuata* n. sp. Length 20 mm.
Fig. 9. *Cypræa* (*Cyprædia*) *subcancellata* n. sp. Length 16 mm.
Fig. 10. *Rimella rugostoma* n. sp. Length 20 mm.
Fig. 11. *Potamides* (*Telescopium*) *chamberlaini* n. sp. Length 35 mm.
Fig. 12. *Ampullina morgani* n. sp. Length 31 mm.
Figs. 12, 13. *Adeorbis infraplicatus* n. sp. Alt. $1\frac{1}{2}$, diam. 3 mm.

The Academy is indebted to the liberality of Dr. Chamberlain for the illustrations, which are drawn by Dr. J. C. McConnell of Washington.

FEBRUARY 7.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Forty-one persons present.

A paper entitled, "A New American Land Shell," by Edw. G. Vanatta, was presented for publication.

FEBRUARY 14.

J. CHESTON MORRIS, M.D., in the Chair.

Eight persons present.

A paper entitled, "Some Observations on the Illecillewaet and Asulkan Glaciers of British Columbia," by George and William S. Vaux, Jr., was presented for publication.

FEBRUARY 21.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Thirty-four persons present.

Papers under the following titles were presented for publication:

"On a Snow-inhabiting Enchytræid Mesenchytræus collected by Mr. Henry G. Bryant on the Malaspina Glacier, Alaska," by J. Percy Moore.

"Descriptions of New Species of Turbonilla of the Western Atlantic Fauna," by Katherine Jeannette Bush.

FEBRUARY 28.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Twenty-two persons present.

A paper entitled, "Notes on a small Collection of Chinese Fishes," by Henry W. Fowler, was presented for publication.

Mrs. Hannah Streeter was elected a member.

The following were ordered to be printed:

## CONTRIBUTIONS TO THE LIFE-HISTORY OF PLANTS. No. XIII.

BY THOMAS MEEHAN.

### I. Sex in flowers.—Corylus rostrata.

Since the publication of my first paper on the law governing the sexual characters of flowers,[1] and others subsequently on the same topic, the evidence of the soundness of the principles therein presented is everywhere so palpable that I have for some years past given up noting it and placing it on record. The principle then and subsequently made plain is, that in the earlier stages of its life a flower bud may be either male or female, and that the final determination of sex is a mere question of nutrition. If there be an abundant supply of nutrition available, or vital power capable of availing itself of the nutrition provided, the female characteristics prevail. With lessened nutrition, or of vital power in the floral matrix to make use of nutrition, the male characteristics result. These views, opposed as they were by eminent biologists, and even ridiculed by my esteemed friend Prof. Agassiz on the reading of my paper, I have lived to note are generally accepted, though at times it seems to me that a few more recorded observations might be profitable. Before me at this time is an able paper by Prof. Kenjiro Fujii, of the Imperial University of Tokyo, Japan, on sexuality in the flowers of *Pinus densiflora*.[2] He finds in his observations that the sex of the flowers is undetermined until a certain stage of development, and that a flower which would otherwise develop into a male has a tendency to become female when local increase of nourishment takes place at a certain stage, or during certain stages of its development. This seems so like the language of my papers of a quarter of a century ago, that it is pleasant to know that Prof. Fujii has worked the conclusion out in utter ignorance of my having occupied the field before him.

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[1] Proceedings of American Association for the Advancement of Science, 1869, p. 256.

[2] Tokyo Botanical Magazine, Vol. ix, No. 101.

I will give a striking illustration of the soundness of this principle, which I have not hitherto recorded, in *Corylus rostrata.*

In one of my earlier papers[3] I recorded that there was a uniform line of character dividing the species of western Europe from their close allies in eastern America. Among other points, the tendency to lateral branching is more marked in the European than in the American line of the same family. *Corylus Avellana* and *Corylus rostrata,* which I had not in that list, are good illustrations. In a cubic yard of growth there would seem to be hundreds of twiggy branchlets in *Corylus Avellana,* the common European Hazelnut, to the scores only in the North American Hazelnut, *Corylus rostrata.* It is important to note this difference in these species, in connection with these sexual questions, because at first glance the male catkins seem terminal in the European, and axillary in the American. The male catkins seem situated on comparatively strong branchlets; while the female buds seem to be on branchlets often weaker, and situated below the males and more unfavorably located as regards nutrition. That this is deceptive will hereafter be shown.

The branching of *Corylus rostrata* is remarkable for its stiff rigid character. It might be taken for some willow at first sight, rather than a relative of *Corylus Avellana;* although this latter species has this culm-like or reedy appearance before the plant reaches its flowering stage. The flowers appear along the whole length of these rigid branchless stems. The male flowers are produced from the lower nodes, and the female from the upper ones. *But the proportion of each on the separate branches is in exact proportion to the vigor of the branches.* On a very slender twig of perhaps twelve or fifteen nodes, there will be a male catkin from every bud. On the branches of medium strength the proportion of male to female will be equal, while on the branches of superior vigor all but three or four of the lower ones will be female. On a strong leading shoot before me, and which is characteristic of numbers of others on the plant from which it was taken, the four lower buds only have catkins; while the ten upper buds have either female flowers or a few strong buds to make branchlets for next season.

No one closely observing a vigorous plant of *Corylus rostrata* can

[3] "On the Relative Characters of Allied Species of European and American Trees" (Proc. Acad. Nat. Sci. Phila., 1862, p. 10).

fail to be impressed with the truth of the principle I have advanced, that the question of sex in flowers is merely a question of nutrition in an early stage.

For reasons already given, the fact is not so apparent in *Corylus Avellana.* In the later period of the growing season, in this species, some of the axillary buds develop to short branchlets instead of remaining as buds to bear flowers, and make growth for the coming year. It is from the axillary buds of this secondary growth that the male catkins appear, and thus present the appearance, from their elevated position, of being superiorly situated as regards nutrition than the female flower buds, which are only apparently below. When closely examined it will readily be seen on how weak the axes and how very unfavorably for nutrition these buds of the male catkins are situated.

It may be noted that the axial buds, bearing the male flowers in *Corylus rostrata,* develop slightly to a branchlet in the fall of the year, but I have never seen one to reach more than a quarter of an inch in length.

I know of no monœcious plant that does not show a more or less continuous activity during the early autumn, or even during the winter season if a few days of springlike weather occur, and the postulate may be presented that a marked characteristic in the growth of a female flower is the greater conservation of energy during its early stages, as compared with a tendency to reckless expenditure in the male flowers. After all, this is but another way of expressing what has already been made plain, that the ability to store and to profit by nutrition accounts for sexual differentiation.

## II. Clethra alnifolia in relation to its Morphology.

In families where there is considerable irregularity in the number and arrangement of related plants, it is important in what might be termed genealogical botany that the primary type should be well understood. In Ericaceæ, for instance, we have genera with varying numbers in the calyx, corolla, stamens, and styles; some are gamopetalous and some polypetalous, while some have inferior and others superior ovaries.

As all parts of a plant from the starting in growth of the seed to the final maturity of the flowers it produces are but modified leaf-blades, the arrangement of the leaf-blades on the primary stem should furnish a good foundation for subsequent investigation. Taking a fairly vigorous branch of *Clethra alnifolia*, we note that the phyllotaxis is on the $\frac{2}{5}$ plan. We may, on this fact, look for a pentamerous system to prevail in the subsequent development, and charge to consolidation or to abortion any variation from this type. Following again the *Clethra*, we find a five-cleft calyx, and we say it is normal. Then we have five petals alternate with the sepals, which again we pronounce normal. But the next cycle appears as ten stamens, which for a single cycle would be out of order. Observing closely, however, we note that five of the ten are longer than the others, and we learn that there are really two cycles of five, of which the long stamens represent the outer.

Taking up now the gynœcium: the stigma is noted as being slightly three-cleft, indicating a tricarpellary ovarium. There should be five. Two are wanting. This sudden departure from what has hitherto been a regular pentamerous series, suggests that there has been a suppression of several verticils since the appearance of the last staminal whorl. A glandular disk fills the interspace, and we may reasonably conclude that herein lie the missing links. The carpellary system here is parallel to prolificacy as often seen in flowers. One rose proceeds from the centre of another rose, or a small orange at the apex of a larger one, as in the variety known as the navel. The upper one, as in the case of the gynœcium of *Clethra*, loses much of the normal vitality of the individual.

In some genera of Ericaceæ cohesion—vital power in its higher stage—plays a part in organizing, the reverse of the lower degree, but still with the same result in the disappearance of parts that me may term primarily separate. In examining a large number of *Clethra* flowers, a pair of stamens will occasionally be found as completely consolidated into a single filament as the carpels have had the three styles united; the extreme upper portions of each, however, continuing normal. It shows a tendency to consolidation. From a consideration of all the facts, we may conclude that the primary type of Ericaceæ is pentamerous and polypetalous, that those approaching this type are the oldest in the genealogical line, and that all the variations from this type in the order are deducible from the variations in growth-energy resulting in the abortion or consolidation of primary parts.

## III. SANICULA—A BIOLOGICAL STUDY.

Examining a plant of *Sanicula Marilandica*, a striking point presents itself in its branching character. These branchlets are usually in threes, and exceptionally in fours. That acute observer, Rafinesque, noticed this, and it was doubtless on account of this striking character that he proposed the name of *Triclinium*, when he thought to make a new genus out of the older *Sanicula*.

I have endeavored to teach in numerous papers, that by far too much is claimed for environment in the evolution of form. It would rather seem that form depends on a purely mathematical law of growth-force. Growth is not a continuous operation, but rhythmic. The degree of force depends on a supply of nutrition and the ability of the plant cell to avail itself of the supply. As, therefore, each rhythmic wave varies in intensity, the ultimate form of the immediate structure under the influence of that wave must vary accordingly.

Again I have taught that even sex is influenced by like conditions. Those parts of the flower or portions of a plant under the influence of a vigorous growth-wave laden with nutrition favor the production of female organs—the feeble wave is productive of male organs only.

A study of *Sanicula* well illustrates these points. The first growth-wave ceases at the first pair of leaves. This must have been very sudden; for the main axis has been so deprived of food, and its vital power rendered so weak, that it can only make a feeble growth with the advance of the next wave. The consequence is that the growth-wave is turned into the two axillary buds. They take the place of the original axis, and we have two leading branches instead of one. The original axis remains a weak, threadlike, common pedicel, which bears usually but a single fertile flower and numerous barren ones. In some species of plants the central axis utterly fails under the shock of the rhythmic growth. In that case we have the dichotomous mode of branching.

Passing the eye along the stem, we find the growth-wave, rhythmic as it is, decreasing in vigor. The central axis profits more by nutrition—the branches from the axial buds are less like leaders—and by the time the terminal point is reached we find it surmounted by a fruit on a pedicel much stronger than the lateral ones.

There are but three lateral branchlets, though occasionally four; and the retarding of the axial growth has been of such a severe character, that the axillary origin of the lateral branches has been totally obscured. The pedicillate male flowers originate from numerous axillary buds on these fruit-bearing branchlets, the external evidence of such origin being also obscured. It is believed that a careful study as indicated will be convincing that it is the degree of the rhythmic growth-force that decides the character of the plant, and also the relation of the sexes to each other.

Now let us take *Sanicula Canadensis*. With the light already gained, we see that nothing but a variation in the force of the rhythmic wave has made a distinct species. The characters are all of the same class, but there has been acceleration and retardation of the wave force in different directions. The axillary branchlets have continued to retain the attention of the growth-wave to the last, and now bear the female flowers—while the weaker central one has accorded to it male ones only. Examining, now, the Old World species, *Sanicula Europæa*, we see scarcely any difference except such as might occur from variation in the degree and direction of the growth-wave. Nutrition has been diverted from the central axis to a greater degree than even in our own *S. Canadensis*. It produces only short-stalked male flowers.

We here have a genus in which we can clearly see how the species were made. The degree of force exerted by the rhythmic wave started the process, and the assimilation of nutrition completed the task.

The study brings us nearer to a perception of the origin of species. But we may not yet perceive the hand that set the process in motion. The characters that distinguish these three species seem permanent now. They do not change under any conditions of environment existing at the present time, however varied they may be. Though we may say that the three species would easily be produced out of one type, simply by varying degrees of growth-force; the conditions under which this variation occurred, and the period in the world's history when they occurred and became hereditary, is still a mystery.

## IV. Rosa rugosa in connection with the evolution of form.

A few years ago I crossed a flower of *Rosa rugosa* with pollen from the well-known hybrid perpetual, General Jacqueminot. It may be noted here that in this locality the rose anthers mature almost simultaneously with the expansion of the petals. To be certain that a flower will have no aid from its own pollen, my practice is to open the petals carefully the day before they would expand naturally, remove the stamens with the unopened anthers, and then at once apply the foreign pollen. Though I believe pollen will remain potent at the apex of a stigma for an indefinite time, so as to be ready to perform its function the moment the stigma becomes receptive, I apply more pollen after the petals open normally. With these precautions I feel safe in my experiments against the interference of undesirable pollen. These precautions were taken in this experiment with *Rosa rugosa*.

In the autumn the seeds were cleaned from the capsule and sown in the open ground.

The following summer two plants only had made their appearance, and attracted attention at once from the fact that one of them had the appearance in foliage and habit of General Jacqueminot, and the other somewhat after the manner of *Rosa rugosa*, the female parent. The first year of seedling roses results in comparatively feeble growth. The stronger growth of the second year was eagerly looked forward to. When that time arrived the one resembling the male parent was stricken with a fungous parasite, and so severely that, in spite of our efforts with copper solutions, the branches were no stronger than they were the year before. The vital power was so much reduced that it was totally destroyed by the subsequent winter. In spite of its weakened condition, it retained to the last its striking resemblance to the hybrid perpetuals of which General Jacqueminot is a type. The other flowered, and to my great surprise was not *Rosa rugosa*, but a perfectly typical specimen of *Rosa cinnamomea!* It is still flowering at this date, June, 1897, and is simply the cinnamon rose.

To carry this curious experiment further, I had a small quantity of seed of *Rosa cinnamomea* and *Rosa rugosa* sown near to each other where comparisons could be made as they grew. There were something less than a hundred plants in each lot. Both sets were nearly identical in character as they grew. The branches were slender, smooth, with scattered spines, and no aciculæ. As the plants gained vigor, strong branches, densely clothed with bristles, would appear from the *rugosa* plants, and ultimately became absolutely that species. Some of them would, however, continue to produce some smooth slender branches; and these, flowering, were purely *Rosa cinnamomea*—the two species flowering on the same plant. These separate blocks of roses are still blooming where they were sown, and in the bed of *Rosa rugosa* there are ten plants that still continue *Rosa cinnamomea*.

The bed of *Rosa cinnamomea* continued its comparatively weak growth characteristic of the species. Occasionally a strong shoot would push out from near the ground covered with bristles as in *R. rugosa;* but it would eventually weaken, become smooth, and have the smaller flowers, foliage, and, in fact, be nothing but *R. cinnamomea.* One only assumed a more vigorous and bristly character. This plant has the flowers as large as those of *R. rugosa*—that is to say, they are more than double the size of the normal cinnamon rose, though continuing the pale rose color instead of the deep crimson of *R. rugosa.* The foliage also, though not as coarsely wrinkled, that is to say, rugose, as the other, still is diverse from the type, and is an advance in the direction of the latter rose.

Two remarkable facts are made clear by these observations:

*First.*—Two totally distinct forms can be produced from the same seed vessel, though every condition surrounding their inception seems exactly the same.

*Second.*—*Rosa rugosa*, a species with characters markedly distinct from *Rosa cinnamomea*, is nevertheless an evolution from that species, and has been produced by the energy of a more vigorous development.

We may conclude from these facts that however much may be conceded to gradual modifications extending over indefinite periods as an agency in the evolution of species, development need not be dependent on this principle alone. The varying degrees of internal energy must be credited with producing sudden and remarkable changes, though we may not yet be able to perceive clearly the nature of the motive power that induces it.

## V. VIOLA IN RELATION TO POLLINIZATION AND FECUNDATION.

Though it has been shown by many close observers that the general opinion is erroneous that early or perfect flowers of many species of *Viola* are infertile, the impression is still widely prevalent, especially in the case of the very common *Viola cucullata*. I have myself held that opinion, though I have placed on record that they were abundantly fertile when growing on a dry rocky piece of ground. I had, however, never made the continuous daily observations on them that I have made on other plants, and so made it a point to do so, commencing the task on the first of April, 1897.

I have an orchard of about half an acre, partially shaded by the branches of the apple trees meeting together. The surface was originally in grass, but at the date given only a few tufts remained. The whole at the date named was a sheet of violets in bloom. These many thousands of plants all sprung from a few. I noticed these a quarter of a century ago. Myriads of seeds from last year's crop were showing cotyledons. By sheer force of numbers they were crowding out all other vegetation, and it is a question whether their operations had not as much to do with the destruction of the original grass as the shade which the apple trees afforded.

Though from a few original plants, the assemblage at this date presented a remarkable variation in the form and color of the flowers. Some had petals almost linear, others petals almost round. In some cases the two upper petals would be nearly round, and the three lower ones very narrow. The color of the petals varied in innumerable shades, from the normal violet to nearly white in one direction, and to nearly red in the other. Some plants would have the peduncles little longer than the leaves; others would have the flowers on long and slender peduncles. A notable fact, however, was, that with all this variation in the flowers, not a trace of variation could be found in the plants themselves. In foliage and habit, every plant seemed an exact repetition of another one. As conditions of environment could have nothing to do with these variations, and as there were no varieties to aid variation through cross pollination, there can be but one deduction, that internal energy alone is responsible for the changes.

My next thought was to watch for insect visitors. Winged insects are scarce with us in April. I saw none among these plants during the whole month. I cannot say that these millions of violet flowers had no insect visitors during that period, but it is safe to say that if any were visited by insects the number would be so inconsiderable as to have no influence on the result.

Numberless flowers were opened from day to day. All the anther-sacs were abundantly supplied with perfect pollen. From the earliest period the upper portion of the style, with its stigma, would be in advance of the stamens. When the pollen would be projected from the anther-cells, the membranous appendages of the anthers would be so closely appressed to the style that it would be very difficult for pollen to get through to reach the stigma. Though pollen grains could get through this close-fitting sheath, the stigma is so thoroughly encased by the mass of hair in the throat, that it is inconceivable that pollen should ever reach it. As a matter of fact, I could never find a grain of pollen on the portion of the style above the membranous sheath, and of course none in the stigma, though the ovarium clasped by the anthers themselves would be completely pollen-dusted.

I was satisfied from these observations that the flowers could not prove fertile, and was prepared to believe that so far as *Viola cucullata* is concerned, the popular impression regarding infertilty in this species was correct. I started to examine several other species in the same relations. *Viola tricolor* is conceded to have its early perfect flowers fertile. I examined some flowers from the wild species growing in my garden. I found the stigma barely extending beyond the membrane sheath, which, by the way, was not closely clasping, nor was there a mass of hair on the petals to guard the receptive portion from an attack by the pollen grains. It did seem that the fecundity of the early flowers could be accounted for. But again I could not find a single pollen grain on the apex of the style, or stigma, as we would terminologically say!

By the time the first week in May was reached, I was surprised to find an abundant crop of seed vessels on the earlier flowers in the orchard, the peduncles curving toward the ground just as they do in the cleistogamic condition. A number, probably one-third, had failed to perfect seed, but they had advanced considerably before withering, showing that their early demise was not from non-pollination, but from a failure of nutrition, just as in many fruit trees we find the ground beneath their branches strewed with immature fruit, which has fallen, after being fairly fertilized, by the failure in the stock of nutrition to bring them to perfection. In the carefully noted observations of Mr. Darwin and others in the Old World, on the fertilization of flowers, failure of nutrition is rarely permitted to account for the failures to seed in many of the experiments noted.

I have for some time past concluded that, in some manner not yet demonstrated, pollen tubes may and do at times reach the ovules otherwise than by way of what we commonly know as the receptive portions of the stigma. In *Viola tricolor* this may occur by way of the filmy hair on the dorsal part of the stigma, which the pollen may reach in this species as already noted, and the question may arise as to what is the stigma proper in *Viola.* It is customary to regard the small opening at the apex of the thickened style as the stigma. I am inclined to regard it rather as a nectariferous gland. In examining flowers of *Viola cucullata,* just before they expand, the orifice of this tube is closed. When the flower is examined the day following the opening, a globule of very sweet nectar occupies the position; the following day this disappears, and the hollow cavity noticed by various authors is evident under a good lens. This open passage is hardly consistent with the general character of a passage way for a pollen tube which has to depend for material in building up its structure on the cellular matter which it meets with on its journey to the ovule. Nor can I recall any instance in which such a large proportion of nectar is secreted by the receptive point of a stigma. On the other hand, if we believe, as we undoubtedly may, that nectariferous glands are atrophied primary structures, it will be difficult to trace the morphology of such a gland situated in the position this occupies.

But the morphology of the violet presents some anomalies. Though it is certain, as I have demonstrated in various papers, that the leaf does not always originate from the node from which it seems to spring, and that it is the union of the edges of the leaf-blade that causes what we know as decurrence in stem structure—it does not follow that decurrence is not sometimes really *de*-currence. In many species of *Lactuca* from the south of Europe and eastern Asia, this is evidently so; and in *Viola* the auricles at the base of the sepals would undoubtedly have to be accounted for in any fair conception of the consolidated parts of the flower. I take it we are to look in this direction for the origin of the spur in the petals of the violet, and in the fleshy appendages to the stamens, sometimes called nectariferous glands, which fill the spur spaces. Mr. Darwin observes that he once saw *Bombus terrestris* slit the spur of *Viola canina* in search of the nectar these glands secrete, and it is generally supposed they are nectariferous. But certainly in *Viola cucullata* they excrete nothing, as I infer, from not having been sufficiently differentiated from their primary condition to be perfect glands. Taking now, as we may again, the consolidated style, as not merely the elongated extension of the carpels, but also of the primary axis as well; and the thickened upper portion of the style as a feeble effort to form another verticil of floral organs, the apex of the primary shoot would be extremely likely to end in a complete gland. If this view be correct, we have to look elsewhere for the passageway to the ovules; unless indeed we conclude that it is possible for nectariferous glands to serve as ducts for pollen tubes in some instances, a circumstance I have sometimes suspected.

### VI. Isnardia palustris—Additional Note on its Stipular Glands.[4]

I noted in 1886 that the usual description of Onagraceæ—leaves without stipules—was not strictly correct, as they were present in the form of glands in *Isnardia* (*Ludwigia*) *palustris*, the marsh purslane. Dr. Asa Gray, to whose regular and friendly correspondence through a number of years I am greatly indebted, wrote: "You have certainly found something; but whether these glands should be considered stipular or not, I am not prepared to say." The matter had passed from my mind till recently, when the opportunity occurred to spend several hours in the midst of a large quantity of the plant.

At the base of the solitary axillary flower is a pair of minute scales. The general resemblance of the gland and its connection with the base of the petiole suggested the possibility that these glands might also be bracts or scales that had come within the connate power so potent in this species. This power is well exemplified in the structure of the flower. The stamens are opposite the sepals, indicating that the petals have disappeared. Then we note

[4] Proc. Acad. Nat. Sci., 1886, p. 349.

that where there should have been petals alternate with the sepals and stamens, there are four greenish umbonate glands. These of themselves suggest abortive petals. Holding the flowers up to the light, however, we find by the aid of the lens that the petals are really there, but have been completely covered by the connate sepals, the glands being the thickened apices! May not the supposed stipular gland, in like manner, be some foliar organ almost covered by the union of superior parts? In aid, farther, of this suggestion, we note that the primary origin of the leaf is far below the point from which the leaf proper or blade seems to spring. The consolidated petiole can be traced far below the base of the expanded portion. Each consolidated petiole, however, grasps only one-fourth of the circumference of the stem, thus giving it a subquadrangular character. Why might not the supposed stipule be the apex of another pair of minute scaly bracts, all of which but the extreme points had been covered, as the petals were, by the superior size of the consolidating parts above? With these suggestions we examine the stipular glands closely, only to find that they are opposite to, and not alternate with, the pair of scaly bracts above them. We must still believe they are stipular appendages of the leaves, and not the upper remains of independent but submerged organs.

Of late years it has been found that what appear as striking exceptions to general rule can be accounted for in the regular way, the operation of the law only having been obscured. Why *Isnardia* should yet seem a striking exception to the absence of stipules in Onagrads still remains a problem.

During the examination of these plants the absolute fertility of the flowers was suggestive of perfect self-fertilization. Few axils but had their primary branching system retarded for the production of a flower instead. Not a solitary imperfect seed-vessel could be found, out of the many hundreds on a single branching plant. Self-fertilization was found to be the fact. Not only do the anthers discharge the pollen simultaneously with the expansion of the sepals; but they rest on the stigma, so that it is impossible for any external agency to interfere with their work.

Another interesting observation is that at the expansion of the sepals, nectar copiously exudes from the umbones above noted. No winged insect appears to visit these minute flowers.

It would seem from these observations that the gland in *Isnardia palustris* is really stipular; that the petals are not abortive, but have been covered by the connation of the sepals; that the flowers are arranged so that self-fertilization must ensue; that these self-fertilized flowers are enormously productive; and that the production of nectar, so far as the visits of insects may be concerned, is superfluous.

### VII. Parthenogenesis.

It is about two hundred years ago since Camerarius recorded the fact that female mulberries and other trees would produce fruit without pollinization, though such fruit was sterile. These observations have since been abundantly confirmed. The necessity of pollen to fertile seed came to be regarded as absolute law, until some fifty years ago, when the Curator at Kew, Mr. John Smith, announced that an Australian plant, of which he had but one female specimen, perfected its seeds. It proved to be a new Euphorbiaceæ, and he named it *Cœlebogyne ilicifolia*—the generic name from its supposed parthenogenetal character.

The author of this paper was a student in Kew at that time, and well remembers the incredulity with which the announcement was received, that nature should seem to make a universal law in relation to method of reproduction, and yet make a striking exception in this case. Nature furnishes infinite variation, but these variations seem to be only of one general plan. It seemed more probable that, in some method unexplained, pollen had been formed, and really pollinated the embryo. It does not appear that any further observations on this plant were made at Kew, or, if made, recorded.

Strasburger took up the subject again in 1878, but though my good friend, Mr. George Nicholson, Curator of Kew, writes under date of April 10, 1897, that "the whole business has been threshed out by Strasburger," the latter seems to be more concerned about the cell development than the manner of its fertilization. This is especially true of that part devoted to the Castor-oil plant, *Ricinus communis*. In *Cœlebogyne*, he insists that the true embryo does not develop, but that the seeds proceed from adventitious buds from the wall of the ovary. One may conceive of them as bulblets, analogous to what we find in viviparous flowers; but he does not explain how cotyledonous seeds are constructed in this way.

In 1894 the author of this paper decided to make for himself careful observations on *Ricinus*. A number of plants were set out in a mass where he could easily watch them. Every male bud that could be observed was rubbed away before expansion. For all this an abundance of seed matured. It was found subsequently that there were other plants within a quarter of a mile. It was thought best to repeat the observations another year. The following year no plants were near but those under observation, and it began to look as if the plants had no use for pollen. Still there seemed doubt, and the observations were continued yearly to the end of 1897—all with the same result. Dr. Ida A. Keller, Professor of Biology in the Philadelphia Girls' High School, an experienced microscopist, aided me considerably in the observations made, and only for the fact that in one of her acute examinations she discovered a pollen tube at work on the ovarium, there would have seemed no room for doubt that pollen was unnecessary for the production of perfect seed in *Ricinus*. It was determined to try once more. The past year, 1898, only one plant was allowed to grow, and only one flower spike permitted to remain. All the others were cut away in the bud. This permitted closer examination, which was made almost daily. I noted for the first time that there were on the pedicels with the female flowers, buds scarcely larger than pin heads, and, under a strong lens, evidently antheriferous. These were carefully cut away. As the female flowers opened they all withered, unlike their fertility in former years. There seemed no doubt that pollen was essential. After half the spike had fallen away, the upper portion, say some twenty flowers, showed a disposition to permanence. The pretty fringed pistils protruded and continued perfect for many days. Finally, the capsules enlarged until they had about reached the usual dimensions. Now it seemed as if the plant would produce seed without the aid of pollen. After turning brown and seemingly ripe they were found to be as empty as Camerarius' mulberries were.

While under the impression during the earlier years of these observations that *Ricinus* was fruiting in the absence of pollen, I was encouraged by observations seemingly confirmatory by Judge Day, of Buffalo, and Prof. Greene, of Washington, on other plants. At the same time I had noticed that solitary female plants of *Gingko biloba* were fruiting abundantly in Germantown, while the only known male plant was at Woodlands, some ten miles away. Recently Japan botanists have discovered spiral coils of spermatozoids in the generative cells of *Gingko*, and others have observed them in *Cycas revoluta*.

The conclusion reached by the author is that though for several years he regarded the Castor-oil plant, *Ricinus communis*, as a genuine case of parthenogenesis, the past year's experience still leaves the matter open to doubt. If it be true that the female flowers of *Cycas revoluta* can generate spermatozoids in their ovaries, and thus self-fertilize the ova, the occurrence must be rare. In this vicinity old specimens of this plant are frequently seed bearing, *apparently*, but in every case examined by the author they were found to have only empty capsules.

It seems to the author that the subject of parthenogenesis is by no means thoroughly "thrashed out," and the object of this paper is to encourage continued observations.

### VIII. LACTUCA SCARIOLA, IN RELATION TO VARIATION AND THE VERTICAL POSITION OF ITS LEAVES.

*Lactuca Scariola* is spreading rapidly over the United States. Some twenty years ago I was led to my first acquaintance with it through the kindness of Dr. George Engelmann. It was then growing in the vicinity of St. Louis. It interested us from the fact that we thought we saw polarity in the leaves. The plane of the leaf was vertical, and it seemed that the edges were directed due north and south. The plants were growing thickly together, and in the cases which did not come under this rule we concluded that the crowding interfered with the natural tendency. Three years ago, 1894, a solitary plant appeared in my garden. The behavior of a species is always instructive when we can watch its distribution and development from a single plant within a limited area. Being an annual, and flowering after the garden weeding has been completed, it is a comparatively harmless weed. I allowed the plant to seed, and the seeds to be distributed by the wind. The next season a number of plants were allowed to seed. This year, 1897, there are hundreds of plants growing within an area of twenty acres. Many of these I am leaving to grow till they reach the flowering stage, when they will be destroyed.

The variations from the one original plant, and all under the same conditions of environment, are very remarkable. In some the leaves are about four inches long by three wide; that is to say, broadly ovate, while there are some with leaves nine inches long, and from one to two inches wide. In these plants the long linear leaves are obtuse. In others the leaves are some nine inches long, but widest in the middle—these are sharply acute. The leaves are usually entire, but there are a number that are lyrately pinnatifid. In one case the lobing is so deep that the divisions are little more than narrowly winged nerves. In most cases the leaves are flat at the margins, but in a number of cases they are strongly undulate. One of the most striking variations is in the habit of the plant. In the majority of cases the main stem is less than half an inch thick at the base, and grows up rapidly with wide internodes; in others, the stem will be nearly an inch thick, with little disposition to elongate; the lateral buds develop to branchlets, and the plant becomes densely bushy, with scarcely any internodes. In these cases the leaves are cuneate at the base. The only characters that seem uniform through this extensive range of variation is the glaucous green of the foliage, the vertical twist to the leaves, and the ridge of bristles along the midrib on its under surface. Surely we may conclude that the variations presented in this case are due to the degree and direction of life energy, and that the common phrases of "cultivation" and "conditions, of environment" have no meaning here.

The vertical plane of the leaves next commands attention. A careful examination of a number of isolated plants soon leads to the conclusion that there is no polarity—as it is generally expressed. The plane of the leaf is in any direction. There are no more in a northward than in a westward line. I am at a loss to imagine how I, in common with other observers, ever believed it could be classed as a "compass plant," unless it be on the general principle that it is easy to see what we are looking for.

In the examination a novel point presented itself. The leaves are vertical instead of horizontal by reason of a twist just above the point of divergence from the stem. But on every plant there are cases of twists in opposite directions. In former "contributions" I have shown that antidromy is common. There could not be secund inflorescence without it. Two or three leaves in this

*Lactuca* following regularly the spiral against the sun would have the leaves back to back, when the next would twist in the opposite direction so as to face the lower leaf. The occasional pairs of leaves, drawn together in parallel lines, present a very novel and interesting appearance. These cases of antidromy follow no numerical rule. The most striking cases of parallelism will naturally be those where two successive leaves in the spiral face each other; but generally it is the next in the series, or, in some cases, the third or fourth leaf that turns its back on what seems to be the normal spiral course.

It may be here noted that the numerical order in the phyllotaxis is not as definite as it is supposed to be, and this fact will have some bearing on the phenomena connected with *Lactuca Scariola.* In many plants which have a normal $\frac{2}{5}$ arrangement, $\frac{1}{3}$ cases are not infrequently on the same stem. This may be well observed in the thick-stemmed Centaureas.[5] The upper portion of the stem thickens from a considerable distance below the flower, and the numerical arrangement changes according to the degree of thickening. The truth is, as laid down already in these contributions, the cortical layer in a growing branch is made up of the thickened bases of leaves, and the elongated growth of a branch is not in a straight line, but is simply the uncoiling of a growing mass of leaf stalks, the terminals of which become free or proper leaves, as we commonly understand them. That this is the real truth can readily be perceived in many of the stronger growing Compositæ. In a *Centaurea macrocephala*, now before me, the stem can be readily perceived to be formed in this manner. The lower leaf in the spiral laps over the one next above it like a slate or shingle on a roof, and it is *the width in proportion to the length of the spiral coil that decides the numerical order in the phyllotaxis.* The acceleration or arrestation of the uncoiling energy will therefore easily explain for us these apparent aberrations from the normal condition. In some plants the energy born of the spiral motion does not cease with the unfolding of the membranous or leaf-blade portion of the structure. In many composites[6] there may be two or even three twists to the leaf-blade, giving it a singularly curled-up character.

[5] *Centaurea macrocephala* is especially in mind here.

[6] *Senecio Doria* and *Centaurea macrocephala*, for illustration.

With these facts in mind the occasional facing of each other in leaves of *Lactuca Scariola* and other plants becomes explainable under the varying degree of energy expended in the uncoilings of the spiral at different times and localities in the growth of the parts.

An interesting fact in connection with inheritance presented itself in this investigation. As already noted, the plants from the solitary individual varied in numberless ways. The second year's crop had in the main the characters of the parent; but there were groups here and there which, while varying among themselves, would have the general characteristics of the first variation. For instance, there would be a group of pinnatifid-leaved plants, though with variations in breadth and length, in the divisions of the lobes, and in other respects differing among themselves; while in other spots would be groups with leaves wholly entire, and other groups with serratures. The seeds from some single plant, reaching the ground together in one place, probably accounted for this. It is at any rate a good illustration of inheritance going along in parallel lines with variation.

### IX. THE STIGMA OF ASCLEPIAS.

While preparing the chapter on *Asclepias tuberosa* for my illustrations of the *Flowers and Ferns of the United States*, continued as *Meehans' Monthly*, I noted glandular callosities, not hitherto recorded as being observed, indicating abortive floral organs. It led me to a review of our former beliefs in regard to the structure of these curious flowers. The first morphological difficulty was the supposed five-lobed stigma. With our modern knowledge of morphology it seemed incredible that a flower formed on a quinary plan, losing finally by abortion three or four of its carpels when forming the fruit, should yet have a five-lobed stigma at the apex of its ovarium. A careful examination satisfies me that the accepted view is wrong. The mass forming the supposed stigma is wholly independent of the carpellary system. Indeed, there is no departure from the morphological laws prevailing in flowers generally. Keeping in mind the power of union and segregation, and of arrest and retardation in the development of floral organs, the structure of the flower in *Asclepias* will be found exceedingly simple. There is no occasion for the mystery brought in generally to account for a seeming departure in regular law, when accounting for its singular structure.

In tracing the morphological relationship of the parts of a flower, we are largely aided by examining a number of species. In this study of *Asclepias tuberosa*, *A. verticillata*, *A. Syriaca* and *A. incarnata* also took part.

From some vigorous shoots of *Asclepias incarnata*, the lower leaves showed that normally the leaves are alternate, and arranged on a $\frac{2}{5}$ plan. Whatever variation from this plan follows, must be referred to some discordant occurrences. In *A. incarnata*, we see how this operates in forming the branching character. The main stem is subtended, when it begins to branch, by a weak branchlet on one side and by a leaf without an axillary bud on the other. The exact fact is that what now appears the central axis or leading stem was the axillary bud! When the rhythmic growth-wave resumed activity the chief energy was directed toward the axillary bud. It pushed aside the former leader, and reduced it to a mere branchlet. We can still trace this disturbing force through many nodes, though with continued arrestations and developments it is often difficult to trace the originals eventually. But we learn by this to look for these aberrations of the various parts when considering *A. tuberosa* by itself. In the case of the latter species we find in the earlier states of growth the axillary bud is not able to dislodge the central shoot from leadership. In this case we have the branchlet in the axil of the leaf, and not opposite, as in the other species cited. Later on we may find the growth-energy directed strongly in the axillary direction. But we have learned the valuable lesson that variation in the period of rhythmic growth-energy is sufficient to produce specific characters.

With the ideal quinary plan in mind we find in *Asclepias tuberosa* five sepals, and the series of five petals is alternate with the sepals as such a series should be. Then we have, alternate with these, a series of five stamens, but the filaments have become united up to the connective (represented by a minute dorsal gland), what should have been anthers are petaloid, and we have to call that a nectary which should have been a more elaborate organ. The five perfect stamens next appear, and properly alternate with the five petaloid stamens (nectaries) below. Now we perceive what, if noted before, has not been recorded: five greenish scales, alternate with the filaments and connate with them, extending beyond the so-called stigmatic disc, and forming a crested covering for the disc at the same time. This series united with the lower portion of the filaments is also connate with the disc. These scales have formed so complete a union with the anthers, as to give the appearance of wings to these organs, but the tracing beyond the apex of the anther clearly indicates their original distinction. Coming now to the disc, we find that its lobes are alternate with the scales, and that they are opposite to the anthers. Terming all the various cycles of a flower independently of the carpellary or axial system, staminal or petaliferous whorls, the substance of the disc may reasonably be referred to a whorl of this character which has had its terminals bent over as the next outer whorl did, and unite to form a homogeneous succulent mass.

This is more than a conception. The alternate development of each cycle, just as we should expect them to be, brings the facts close to a demonstration. But an examination of the carpellary development makes the facts clearer. Taking a flower about to fade, remove the nectaries, make a vertical section just above the line of the petals, and then open the flower carefully, we find two separate and distinct styles imbedded into the succulent base of the disc. Though seemingly homogeneal with the disc mass, we can with care note that they really terminate at this point. Not only this, but we may *see the stigmatic points.* As the flower dries, the disc mass separates from the apex of the carpels, and falls with what we may surely call the next corollary system. In *Asclepias Syriaca,* the union of the real stigma with the supposed stigmatic disc has been so slight, that no sign of a cicatrice remains to mark the earlier connection.

The union of parts that we conceive to be normally separate is so characteristic of *Asclepias,* that we see the evidence in many ways. The breaking up of the quinary method in this way has already been noted. In *Asclepias tuberosa* this is further seen at the base of each umbel. Each flower, normally, is a primary branch, with the subtending leaf in the axil from which it sprang. But the bases of the flower branches with the subtending bracts have become united and succulent, with only here and there the point of a bract like the topmast of a sunken ship appearing just above the surface.

We may now conclude that there is no special mystery to be solved in the flower of *Asclepias.* The structure is very simple. The parts, as we conceive them primarily to be, are all there, and in their regular places. The tendency to arrestation and union accounts for what seems strange.

With the elucidation of the real structure of the flower, other mysteries will dissolve. No one has been able to explain the manner in which the flower is pollinized. The accepted hypothesis is the chance transference of a pollen mass to the disc by means of an insect's foot. The abundance and regularity of seed vessels on many species should at once discredit such a notion. Regularity does not follow accident. In almost every umbel in *Asclepias incarnata,* there are regularly one or two fertile flowers, and this is true of other species. As the anther cells rupture, the pollen mass is in close contact with what I have shown is the real stigmatic surface. The flower is an absolute self-fertilizer, and can receive no aid from the visits of insects.

The failure of so many flowers to mature fruit is a matter of nutrition. It has already been seen how easily the axillary bud is induced to displace the leader, by the diversion of nutrition in that direction. There are always two ovaries and corresponding styles in each flower of *Asclepias.* If we open a fertile flower in an early stage of its advance to a fertile condition, we may note that the stronger one has simply starved the other.

There are other matters in connection with the life-history of *Asclepias* well worthy of investigation. In *Asclepias tuberosa,* as in some other species, the petals reflex hurriedly when opening, but close in again when near maturity. The flowers that become fertilized coil as if they were tendrils, and indeed seem to prefer to twine around some object. One might almost expect to find some climbing species in the genus. It has been said that explanations of this character to be acceptable should be able to account for all phenomena of a similar character. In this case, what about the stigmas and general features of Apocynaceæ? Surely the staminal verticil has no relation to the disc-like character of the stigma in some members of the order, *Vinca,* for instance. But we do not know how far the consolidation of parts has gone. In a double-flowered oleander we note numberless petal-like organs that must have had a separate starting-point, and what appears as a single style is really made up of two, covered by a membrane evidently of staminal origin.

## X. Phyllotaxis in connection with Chenopodiaceæ and Polygonaceæ.

Phyllotaxis has not been made much use of by systematists. In a general way recognition has been given to the alternate or opposite arrangement of the foliage in connection with orders or genera. We do not expect to find alternate leaves in Rubiaceæ, and opposite leaves in Rosaceæ would be a surprise. But we may go further. In a general way we may look for a pentamerous arrangement of the floral organs, whenever we find a $\frac{2}{5}$ arrangement of the leaves. In Chenopodiaceæ and genuine allies, we find the $\frac{1}{3}$ plan prevail. We may doubt the relationship with Chenopodiaceæ of any plant with a $\frac{2}{5}$ arrangement.

In Polygonaceæ we find the $\frac{2}{5}$ arrangement the rule, and a close study of some species of the order shows that, though there are great deviations from a pentamerous structure, the pentamerous is the main plan, and the apparent deviations are the results of abortion, or of a union of parts usually separate.

*Fagopyrum esculentum* well illustrates this. The outer series which we take to be the calyx is pentasepalous. There are eight stamens, but if we examine the flower closely we find that there are only five in the verticil succeeding the calycine whorl, and these are alternate with the sepals as they should be. The next verticil appears to be of eight glands; but on close inspection there are but five, and these are alternate with the stamens. Then we have three rather smaller glands, just above the line of the larger ones, and making the eight which come under casual notice, and these three are at the base of the three stamens, which make the eight usually credited to the species. Here a puzzle presents itself. There should be two more glands to make a complete verticil of five, and two more stamens for another perfect verticil, and how does it come about that the stamen is just above the gland and not alternate therewith? We cannot answer; but with a clear case of three perfect verticils on the plan of five, we may assume that in some way, as yet unaccounted for, abortion and disarrangement of parts at this point have occurred.

The three upper stamens present an interesting feature that does not appear to have been hitherto noticed. The outer five have an incurved character, but the inner three curve outwardly, and the outer surface of the upper and lower anthers meet face to face. The pistils have an outward trend, or we may say recurve, as the three inner stamens do. I say pistils, for though it is customary to look on the flower as having but a single deeply cleft pistil, the three-valved ovarium clearly indicates a tricarpellary origin.

The fact that but a single seed is found in the capsule must be attributed to abortion, just as we find but a single seed in many pluri-carpellary rosaceous fruits; and to the same principle of abortion that has already operated in breaking up the pentamerous character on which, as we have seen, the flower is normally planned. Instead of a relationship to Chenopodiaceæ, as usually suspected, or with Caryophyllaceæ, as has been suggested, its proper position is evidently nearer Rosaceæ than with either. In *Spiræa*, for instance, say *Spiræa opulifolia* L., we have the persistent five-cleft calyx, but only three carpels in many instances, with remarkable irregularity in the number of the seeds. Then, proceeding to *Neviusia*, we have the permanent calyx doing service for petals just as we find in *Fagopyrum*, and we have a little disc on which are the stamens, corresponding to the glands on which are the *Fagopyrum* stamens. Further, we have the ovaries reduced to two, with a single ovule.

This conception of the relationship of Polygonaceæ to the Rosaceæ enables us to account for the stipules, characteristic of Rosaceæ, but which are wanting in Chenopods. That the ochrea in Polygonaceæ is but a stipule which may become united so as to clasp the stem is universally conceded.

A feature that has been overlooked in *Fagopyrum* is partioularly instructive. Even the most recent descriptive work, Britton and Brown's *Illustrated Flora of the Northern States and Canada*, says of it, "glabrous except at the nodes." But one-half the stem and its inner face are hairy, only the exterior half is glabrous. It has been wholly my work to show that leaves do not originate at the node from which the leaf-blade springs. I contend that the whole of axis or stem is made up of the sheathing bases of the leaves, the blade being simply the departure of the upper portion, when the cohesive power has been reduced in force. The margin of the leaf-blade in *Fagopyrum* is ciliate. The line of hair on the stems of the plant are simply the strongly developed cilia on the united edges of the clasping leaf-bases.

An interesting circumstance in connection with *Fagopyrum* is the tendency to sterility of the flowers under certain conditions. Farmers know that if buckwheat is sown early in the season, the seed crop is light. Examining plants on the 22d of July, that had come up from self-sown seed in early spring, out of many hundreds of flowers, only one had perfected a seed. The anthers were destitute of pollen. This may have been the result of unusual vegetative vigor, which vigor has to be somewhat checked in most plants before fruitfulness is favored. The plants examined were growing in very rich soil, and unusually luxuriant; but the fact shows how much conditions have to do with sexual affairs.

### XI. The influence of fungi on the forms and characters of plants.

The influence of microscopic fungi in changing the form and character of vegetation is well-known in connection with monstrous conditions. It does not, however, seem to have occurred to biologists that what occurs in an exaggerated degree may reasonably be expected to prevail as a rule. The power that can induce vegetation to run into monstrosities may be so able to control its forces as to be a regular factor among the laws of form.

I believe that Prof. Farlow and some German botanists have recorded cases where the action of minute fungi has changed the character of plants to a degree that might be almost termed specific. I have myself, in a communication to the Academy of Natural Sciences of Philadelphia (see *Proceedings*, 1874, p. 146) shown that where *Euphorbia maculata* is attacked by an *Æcidium*, it assumes characters very little different from *Euphorbia hypericifolia*. Instead of trailing, the plant becomes erect. The hairy stem and fruit become perfectly smooth, and the swelling at the nodes that characterizes the latter species is assumed under the changed conditions. Only for the evidence furnished by the reproductive stage of the fungus, a botanist might well be pardoned for referring the attacked specimens to *Euphorbia hypericifolia*. Assuredly, *E. maculata* would not be considered in the determination.

Recently a specimen of a singular combination was placed in my hands by Mr. W. Finger, of Milwaukee, Wis. A pair of long-stalked, smooth and shining leaves seemed to proceed from a root stock of *Hepatica acutiloba* D. C. They were strikingly suggestive of some undescribed species of *Ranunculus*. The collector was suspicious that some other plant had managed to force its leaves through the root stock of *Hepatica*, as instances of this behavior in some plants have been known. Though nothing pointing to this could be ascertained, the specimens were sent to me under an impression that there must have been some such occurrence. The leaf-blades, however, showed, by the slightly developed fructification, that the whole character of the leaf had been changed through the medium of a minute fungus, apparently closely related to an *Œcidium*, as had been found connected with the *Euphorbia*.

Fig. 1.

In the paper on *Euphorbia* cited, I ventured the proposition, as deduced from the observations recorded, that "certain phases of nutrition brought about by the attack of a fungus may change specific characters." The experience here related not only affirms this proposition, but indicates that the changes induced follow definite lines. In the *Euphorbia* the result of the operation of the fungus was especially marked by the elongation of the nodes and the total suppression of the hair that densely clothes the species attacked. In this case we have again the hairy character of *Hepatica* totally obliterated, and the petiole elongated in a striking manner.

In view of the modern discoveries of symbiotic relations between algæ and fungi in the development of lichens, and of species of fungi in connection with the life-histories of other plants, there can be no extravagance in the suggestion that in some manner as yet undiscovered these minute organisms may play an important part in the origin of form. In this case nothing but the advance toward fructification would have furnished ground for suspicion that the leaf was not in a normal condition.

### XII. The Movements of Plants.

What is known as Heliotropism has never been clearly understood. Much that has been referred to the action of the sun may be attributable to other causes. When Moore sang:

> "As the sunflower turns on her God, when he sets,
> The same look which she turned when he rose,"

he expressed the prevailing thought that the plant, in an active sense, sought the sun or avoided the sun, as the case might be, and not that the sun was the acting direct agent in drawing the flower unwillingly along.

On August 20, 1898, I was passing a large mass of *Helianthus orgyalis* at about sundown, and noted that they were taking a wide curve toward the northeast, the stronger plants making a curve of nearly a foot in diameter. As the thermometer had been ranging between 80° and 90° Fahr., I passed on with a general impression that excessive transpiration had induced wilting. On the evening of the 25th, observing again this general northeast curve, I attempted to lift one of the curved points, and was surprised to find the stem at that point rigid, and not flaccid, as it would have been if suffering from lack of moisture. Careful and continued observation was decided on.

On the 26th, at 6.30 P.M., the stalks which at sundown the previous evening were curving northeast were now erect. On the 27th, at 6 P.M., the stalks were curving again northeastwardly. On the 28th, at 11.30 A.M., all were curving slightly southwest, and by 2 P.M. the same day were nearly erect. At 6 P.M., with their usual curve northeast.

On the 31st, at 6.30 A.M., found the first deviation from that general plan in having the curves northeastwardly, instead of having erect stems. At noon they were erect, except a few of the weaker ones which had a northwestern curve. It should be here noted that the terminal flower, which in this and many other composite plants is the first to open, while the side branches rapidly develop, was now expanding, but many of the stronger branchlets joined with the weaker main stems in this northwestern curve. Even where the main stems by some accident had a southern or eastern leaning, the branchlets had the northwestern curve. Observations were continued till the evening of September 4, all resulting in the fact that the general rule in this species was that the curving was at nightfall northeastwardly; at 6.30 A.M., erect; at noon, with a slight curve, and at 6 P.M., a strong curve northeastwardly.

On September 6, *Helianthus Maximilianis* had developed considerably toward a flowering state. At 7 P.M., all the flower stems were bending slightly westwardly. On the 7th, at 7 A.M., all trending eastwardly; at 6 P.M., westwardly. On the 8th, 9th and 10th, the observations were the same. There was no opportunity to note the direction of the stems at midday, but on the 11th they were nearly erect, but with a very slight eastern trend. At 5 P.M., quite erect. By this time the ray florets of the terminal head of flowers were expanding, and no curving was noted subsequently.

In these observations I thought to note whether the curving was due to an uncoiling of the spiral growth, or was done by a direct lifting upward and over to the opposite point of the compass. Pins, with their heads pointing east, were inserted in the stems just beneath the terminal flower head. Through all the variation in the direction of the curves, the heads remained unchanged in direction. This proves it was not an uncoiling operation, but done as a purely ascending and descending act.

Further, these observations show that the curvature proceeds at night to the same extent as by day. Light, therefore, or the attraction of the sun's rays, must be eliminated from the factors in the work, especially as the evening curvature of one species is in a different direction from the other. So far as these observations go, the cause of motion is still obscure.

While these observations were in progress, I noted on the evening of September 5 that a large plant of *Palafoxia linearis* that certainly had all its branchlets erect in the morning were beautifully curved at 6 P.M., but they were in no particular direction of the compass. The curved branches were so rigid that they resisted considerable force in the endeavor to straighten them. The next day at 7 A.M. they were perfectly straight. The observations were made daily till the 11th, with the same results, the only additional fact being that the curving seemed to commence about 3 P.M., and to reach its maximum about 5 P.M. The stronger branches had the greatest curve, in some cases making a complete circle, the point of the branchlet reaching the main stem, the curve of the weaker branches usually reaching a half circle. On the evening of the 7th I tied a light label weighing an eighth of an ounce to the apex of one strongly curving branchlet. It had no result in weighing the branchlet further down. In the morning it still held the branch down to the point I had left it the evening before, though the point beyond the string had grown a little and taken an upward curve. When I cut the string with the point of a scissors, the branch flew upwards with a sudden spring, reducing the curve from a half to the quarter of a circle. The stem retained this light curve during the whole of its subsequent growth. In this connection it may be noted that in the reflex from the curve to erection in *Helianthus orgyalis*, the stem never reached a perfectly straight line, and hence the stems of this species are *generally flexuose*. That the curves in *Palafoxia* should be in any direction of the compass indifferently, and yet in specified directions only in the two Helianths, is remarkable.

While taking notes on these plants at dusk one evening, I noted that a plant of *Helenium autumnale*, with hundreds of unopened flowers, seemed drooping for want of water. Calling the fact to the attention of Mr. Hemming, in charge of my hardy herbaceous department, he felt sure that it only needed water, and this was copiously applied, with no result. Closer examination showed that the common peduncle was bent in the middle, the upper portion forming a right angle with the stem. So rigid was the bend that they could not be straightened without injury. The angle is maintained for a number of days till the ray florets become visible, when the peduncle gradually straightens, taking several days to complete the task. As in the case of the Helianths, pins were inserted in order to note any uncoiling process if present. The straightening was done by a purely ascending process.

The gain to science by these observations is negative. It is clearly seen that what we have understood as heliotropism in connection with plant movements has no place in the phenomena. It may be assumed that we have to look to various phases of life-energy in the plants themselves for the final explanation.

### XIII. Eccentricity of the Annual Wood Circles in Rhus Toxicodendron L.

In an abstract of an address[7] made by myself on excrescences and eccentric wood growth in trees, I pointed out that the thickening of the annual layer of wood, more in some portion of the circle than in others, was due to a greater generative power of the cells in the thickened portions owing to more abundant nutrition having reached them. "Where the whole mass of tissue seems equally and regularly vitalized, the generative tissue forms a new layer of wood of about equal thickness all round." "In some cases masses of cells seem to easily draw from others more than their share (of nutrition), and the latter are correspondingly weakened." "All the cases of peculiar eccentricities, *Hedera*, *Toxicodendron*, *Ampelopsis*, and the peculiar cases in ordinary timber trees, could be explained by this, so far as to note that the immediate law was a loss of generative power in the cells of the annual layer. Of course the indirect causes leading to this would be numerous, and left room for much more investigation." At the conclusion of that address the report published says Mr. Meehan was asked to explain the square section of trunk of *Picea amabilis* on exhibition at the American Centennial, and the reply was that in all probability the thickened portions of the annual layers at the corners forming the square were due to strong roots near these four corners supplying abundant nutrition in those directions.

Though twenty-two years have elapsed since that communication was made, the matter does not seem to have been further investigated, and our biological text-books still endeavor to explain these variations in the width of the concentric rings to various causes other than the one to which I have alluded. Though the bulk of nutrition must be by way of active roots, the carbon necessary for the structure must be contributed through the leaves. Healthy leaves and vigorous roots must be reciprocal. On the other hand, the power exercised by any force is in inverse ratio to distance; and it is probable that a weak series of foliage, near the active roots, might aid nutrition to better advantage than stronger ones further away.

Some interesting observations were recently made on the ordinary

[7] Proc. Acad. Nat. Sci., December 19, 1876.

poison vine, *Rhus Toxicodendron* L. A large stem that had for a quarter of a century been attached to an old cherry tree was cut down. From this were many old branches, which had not attached themselves to anything, and had no rootlets, as those attached to the tree had. In none of these latter cases was the wood eccentric, while even quite young branches, rooting to the bark of the cherry tree, were eccentric. Fig. 3 shows a section of the main stem, cut across two feet from the ground, showing the attachment by its numerous fibrous rootlets to the old bark at the back. Fig. 2 is a section of a seven-year-old branch which has not thrown out rootlets. From an examination of a number of stems with and without rootlets, the fact was clear that the rootlets decided the eccentricity. They evidently introduced nutritious matter from the old bark to which they clung, and the cells nearest to them derived the chief advantage. The concentric rings would inevitably weaken in proportion to the distance from the source of supply. If the woody circles had been all of equal thickness the pith would have been in the centre, as we see in Fig. 2.

Fig. 2.

In the contribution reported in the *Proceedings* as above cited, the weakened condition of the wood cells, and their overgrowth by stronger ones is given to account for the bark often found inside the trunks of *Bauhinia*, *Wistaria*, and other woody plants. We see in Fig. 3 how this can easily be brought about. If some good roots in connection with healthy leaves should appear in connection with the lobes represented by the heart-shaped figure so as to reinvigorate the depauperate wood cells, the bark would soon meet, and eventually be wholly enclosed.

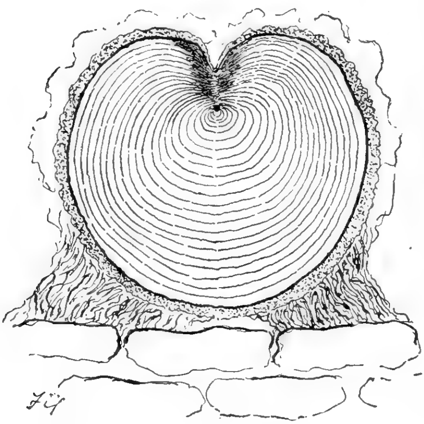

Fig. 3.

It may be added that the fibrous roots of the Poison Vine are all annual, but they become very wiry after death, and continue apparently for all time to aid in sustaining the plant's attachment to its support until violently separated by external forces.

## XIV. Morphology of the Grape.

In referring to the grape or other vitaceous plants, it is customary to say of the tendril that it is a reduced branch. It was long a puzzle to me that a branch should appear on the opposite side of a leaf, which leaf should have no axillary bud, and, further, it seemed remarkable that when there was an axillary bud at the base of the leaf, there was no tendril on the opposite side.

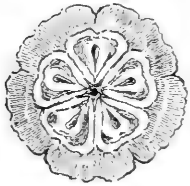

Fig. 4.

I have since learned that in these cases the plant simply presents to us phenomena very common in plants, especially when forming an inflorescence, of displacing the leading stem, and replacing the leader by the growth of the axillary bud. What was the leader is pushed on one side, and seems to be, what writers on the vine assume the tendril to be, a mere branch. In vigorous branches of the grape vine, there seems occasionally to be an axillary bud opposite the tendril, but this is simply a supra-axillary bud, the upper of the two having advanced to the position of a leading stem, when the former leader had been reduced to the condition of a tendril.

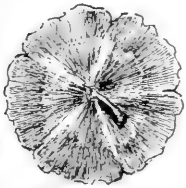

Fig. 5.

The fact is of importance in tracing the genital relationship of the order of grape vines with other families. There is much in Vitaceæ to suggest an alliance with rhamnaceous plants. In Celastraceæ, for instance, the character noted in the grape of having the tendril opposite a leaf without an axillary bud is wanting simply owing to the opposite-leaved method of carrying its foliage. How the growth-energy has been diverted from the leading shoot to the axillary buds is shown in the inflorescence of *Euonymus Japonicus.* With a further suppression of the leader there would have been dichotomous branching. With an alternate system of leafage, the central axis would have been pushed aside to become a tendril or some other lateral organ. The stronger shoot from the axillary bud would then be the leader. In many rhamnaceous plants, notably in some species of *Zizyphus*, though the axillary bud has sufficient force to occupy a position erect and in a direct line with the branch that bore it, thus pushing aside the former leader, it has not energy enough to maintain the leadership. The main branch, though forced from the direct line, continues to lead, and then we have the zigzag or flexuose stem.

Another evidence of the close relationship of Vitaceæ with the rhamnaceous family is furnished by an occasional tendency in grape berries to assume a valvate capsular form. A case of this some kind fell under the notice of Fl. Von Schlechtendal, who thought it of varietal importance. He figures and describes it in the volume of *Linnæa* for 1830 as *Vitis vinifera capsularis.* Morphology had not reached the importance it has arrived at to-day. My first opportunity to examine a case of the kind was furnished by Dr. James A. Darrach, of Germantown, Philadelphia, who found it on a bunch of the Flame-colored Tokay, common on our fruit stands as the California grape. It is capsular, five-parted, disclosing the naked seeds attached to an axile placenta, the whole very suggestive of some celastraceous plant.

The grape is notorious for other morphological vagaries, among which the total absence of seeds in some varieties is to the point. The Corinth, Mokunha and Sultana are also cases. These furnish the currants of commerce. Seedless berries are common among the fertile ones in many varieties of American species. In one known in gardens as the Lindley, one-half of the berries will be seedless, and sometimes the whole bunch will be of that character. In these the berries do not reach more than one-half the size of the seed-bearing ones. The manner in which this variation is accomplished has been ably set forth in the *London Journal of Horticulture*, of September 3, 1896. It is well-known that many fruits will advance considerably in size in the absence of pollination. The fruits are seedless, and they never reach the dimensions of the fertilized fruits. The osage orange and the cucumber are familiar instances. In the growth of cucumbers under glass every female flower produces a cucumber, but if the grower desires large and fine fruit, he uses the male flowers directly on the females. The isolated female osage orange has the seedless " balls " but half the size of the fertile ones. In the paper on the grape above cited, the author traced the successive stages of growth in the fruit by the aid of a powerful microscope. The mother or berry-bearing plant has the power of growth up to a certain stage. Ovarium, ovules and every part advances up to about half the size of the full-grown stage, when it awaits the entrance of the pollen tube. If this tube fails to appear at this stage, the funiculus or neck connecting the ovule with the placenta dies, and this ends all future growth. The grape is a plant having female flowers, male flowers and neuters. It is among the latter that the currants or seedless grapes appear. The ovaries and ovules are perfectly formed, but the stigma is imperfect and will not admit the entrance of the pollen tubes.

## A LIST OF FISHES COLLECTED AT PORT ANTONIO, JAMAICA.

BY HENRY W. FOWLER.

Two collections of Fishes were made, mostly from the nets of fishermen during April and May in the year 1891, by Messrs. W. J. Fox and C. W. Johnson while on a trip through Jamaica. The collection formed by Mr. Fox is at present in the Academy of Natural Sciences of Philadelphia, while that belonging to Mr. Johnson became the property of the Wagner Free Institute of Science of Philadelphia. To Mr. Johnson I am much indebted for the loan of the collection formed by him. In the following list several of the species may be of interest, as not having been frequently recorded from the island's fauna.

ALBULIDÆ.

1. **Albula vulpes** (Linnæus).

CLUPEIDÆ.

2. **Sardinella macrophthalma**, (Ranzani).
3. **Sardinella humeralis** (Cuvier and Valenciennes).
4. **Opisthonema oglinum** (Le Sueur).

ENGRAULIDIDÆ.

5. **Cetengraulis edentulus** (Cuvier).

HEMIRHAMPHIDÆ.

6. **Hyporhamphus unifasciatus** (Ranzani).

HOLOCENTRIDÆ.

7. **Holocentrus ascensionis** (Osbeck).

MULLIDÆ.

8. **Upeneus maculatus** (Bloch).

CARANGIDÆ.

9. **Decapterus sanctæ-helenæ** (Cuvier and Valenciennes).
10. **Trachurops crumenophthalmus** (Bloch).
11. **Vomer spixi** (Swainson).

SERRANIDÆ.

12. **Goniopleotrus hispanus** (Cuvier and Valenciennes).
13. **Bodianus fulvus ruber** (Bloch and Schneider).
14. **Epinephelus maculosus** (Cuvier and Valenciennes).

LUTIANIDÆ.

15. **Neomænis griseus** (Linnæus).
16. **Neomænis analis** (Cuvier and Valenciennes).
17. **Neomænis synagris** (Desmarest).

### HÆMULIDÆ.

18. **Hæmulon parra** (Desmarest).
19. **Hæmulon flavolineatum** (Desmarest).

### GERRIDÆ.

20. **Eucinostomus harengulus** Goode and Bean.

### POMACENTRIDÆ.

21. **Eupomacentrus leucostictus** (Müller and Troschel).

### SCARIDÆ.

22. **Sparisoma flavescens** (Bloch and Schneider).
23. **Sparisoma rubripinne** (Cuvier and Valenciennes).

### BLENNIDÆ.

24. **Labrisomus nuchipinnis** (Quoy and Gaimard).

### PLEURONECTIDÆ.

25. **Syacium micrurum** Ranzani.

## A NEW AMERICAN LAND SHELL.

BY EDWARD G. VANATTA.

**Pristiloma pilsbryi,** n. sp.

Shell imperforate, translucent, light horn colored, polished; suture deep; spire depressed, composed of five and one-half slowly increasing whorls; the first two whorls are smooth, the remainder are deeply radially sulcate, the sulci fading out at the periphery, making the top of the whorls flatly nodulose. There are about fifty-two nodules on the last whorl. Base smooth, squarely convex, giving the shell the form of a thick rounded disc. Mouth narrowly lunate. Lip sharp, rather sinuous at the base, with a slight callus near the columella as in *Pristiloma stearnsi;* columellar lip slightly reflexed.

Alt., 1.68; greatest diam., 2.56; least diam., 2.4 mm. Portland, Oregon. Collected by H. Hemphill. Acad. Nat. Sciences, No. 56,996.

The sculpture of the spire of this species is very much like *Macroclamys diadema* Dall. It is distinguished from *Pristiloma stearnsi* Bld. by the very much deeper and more separated sulci, and the lower spire.

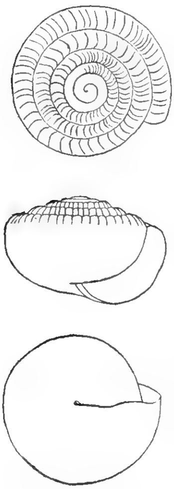

FIG. 1.

## SOME OBSERVATIONS ON THE ILLECELLEWAET AND ASULKAN GLACIERS OF BRITISH COLUMBIA.

BY GEORGE AND WILLIAM S. VAUX, JR.

With but a very few exceptions it seems to be a rule at the present time that all glaciers are receding up the valleys into which they extend. Whether this will be a permanent recession, or whether a period will come during which an advance will take place, time alone will tell. That there has been a permanent recession the numerous moraines below the prominent glaciers bear ample witness, but they also show that there have been many advances between the periods of recession.

The glaciers of the Canadian Rockies offer many attractions to those interested in their action, both on account of the newness of the region in which they are located and their marked activity. The Canadian Pacific Railway, without which this region would be almost inaccessible, was first opened but a little over a dozen years ago, and before that time it was practically an unbroken wilderness. Among the most accessible glaciers from the line of the railway are those in the vicinity of the Glacier House, which is situated in the heart of the Selkirk range, at an elevation of 4,122 feet above sea level. With this point as a centre a score of glaciers may be reached. It seems to form a natural station for their observation.

The most accessible, and in some respects one of the most remarkable, is the Great or Illecellewaet Glacier, situated about one and one-half miles in a direct line from the station. The immense névé which feeds it, lies on the top of the range forming the divide, and from it several branches flow down into as many valleys. The Great Glacier is notable on two accounts: its freedom from dirt at its foot, and the remarkable rapidity of the ice fall. One of the first persons to make observations on this glacier was Dr. William S. Green, F.R.G.S., who in 1888 spent some time in surveying and exploring the region. He records that in twelve days the centre of the ice moved twenty feet, while at the side it moved only seven feet. He also notes "that the snout of the glacier showed evidence of retreat, for there were two rows of boulders in front of it. The outer one, about sixty feet from the ice, seemed to have been dropped the previous year; the inner row during the present year."[1]

Since that time the glacier has been visited by a number of persons who have located the snout as respects certain marked rocks, or in some other way, but in many instances the record has become lost or uncertain so as to be of little value. At the present time the glacier is rapidly receding, and from an examination of the bare moraine and scrub below it, there seems to be evidence that this has been going on actively for a comparatively short period.

July 16, 1887—one year before Dr. Green—we first visited the glacier, and made a number of photographs of its foot (Pl. III). These photographs, after a lapse of over eleven years, make possible an exceedingly interesting comparison of the position of the ice. At the present time there is a broad space of loose boulders below the snout, utterly devoid of vegetation. In 1887 alder bushes grew within twenty feet of the ice. The slope of the ice was also very different from what it is now. There was then a great mass with steep sides extending over the present bare space, while now the ice slopes comparatively evenly till it dies away altogether in the stream. The fact that during eleven years the alder bushes have not advanced on the retreat of the ice, and that in 1887, when the photographs were taken, they were so close to it, would seem to indicate that at least for a score of years previous to 1887 the glacier had not extended materially further into the valley than it did at that time. Taking into consideration the border moraine marking the position of the ice in 1887, the alder bushes which then, as now, grew up to the lower side of the moraine, and which have increased but little in size during the eleven years, and the characteristic steepness of the slope of the ice, it would seem probable that a period of advance had occurred shortly before the year 1887. One very small moraine about 200 feet from the snout of 1898 showed an insignificant advance since that period, but apart from this the motion of the glacier appears to have been only of recession.

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[1] Among the Selkirk Glaciers, by W. S. Green. Macmillan & Co., 1890, p. 219.

Photography seems to offer the most satisfactory means of permanently recording the position of the ice from year to year. On our visit, therefore, to the Great Glacier in 1898, a large rock was chosen on the south side of the trail, below the bridge, and some five hundred yards from the ice foot. The 1898 test view was taken from this position on the 19th of August (Pl. V). The small moraine in the lower right-hand corner is the one mentioned by Dr. Green, and shown in the pictures of 1887. The large rock marked "E" was then partly encased in the ice, as will be seen in the centre of the 1887 picture, and forms a most excellent point for identification (Pl. IV). In conjunction with the photograph a number of range rocks on the moraine were selected and marked for identification. The rocks "B" and "D" on the photograph were chosen because they were of unusual size, and were far enough from the ice to prevent any movement. A line drawn between them August 17, 1898, passed eighteen inches below the extreme snout of the glacier at "H." "B" is a large rock, with a triangular black mark on the north side. It was lettered with venetian red paint as follows:

VIII–17–'98.

VIII–17–'98.

"D" is a yellow rock which has been split in halves. It was marked on one piece, "Rock opposite lines with snout, VIII–17–'98," and on the side opposite with a vertical line and two arrows. The rock "G" was not marked, but may be easily identified by the photograph. Its highest point was fifty-nine feet to the nearest ice on August 17, 1898.

To locate the position of the snout, the rock "C," a long, rounded boulder, was chosen. It was marked "60′ 0″ to snout, VIII–17–'98," and with arrows.

During the warm weather of August the rate of recession was very rapid, and a few days made a marked change in the position of the ice. October 24, 1898, Mr. Hugh B. Walkem, of Vancouver, visited the glacier and compared the position of the ice with the rocks marked by us, sixty-eight days before. He found that the snout had receded forty-six feet in that interval, or eight and one-tenth inches per day.

As respects the annual rate of recession it is hard to obtain reliable data as a foundation. There are several rocks on the moraine which bear marks or dates as old as 1890, but most of them are so worn as to be almost illegible. We found one, however, near the border moraine above referred to which, if it had not been moved, indicated that in August, 1890, the snout was sixteen feet above a certain mark. The distance from that mark to the snout in August, 1898, was four hundred and fifty-two (452) feet, or an average annual recession of fifty-six (56) feet, during the period of eight years. There is reason to believe, however, that for a part of this period the glacier remained more nearly stationary, and in the remaining years made up for the deficiency by a much more rapid melting away.

The Asulkan Glacier being situated at the head of the valley of the same name and about four miles distant from the Glacier House is not nearly so easy of access for observation. Its névé is connected with that of the Illecellewaet over the ridge which separates them, so that while they flow into separate valleys they rise from practically the same source. We are not aware that any work has been done upon this glacier, as it is probably not visited by more than a score of persons in the course of the year. The rapidly descending stream from its foot, which is joined by another from the glaciers in the immense amphitheatre to the east, passes through a narrow cañon a quarter of a mile below the snout. In this cañon there appeared to be no sign of glacial action, which would indicate that the ice had extended below this point only before the formation of the cañon. A very large moraine flanking the glacier on the west also pointed to the fact that the ice had not receded materially in recent years.

The same methods were pursued here as in the case of the Illecellewaet Glacier. A very large rock, the top of which was smoothly glaciated, was chosen on the east side of the stream below the glacier, and the test picture was taken, August 23, 1898 (Pl. VI). While it records the general outline of the ice, it does not locate the snout, which seemed to be deeply buried in moraine. Apart from thus fixing the position of the ice on this date, it was impossible to draw any conclusions, as there are no previous records with which to make comparisons.

## A SNOW-INHABITING ENCHYTRÆID (Mesenchytræus solifugus Emery) COLLECTED BY MR. HENRY G. BRYANT ON THE MALASPINA GLACIER, ALASKA.

BY J. PERCY MOORE.

The material upon which the present account is based was collected by Mr. Henry G. Bryant upon the snow of the Malaspina Glacier, while conducting explorations on Mt. St. Elias during the summer of 1897. The habitat of the worm is so unusual that a somewhat detailed account of its structure and habits seems desirable.

The mature examples, of which a considerable number were secured, are slender and linear, having about the form of *Fridericia longa*. They possess on an average 55 somites (43 to 58), and measure 15–20 mm. in length by .6–.7 mm. in greatest diameter (somite XII). At the oral end is a short, bluntly rounded and somewhat swollen prostomium. The oral somite is slightly enlarged and sharply marked off from the succeeding somite by a deep furrow. Somites II to V inclusive are somewhat depressed, the remainder of the worm being terete. In contracted specimens these anterior somites are distinctly divided into three annuli each. After increasing gradually to somite XII, the diameter remains quite uniform to about one millimeter from the posterior end, whence it narrows rather abruptly to the truncate anal ring.

In none of the specimens examined (about twenty in number) is the clitellum very distinctly developed, but on the contrary is thin and scarcely extends beyond the limits of the twelfth somite.

Dorsal pores are entirely absent from the somites, but there is a well-marked cephalic pore near the apex of the prostomium, fig. 7, *cp*. The external openings of the spermathecæ are situated in the centres of a pair of conspicuous elliptical swollen areas (figs. 1 and 2, *st.*), corresponding to the intersegmental furrow IV–V. These areas are much larger, more glandular, and more conspicuous than is usual in the Enchytræidæ. They lie toward the ventral rather than the dorsal body surface, and the spermathecal pores are between the levels of the ventral and dorsal setæ bundles.

Equally conspicuous in preserved worms are the often partially everted male genital bursæ, which appear as a pair of prominent papillæ (penes) on the ventral face of somite XII (figs. 1 and 2, ♂). At their apices are the male pores — triradiate slits with two short mesial limbs and a longer ectal one (fig. 1). When the bursæ are not everted, the male pores have the form of transverse slits on slightly elevated papillæ. The female pores (figs. 1 and 2, ♀) are very small, and are found only with some difficulty in entire worms. They are in line with the male pores and situated at the intersegmental furrow XII–XIII. The general characters of the anterior end of the worm are shown in figs. 1 and 2.

The setæ have the form usual in the genus, being feebly sigmoid and arranged in fan-shaped bundles, but are mostly imperfect, owing to the points being worn or broken off. The dorsal (lateral) bundles contain usually two, sometimes three, the ventral three to six in the preclitellial region, and usually four or five behind the clitellum. The ventral bundles are more conspicuous, not only because of the greater number of setæ which they contain, but also because these setæ are of somewhat larger size than the dorsal ones. Enlarged setæ are found in the ventral bundles of XI; these are about one-third longer and much thicker than the others. Setæ are absent from somite I, and the ventral bundles normally from XII. On the latter the ventral bundles are partially replaced by groups of pigmented glandular cells which lie ectad to the male pores. Sometimes a single small seta persists in this region. The dorsal bundles are sometimes also reduced on this somite and may be represented by two setæ, by one seta, by the pigmented glands or have disappeared altogether (as in one series of sections).

A very striking peculiarity of the species is the yellow-brown, deep chocolate-brown or almost black color, and its opacity. Mr. Bryant informs me that the worms were quite as conspicuously colored in life. Several of the specimens are marked by more or less complete white or yellow rings which are the result of ruptures of the epidermis along the intersegmental furrows, permitting the underlying muscular layer to show through. As Mr. Bryant states that these bands were present when the worms were collected, the injuries may be the result of previous freezing. Unstained sections show that the pigment is in the form of minute granules deposited thickly in the epidermal cells. These granules form a very densely packed stratum toward the outer surface of the cells, but become fewer and finally altogether absent toward their basal surface (fig. 8). Pigmentation is not confined to the outer surface of the body, but affects as well all internal epithelia which have been derived from ectodermal invaginations, as the setigerous glands, lining of buccal cavity and pharynx, genital bursæ, stalk of the spermathecæ, terminal vesicles of the nephridia and the lateral portions of the nerve cord.

Except that it is deeply cleft in front where its angles pass into the circumœsophageal connectives, the supra-œsophageal ganglion is nearly quadrate; the posterior border is almost straight. It is situated in somites I and II (fig. 4 and fig. 7, *cg.*). The body walls are unusually thin for an Enchytræid, which results from the weakness of the longitudinal musculature (fig. 8). The dorsal blood vessel becomes free from the alimentary canal in the clitellar somite (XII). It contains a usually inconspicuous cardiac body composed of two or three rows of cells.

No important peculiarities are apparent in the structure of the alimentary canal. The pharyngeal pad (fig. 2), occupies the second and third somites. It is preceded in the first somite by a pair of lateral appendages which project into the lumen of the buccal chamber. When retracted it forms the cephalic wall of a dorsal pouch, the posterior wall of which is the much-folded pharyngeal wall. Otherwise the alimentary canal is simply sacculated, and ciliated throughout. The chlorogogue cells begin in IV. They are very high and slender, the bodies very transparent, but filled with pigment (?) granules and fat like globules. Large septal glands are attached to the posterior faces of septa IV–V, V–VI and VI–VII, and occupy the greater part of the succeeding somites. There are no salivary glands (peptonephridia of Benham).

Nephridia are situated in every somite posterior to VII. These organs each consists of a long, narrow tube, very closely and intricately folded; but the loops do not communicate laterally with one another to form a plexus. Throughout its course the lumen is relatively large and the walls thin, so that the character of a tube is not obscured, as in many Enchytræidæ. The folded tube forms a compact mass divided into several lobes, of which a long, narrow ventral one, from the middle of which the efferent duct arises, and a short, broad, dorsal one are the principal. The part of the organ just described is postseptal. Only the small funnel and its stalk project through the septum into the somite next anterior.

The testes (fig. 3, *t.*), are attached to the body floor close to the root of the septum X–XI, and rather near to the middle line. Their products are shed while in early developmental stages into the cavity of somite XI, from which some find their way into X, but most pass into the sperm sacs to complete their development. The sperm sacs (fig. 3, *ss.* and *rss.*), are paired, but only the left one has any functional importance. Both arise from the septum XII–XIII, rather high up beside the intestine. Both are simple hollow tubular outgrowths whose walls have the same structure as the septa, being formed of a double layer of the very delicate cœlomic endothelium, with a very delicate and imperfectly developed muscular stratum between. That of the right side (*rss.*) is almost rudimentary, being narrow and confined to somite XII, in which it ends blindly, or possibly unites with the left after passing around to the ventral side of the intestine. Owing to the delicacy of its walls and the crowding of other organs, this point could not be certainly determined in the three series of sections studied. All appearances are, however, in favor of the interpretation expressed in fig. 3. The left sperm sac is greatly developed. Extending caudad from its origin through somite XII it passes to the ventral side of the intestine, and then occupying more or less approximately the middle line and perforating the successive septa, it continues into somite XX, in the posterior part of which it terminates blindly. At each septum it is constricted, but bellies out in the somites, and when filled with developing spermatogonia is the most conspicuous body in a section, not excepting the alimentary canal. Comparing it with the size of the testes it is a matter for wonder how the latter can produce sufficient spermatogonia to keep the former packed as full as they are usually found. The spermatogonia must divide many times.

The sperm funnels (fig. 3, *sf.*), have the large size, glandular appearance and narrow lumen so usual in the Enchytræidæ, and occupy most of the space by the side of the intestine in somite XI, the posterior septum of which is crowded backward.

Of a somewhat truncate pyriform shape, they are bent on themselves in such a manner that their mouths are directed toward the openings of the sperm sacs, while their stalks perforate the septum ventrad to the latter and pass into the sperm ducts. The sperm ducts (fig. 3, *sd.*) are remarkably long—about fifteen times as long as the sperm funnels—and form a pair of much coiled and twisted loops reaching in a typical example into somite XVIII. That of the right side enters the ovisac by its mouth and remains coiled within it by the side of the aggregated ova for the remainder of its course. In fig. 3 it is represented, for the sake of simplicity, as a straight loop. The left sperm duct lies free in the body cavity, passing through the septa by the side of the left sperm sac, ventrad to which most of its coils lie. The sperm ducts are composed of a cubical epithelium and are ciliated throughout. Before entering the atrium in somite XII the recurrent limbs of the sperm ducts expand into narrow fusiform sacs (fig. 3, *ss.*), having glandular, epithelial and muscular walls, which receive the ductules of a group of unicellular spermiducal glands. This structure probably serves to form and eject the spermatophores. A narrow curved duct, which is also provided with some unicellular glands, perforates the mesial wall of the atrium and opens into its lumen.

Unlike the remainder of the male efferent apparatus, the atrium (fig. 3, *a*), is, in part, of ectodermal origin, as is indicated by the pigmented lining epithelium. It is a spheroidal thick-walled partly eversible sac, with an internal cavity having a mushroomlike shape in the retracted organ. Its walls are composed of a cuticle-covered, rather deep, pigmented and perhaps glandular epithelium, surrounded by a thick muscular layer in which the fibres are partly longitudinal, but largely radial, especially about the place of entrance of the sperm duct. A number of groups of unicellular glands are attached to the organ, and probably empty into its lumen. The external opening is described above.

The ovaries (fig. 3, *ov.*), arise from the floor of the body-cavity at the foot of the septum XI–XII. The ovipores have the usual Enchytræid form and relation. Their position is noted above. A single ovisac (fig. 3, *ovs.*), is present. This is pushed back from the septum XII–XIII, just dorsad to the sperm sac, which behind this point displaces it to the right for the greater part of its length. The sac is long and cylindrical, much constricted at the septa and is occupied, in addition to the ova, by one of the sperm ducts. In those specimens in which it is best developed it ends in somite XXII, but in some specimens it is less developed, and doubtless varies as in other species of *Mesenchytræus*. Sometimes ova are present in the posterior part only, in which case the anterior part, occupied by the sperm duct, is difficult to distinguish.

The paired spermathecæ (fig. 5) open externally between IV and V, and on a level midway between the dorsal and ventral setæ bundles. The epidermis about the opening is thickened in an elliptical area, owing to the presence of numerous unicellular glands. The stalk has a narrow lumen and thick walls made up as follows: (1) A thick lining cuticle; (2) a very deep epithelium consisting of a layer of cells divided into an inner (lumenal), which is unstained, and an outer (basal), stained and nucleated zone; at the plane of separation is a ring of pigment granules; (3) a very regular layer of longitudinal muscle fibres, one deep; (4) a layer of enlarged peritoneal cells, largest posteriorly and dorsally, and much smaller on the side toward the septum. The stalk passes mesiad along the septum, then turns dorsad and caudad, the muscular and peritoneal glandular layers cease, and the walls become thinner as the organ expands into the ampulla, which is sometimes very spacious, sometimes, as in the specimen figured, quite contracted. At the point where the stalk expands into the ampulla arise three slender, thin-walled diverticula, usually two from the outer and one from the inner (mesial) face. They vary in length, the longest about equalling the stalk. The ampullæ of the two sides open into one another, and the common sac thus formed by a small pore into the œsophagus on its dorsal side.[1] The epithelium

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[1] I find upon reëxamining the material that several of the more slender and lighter-colored worms which I had taken for immature individuals possess spermathecæ of quite a different form. They are much smaller than those of *M. solifugus* and lack the diverticula entirely; they are simple club-shaped sacs, without specially enlarged ampullæ, and communicate neither with one another nor with the œsophagus. The epidermis about the spermathecal openings is not thickened. The male genital organs also differ; the saccus ejaculatorius is smaller, the walls of the atria less thick, and the external pore much less conspicuous. The posterior border of the supra-œsophageal ganglion is concave. These characters are exhibited by three specimens. The poor state of preservation of the specimens permits no further description. For this species the name *Mesenchytræus nivus*, which has not yet been published for the other, is proposed.

of the ampullæ is of a character intermediate between that of the stalk and the diverticula.

As established by Eisen ('78) as a subgenus, *Mesenchytræus* included Enchytræidæ having sigmoid setæ, a relatively short sperm duct, and a supra-œsophageal ganglion which, while truncate (straight or slightly convex) on the caudal margin, is deeply cleft cephalad; besides these characters certain peculiarities of the spermatozoa were mentioned. Michaelsen's studies ('88$^{a}$) on *M. setosus* and other species have led him to add two very important and, among the Enchytræidæ, unique characters, viz., the presence of septal sperm sacs and ovisacs, and of lobate nephridia, in which the closely folded tubule can be traced as such. All described species of *Mesenchytræus*, which, following the usage of Michaelsen, is now ranked as a full genus, agree also in the possession of the following characters, in respect to which the genera of Enchytræidæ differ among themselves. The setæ are sigmoid and are asymmetrically arranged in the bundles, of which the ventral contain (at least anteriorly) a greater number of setæ than the dorsal. Dorsal pores are absent, but a large head-pore is situated near the apex of the prostomium. The dorsal blood vessel arises within[2] or caudad to the clitellum and contains a cellular heart-body. The blood is colorless. Salivary glands are absent. The supra-œsophageal ganglion is broader than long, deeply cleft anteriorly and straight or slightly convex posteriorly. The nephridia have very small anteseptal portions consisting of the funnel only, and large irregular massive postseptal portions. The sperm-duct is not more than ten times (Michaelsen says eight times) as long as the funnel. This statement of characters is derived mainly from Michaelsen's *Synopsis* ('89).

The "snow-worm" described above, presents all of these characters with the exception of the relatively short sperm ducts, which are about fifteen times as long as the funnels. The slight modification of the generic definition made necessary to receive this species is, however, unimportant, in view of the considerable variability in the length of this organ exhibited by species already known. In *M. fenestratus* Eisen ('78), the ducts but just equal the funnel in length, in *M. falciformis* Eisen they are six times and in *M.*

[2] In an undescribed species from the neighborhood of Philadelphia.

*beaumeri* Michaelsen ('87) eight times as long. According to Eisen the relative lengths of ducts and funnels vary greatly within the limits of the single species *M. mirabilis* Eisen ('79), in some individuals the former being but four times, in others as much as ten times as long as the latter.

*M. solifugus* is, however, a very distinct species, whose nearest ally seems to be *M. mirabilis* Eisen. According to Michaelsen ('87), the latter species has a single sperm and a single ovisac, both of which are greatly elongated caudad and constricted at the septa. It further approaches *solifugus* in the elongation of the sperm ducts. The entrance of a sperm duct into the ovisac has not been described for any other member of the genus, in which these ducts are usually coiled up within the limits of somite XII. But the relation of the sperm ducts, and particularly of the right one, to the mouth of the ovisac, is such as to permit of ready entrance, and it may in future be found to take this position in some other species. The enlargement of the outer end of the sperm duct and its glandular appendages are better developed in this than in other species.

With but very few exceptions, the Enchytræidæ are translucent and colorless, or have but very little integumental pigmentation. Very remarkable and distinctive therefore is the thick opaque deposit of pigment granules in the epidermis of this species, and the conditions under which the worm lives make an explanation all the more difficult to find.

The foregoing description and much that follows were written and the accompanying drawings prepared in December, 1897. The paper was then laid aside pending some projected experiments designed to determine the physical factors effective in stimulating the production of pigments in the Oligochæta. No opportunity for carrying out this plan has been found, and in the meantime Prof. Emery has described the worm in two short papers ('98[a] and '98[b]) under the name *Melanenchytræus solifugus* from specimens collected on the Malaspina Glacier by Dr. Filippi, of Prince Luigi's party. The description is communicated at the present time at the request of Mr. Bryant. I had called the worm *Mesenchytræus nivus,* a name which is now discarded, owing to the earlier publication of Emery.

To the new genus *Melanenchytræus* the following characters are attributed by the describer: Epidermis pigmented; each segment except the first bears a dorsal and ventral bundle of setæ; the ventral bundle is lacking on somite XII, its position corresponding to the male pore; the sperm ducts form convoluted loops which extend into somite XV, and terminate in fusiform enlargements which receive the prostate glands and open into the bursæ; the spermatic sacs are large and extend through several segments; the spermathecæ do not communicate with the intestine, but are continuous the one with the other, and have each at the base of the ampulla two or three diverticula; the nephridia are much convoluted, with few nuclei; the dorsal vessel begins in XII, and contains a cardiac gland; there is a cephalic pore, but no dorsal pores; in the pharyngeal epidermis are found numerous branching pigment cells; there are no salivary glands and the œsophagus is continuous without special modification into the intestine; the cœlom of somites IV to VIII is for the most part filled with unicellular glands.

Nearly all of these characters, as has been pointed out above, are common to all species of *Mesenchytræus;* only the following of those mentioned by Emery are at all peculiar, viz., the pigmented epidermis, spermatheca without openings into the œsophagus, the elongated sperm ducts and the origin of the dorsal vessel in the clitellar somite. The first, although very remarkable, can hardly be given generic value. The second is an error, as the spermatheca do communicate with the œsophagus by a small pore; nor is the union of the two spermathecæ unique, as I find this character in a Philadelphia species which is strictly Mesenchytræid in every other respect. The unimportance of the relative lengths of the sperm duct and funnel has already been commented upon. The extension of the ducts posteriorly beyond the limits of somite XII is more important, but a similar course of the sperm ducts is described by Eisen for *Enchytræus* (*Neoenchytræus*) *vejdovskyi*, while in other members of this genus the ducts are closely coiled within somite XII. Michaelsen lays considerable stress on the origin of the dorsal blood vessel anterior or posterior to the clitellum, but the character cannot of itself be of much importance, owing to its variability. Thus in *M. beaumeri* Mich. the dorsal vessel arises in XVIII, in *M. flavidus* Mich. in XIII, and in an undetermined American species in XII. It seems to me, therefore, that the creation of the new genus *Melan-*

*enchytræus* for *M. solifugus* is unnecessary, and the species is here referred to *Mesenchytræus.*

The following account of the habits and environment of the snow-worms is due to Mr. Bryant:

"The snow-worms were first observed a few hundred yards from our first camp, on the edge of the snow mantle of the glacier, which at this time (June 17) extended to within a few miles of the terminal face of the glacier. By the first of August this snow mantle, which in places was six or seven feet in depth, had entirely disappeared, exposing the hard, compact ice of the glacier. The elevation of the first snow-camp referred to was 520 feet above sea level. Here but few specimens of the worms were noted. At our second camp on the snow (elevation 1,260 feet), they were quite abundant in places, as also at our next camp (elevation 1,580 feet), where their presence in large numbers irregularly dispersed presented the appearance of blotches of coarse dust on the snow. Our base-camp was on a small expanse of snow-free ground on the south slope of a range of foothills abutting on the main range at an altitude of 1,750 feet. A few worms were observed on the adjacent snow of the main glacier, at a somewhat lower elevation; but I do not recall seeing any representatives of this species on any of our excursions in the upper snow fields of the region.

"During the month of June and early part of July, while the snow is comparatively dry, they appear about four o'clock in the afternoon on the surface and move sluggishly about, their dark color being quite conspicuous against the white background. They remain on the surface during the night; but when the sun appears in the morning they again burrow into the snow. They were widely distributed over the entire snow-field of the glacier, diminishing in numbers toward the edges. There was no uniformity in their dispersion. We did most of our sledging at night, and frequently passed stretches of snow several hundred yards in extent without noticing any specimens, and then would come to irregularly defined areas which seemed to support colonies of them, where the snow showed shadowy, dustlike patches caused by their presence in considerable numbers. As showing their sensitiveness to heat, I frequently observed their active wriggling as soon as a piece of snow containing them was taken in the hand. Later in the season, when the melting is further advanced and the snow saturated with moisture, the worms appear to become more active, and can be observed moving about in the shallow pools and lakelets which form on the surface of the glacier.

"When the snow entirely disappeared and the hard ice surface of the glacier appeared, the snow-worms were observed in the water which formed in the narrow crevasses. In my notes of August 2, I find the following: 'Collected some black worms to-day in a crack of the glacier—found them in the water of a high, narrow crevasse. Observed them on the edge of the submerged snow at a depth of five feet below the surface. The worms seem to have a browner color than when found on the snow earlier in the season. Some of the specimens I obtained had also distinct whitish bands around their bodies.'

"This variation in color is noticeable in the specimens collected in spring and late summer. As may be supposed, there is a marked absence of animal life on the surface of the glacier, which has an estimated length of seventy miles and a width of twenty-five or thirty miles. Wild geese were found nesting on the terminal moraine near the coast in June. The desolate monotony of the snow horizon was broken only on two or three occasions by the appearance of two species of Arctic gulls. Six species of moths, four species of spiders (one new species), and a number of flies, which included two or three new species, were collected on the glacier. The only insect found associated with the snow-worms was a minute black Thysanurian, which resembled at first glance a flea. This has been determined by Dr. Henry Skinner as *Achorutes nivicola*. These insects were found continuously and constantly associated with the worms in the dry snow, and, later on, in the pools of water. They were very active and leaped about like fleas. In no instance were lichens observed associated with the worms, although at several localities on the glacier pale crimson spots on the snow indicated the presence of the minute cryptogamic plants (*Protococcus nivalis*) which give rise to the 'red snow' frequently observed by Arctic travellers. The mean temperature of day and night on the expedition has not yet been computed; but I should estimate that the mean temperature at night was about 32°, and in the day about 55°."

It is a remarkable and interesting fact that the insect fauna of snow-fields consists almost entirely of species which are either black or very dark colored, although closely related species living amid different surroundings may be brightly decorated. That this is true in certain cases, as of the snow-inhabiting Campodeæ of the Alps, *Deesoria glacialis* and *Degeeria nivalis*, is well known to zoölogists, but the all but universality of the fact is not fully appreciated, except among entomologists who have studied Alpine and boreal forms. As long ago as 1834 Fröbel and Heer pointed out the existence of this relation between the pigmentation of insects and a snowy environment. They have compiled ('34, II, 97) tables showing the increase of dark pigments among the representatives of many species and genera of Coleoptera, Lepidoptera, Diptera, Arachnida, etc., as they extend to and beyond the snow line on the Alps or toward the north on the European continent.

A related fact is that insects which mature and become active during the winter in this latitude are likely to be black, or at least dark colored, although closely related species which are active at other seasons are much paler or brighter. This may be abundantly verified in the minute Diptera and Campodea which frequent sunny spots on the snows of late winter and early spring in the neighborhood of Philadelphia, or by reference to a paper by Fitch ('51), on the winter insects of New York, in which about twenty species of Campodea, Neuroptera and Diptera are described, every one of which is wholly or chiefly some shade of black. Associated with the "snow-worm" on the Malaspina Glacier was found a small Podurian, *Achorutes nivicola*, also black; and in the neighborhood of the glacier were collected a number of moths, flies and spiders, which have been described respectively by Skinner, Johnson ('98) and Banks ('98). So far as the colors of these have been noted, they are confirmatory of the general fact stated above.

It seems probable that the same causes which have stimulated the formation of pigment in the Oligochæta also favor its production in the Tracheata, and that some factor in a snowy environment lays the brand of melanism upon all of the constituents of its invertebrate fauna. But an analysis of the physical and vital conditions makes it evident that any one or several of five or six factors may be the effective cause, and until some of these can be eliminated by the conditions of experimentation it is almost idle to speculate. Apparently the most important physiological result to the organism of such a coat of pigment would be to place it in closer thermic relations to its surrounding. By virtue of it the organism could absorb a greater amount of radiant energy from an external source of greater intensity, but it would also lose its internal heat more rapidly to a cooler medium with which it was in contact. This being the case, it seems impossible to apply Lord Walsingham's ('85) hypothesis, valuable though it may be when applied to insects alone, to our worm. Lord Walsingham calls attention to the very striking fact that while many warm-blooded animals become white when subjected to Arctic conditions, the very opposite takes place in insects. He points out that it is vitally necessary for a homothermic animal to retain as much as possible of its internal heat during cold weather. A white coat favors this. An insect, on the contrary, having a variable temperature, becomes dormant whenever the external temperature falls below the minimum for its metabolic activity, but becomes more and more active with increasing temperature. In Arctic climates the season of activity for insects is very short. It is manifestly advantageous, therefore, that during it, metabolism be as rapid as possible. Increased capacity to absorb radiant energy would therefore be beneficial.

Inasmuch as the snow-worm does not, according to Mr. Bryant's account, expose itself to the sun's rays, it cannot benefit by its capacity to absorb heat rays, except possibly during the short period when it lives in the glacier pools. Even if they were to come to the surface of the snow while the sun shone, it seems to me that they could gain no appreciable amount of heat. The heat absorbed would be immediately transferred to the surrounding snow, which would melt, and the worm would simply tend to sink beneath the surface. This would be the only change resulting from its capacity to absorb heat rays. Zoölogical literature fairly bristles with attempted explanations of melanism. Some are simply attempts to correlate melanism with certain factors of the physical environment; others are more or less ambitious essays to explain the general fact or special cases. Without seeking to exhaust the field, I have applied more than a dozen of them to the case of this worm, without finding one that fits all of the conditions.

The Oligochæta are generally associated with warm, moist situations. We meet with them mostly during the spring and early summer months, while during the winter they retire from sight by burrowing into the earth below the frost line. Yet every one knows that after a warm rain in winter vast numbers of our common genera are often left dead on the surface of the ground to become the food of fowls, crows and other birds. A few warm days will start earth-worms into conspicuous activity, and many species retire beneath the surface only just so far as the actual freezing of the soil compels them. Our common Enchytræidæ are often found in clods of earth which are more or less completely frozen, or in the interior of frozen logs amid crystals of ice. This capacity of Oligochæta, and especially of the Enchytræidæ, to resist cold is now well known. Zoölogical literature contains the following cases: Leidy ('84) describes some small worms (which he refers to *Lumbriculus*, but later ('85) describes as *Lumbricus glacialis*, which is an Enchytræid) found frozen in a block of ice taken from a mill-pond in Delaware County, Pa. With them were associated *Rotifer vulgaris* and some immature Anguillulæ. Later some similar worms were received in a block of ice harvested from a pond near Moorestown, N. J., nearly a year before. This ice was filled with air bubbles and water drops in which the worms could be seen. On the ice being melted, the worms were liberated in an active condition and moved about in the water, but died as the latter became warmed. Dr. Leidy supposed that they were not actually frozen while imprisoned in the ice. He describes them under the name of *Lumbricus glacialis* ('85).

Kraus ('86) states that a small white worm was abundant in the ice supplied to the town of Salina, Kans., during the summer of 1885. As the ice melted they became somewhat active, but died when the temperature of the water reached 60° F. The same species was found living in the mud at the bottom of stagnant pools. Its presence in the ice is accounted for by the water having frozen to the bottom in the ponds from which the ice had been taken.

Reecker ('96) found a living earthworm in natural ice on July 16. It was moving about in a cleft in the centre of a piece of ice. The cleft communicated by a minute opening with the exterior. He supposed that in February or March, during a thaw, the worm had crawled between two blocks of ice which subsequently were frozen together. This worm, which was identified as *Lumbricus rubellus*, remained alive in the water until killed for preservation.

Sekera ('96) observed specimens of earthworms of the species *Dendrobæna rubida* Nj. ( -*Allolobophora boeckii* Eisen) frozen in blocks of ice in East Bohemia in December, 1886. When freed from the ice they remained alive in the water for a week, when they were preserved. This species is abundant in bottom lands and along meadow brooks, and Sekera suggests that the worms crawled out on the surface of the snow on a sunshiny winter's day, and were imprisoned by the formation of an icy crust after nightfall.

Probably most naturalists have met with similar cases illustrating the cold-resisting power of earthworms. I add the following: While at Woods Holl, Mass., in the summer of 1893, Mr. Joseph Fay submitted to me for examination a large number of Enchytræids taken from ice which had been cut during the previous winter on his pond. Subsequently I received some of the ice containing the living worms. This ice was porous and filled with air or marsh gas vesicles like that sent to Dr. Leidy from New Jersey. The worms became active in the ice water, but died during the course of two days, the temperature of the water having risen to that of the air. This worm is probably identical with the *Lumbricus glacialis* of Leidy, and the "Lumbricoid" described by Kraus ('86). It belongs to the genus *Enchytræus*, but the species is not stated in my notes, and the specimens are not just now available for examination.

During the fall and winter of 1892–3, I kept a large number of living annelids in my bedroom. Among these was an undetermined species of *Limnodrilus*, about thirty specimens of which lived in a tumbler of water. During some of the coldest nights of the winter, when the temperature outside descended nearly to zero, this tumbler remained standing on the sill of a window which was opened for ventilation. In the morning the contents would be a solid lump of ice with a tangled mass of the worms embedded in its centre. During the day the ice would thaw and by evening the worms would be actively waving their posterior ends. This alternate freezing and thawing was repeated many times and on one occasion the tumbler was placed in the open air and its contents kept frozen for a week At the close of the winter all of the worms except three or four were still alive and normal.

I know of no careful experiments on Oligochæta to determine the minimum temperatures which can be resisted without loss of life, but Rœdel ('86) has recorded some experiments which he made on fresh-water leeches. *Aulastomum gulo* resisted a temperature of 2° C. for twelve to fifteen hours, and *Clepsine complanata* a temperature of 5° C. for ninety minutes. The question whether organisms can be actually frozen without consequent disorganization and death has often been raised. It would seem that such small, soft-bodied animals as leeches and Oligochæta must inevitably be frozen when subjected to the conditions described above, and yet they were uninjured, but the experimental proof of this is inconclusive. It is significant, however, that animals with thick, non-conducting external coats, as insects, centipedes and snails (Rœdel, '86, and Pictet, '93) resist much lower temperatures and for a longer time than soft-bodied animals. There is little doubt that the protoplasm of vertebrate tissues will withstand actual freezing and recover its activity upon being thawed. Landois and Stirling ('91) state that frogs will recover after the blood has been frozen and ice has formed in the peritoneal cavity; and among Pictet's remarkable experiments it is recorded that the ciliated epithelium of the frog's mouth was subjected to the extremely low temperature of —90° C. for an entire day and night and yet the cilia recovered their activity when the temperature had been gradually raised above 0° C.

The internal temperature of most of the lower invertebrates rises generally less than a degree above the surrounding temperature (Landois and Stirling, '91, p. 427). Metabolic activities diminish with the lowering of the temperature and, in the animals (vertebrates) which have been most studied, practically cease altogether at the freezing point of water.

Now this snow-worm lives and grows while maintaining a bodily temperature which can seldom vary much from the freezing point of water. According to Mr. Bryant, it lives during the summer in the melting snow and the water derived therefrom which collects in hollows and clefts on the ice. During the night, the period of its activity, when it comes to the surface of the snow, the mean temperature of the air is about 32° Fahr. When the sun shines the worms descend into the melting snow—a veritable freezing medium, which must keep their small bodies continually chilled to its own temperature. An intimate temperature relation between the worm and its surroundings is further enhanced by its pigmented surface which favors both radiation and absorption of heat. In being thus adapted to a bodily temperature very near to that of the minimum for protoplasmic activity, this worm resembles deep-sea animals. Semper has shown ('81) that it is the mean temperature, and not its fluctuations, which is important in determining the rate of growth of an animal; and here we have an organism whose optimum temperature has probably been adjusted to a point at which metabolism ceases in most other animals. Nothing is known of the winter habits of the worm, but no doubt it burrows deeply into the snow, and thus protected, lives in an environment the temperature of which probably varies little from that of its summer habitat at the surface.

But little is known as yet of the geographical distribution of the Enchytræidæ. They have been described from Europe, Asia, North and South America, Greenland and New Zealand. But it is only in Europe that our knowledge of the species and their distribution is even approximately complete. From what is known of the distribution of the Eurasian species the statement seems to be warranted that this family reaches its greatest development in the colder regions. Species abound in Siberia, Nova Zembla, Denmark and Norway, and some are found in Spitzbergen and Greenland, where other Oligochæta are very rare. Very few species have as yet been described from the American continent, but, so far as our information goes, it confirms the results of a study of the distribution of the Old World forms. The tropical and subtropical forms appear to be few and small, while many have been described by Michaelsen ('88[b]) and Ude ('96) from the southern extremity of South America. They abound and present much variety in the northern United States, though but comparatively few species have been described. What is stated for the family seems to be preëminently true of the genus *Mesenchytræus*. Of the eleven species recorded for Eurasia, none have been reported south of Germany, where Michaelsen ('89) has found and described three species; three species are also found each in Siberia (Eisen, '79), Nova Zembla (Eisen, '79, and Levinsen, '83) and Denmark (Levinsen, '83). None have been reported from North America, but two species, one of which is probably *M. beaumeri* Mich., and the other undescribed, occur in the neighborhood of Philadelphia. Ude mentions no *Mesenchytræus* from South America in his recent exhaustive paper ('96). It is perhaps not so surprising that a member of this seemingly almost Arctic genus should be found amid the snow and ice of a northern glacier. Most of the Arctic species collected by Nordenskjold and described by Eisen were found in moss or under stones. The only mention[3] which I find in the literature of a similar habitat of an Oligochæte is the following brief passage in Nordenskjold's *Grönland* ('86, p. 193): "With the exception of a few birds (seen) on the return trip the only animal observed was a worm living on the different species of ice algæ and therefore probably belonging to the fauna of the inland ice." This worm has not been described, and if really an Oligochæte, may be identical with *Mesenchytræus solifugus.*

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[3] The "snow-worms" have been reported by previous explorers of the glaciers of Alaska; by Prof. Wright ('87), from the Muir Glacier, and Prof. Russell, from the Malaspina Glacier. Prof. Wright has kindly sent me some examples collected by him from shallow pools of water on the ice sheet. They prove to represent both *M. solifugus* and *M. nivus.* Prof. Russell ('92) fully confirms Mr. Bryant's account of their habits in the following passage: "In the early morning before the sunlight touched the snow its surface was literally covered with small, slim, black worms, about an inch long, . . . . These creatures were wriggling on the snow in thousands, but as the sun rose and made its warmth felt they disappeared beneath the surface. They are not seen when the temperature is above freezing." In a letter Prof. Russell adds the interesting information that he has observed similar worms on the snows of Mt. Rainier, Wash., thus indicating for them a wide distribution. Arctic and Alpine explorers should be on the watch for them.

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## EXPLANATION OF PLATE VII.

### Mesenchytræus solifugus.

Fig. 1. A ventral view of the anterior twelve somites of the worm, showing the position of the spermathecal and male and female genital pores. × 20. st, spermathecal pore at IV–V. ♂ male, ♀ female, pores.

Fig. 2. Profile view of the anterior thirteen somites of the same specimen, showing the position of the setæ bundles. Lettering as before. The lips of the atrium are everted to form a penis. × 20.

Fig. 3. Semidiagrammatic figure of the reproductive organs contained in somites XI–XXII. × about 35. *t*, testes; *ss*, left sperm sac; *rss*, right rudimentary sperm sac; *sf*, sperm funnel; *vd*, sperm ducts (the right one, lying within the ovisac, is here represented diagrammatically as nearly straight; the left, lying in the cœlom, is exhibited with nearly its actual arrangement of folds and coils); *se*, saccus ejaculatorius; *a*, atrium; ♂, male pore, here shown in a position much more laterad than is proper; *ov*, ovaries; *ovs*, the single ovisac, here represented as only partly filled with ova; ♀, female pore in a position more laterad than is natural.

Fig. 4. Outline of the supraœsophageal gland, from a dissection. × 48.

Fig. 5. Outline and optical section of a spermatheca showing the three diverticula and the external pore below; the upper end is broken and the ampulla not so large as usual. The point where the break is indicated is about where it becomes continuous with its fellow and opens into the œsophagus. × 48.

Fig. 6. A section through somite XVI, showing the relation of the sperm sac, ovisac and the sperm ducts to one another and the intestine and nerve cord. × 55. *ss*, sperm sac filled with developing spermatozoa; *ovs*, ovisac containing ova and the right sperm duct; *lvd*, left sperm sac; *nc*, nerve cord.

Fig. 7. Median vertical section through the anterior end. × 55. *m*, mouth; *cp*, cephalic pore; *cg*, supraœsophageal ganglion; *nc*, ventral nerve cord; *ph*, pharyngeal pad.

Fig. 8. Section of a small portion of the body wall, from the preclitellar region, showing the remarkable development of pigment granules in the epidermis. × 440.

## DESCRIPTIONS OF NEW SPECIES OF TURBONILLA OF THE WESTERN ATLANTIC FAUNA, WITH NOTES ON THOSE PREVIOUSLY KNOWN.

BY KATHARINE JEANNETTE BUSH.

The present article is based on a small, but very interesting, collection of gastropods belonging to the genus *Turbonilla*, which, through the courtesy of Mr. Pilsbry, was recently loaned to the writer for study.

With few exceptions the specimens had been labelled as known southern species and in a few instances had been figured in Tryon's *Manual*, but a careful comparison with the original descriptions and figures showed that these names were incorrectly applied. Most of the species are now described and figured as new. That so many personal names have been adopted for them is, to a great extent, due to the almost overwhelming confusion existing in the names of the hundreds of already described living species (still more increased among fossil forms), by their duplication and, in some instances, reduplication, especially due to the lax usage of some authors in respect to the two genera, *Turbonilla* and *Odostomia*.[1]

During the past few months the writer, jointly with Prof. A. E. Verrill, has arranged and studied the many hundreds of specimens belonging to these genera, dredged by the U. S. Fish Commission from 1871–1887, and also those in the Yale University Museum. The larger part of them represent unknown forms, fine figures of which have been prepared, and, as soon as practicable, will be published with their descriptions.

The acknowledgments of the writer are here expressed to Mr. Pilsbry for the privilege of publishing the following descriptions, and especially to Prof. Verrill, to whose generosity the drawings for the accompanying plates are wholly due.

*List of Localities with the Species found at each.*

Coast of North and South Carolina. William Stimpson; R. Swift.

No. 72,042. **Turbonilla Stimpsoni,** new species—not *T. interrupta* (Totten). 1 specimen

South Carolina. William Stimpson; R. Swift.

[1] Tryon's Manual, viii.

No. 72,043. **Turbonilla textilis** Kurtz (?) variety *a*—not typical. 2 specimens.

### Bermuda. A. Heilprin.

No. 70,024. **Turbonilla Penistoni**, new species—not *T. pulchella* d'Orb. 1 specimen.
No. 79,009. **Turbonilla Heilprini**, new species—not *T. pulchella* d'Orb. 1 specimen.

### Off Micco, Indian river, Fla., two fathoms, mud. F. C. Baker.

No. 60,125. **Turbonilla elegans** Verrill (?), variety (?)—not *T. interrupta* (Totten). 1 specimen.
No. 79,006. **Turbonilla** sp. (?)—not *T. interrupta* (Totten). 1 young specimen.
No. 79,007. **Turbonilla** sp. (?)—not *T. interrupta* (Totten). 1 young specimen.
No. 60,344. **Truncatella** sp. (?)—not *T. interrupta* (Totten). 3 specimens.

### Sarasota Bay, Fla. H. Hemphill.

No. 72,049. **Turbonilla Dalli**, new species. 3 specimens.
No. 79,013. **Turbonilla Hemphilli**, new species. 3 specimens.

### Marco, Fla., two fathoms. H. Hemphill.

No. 72,051. **Turbonilla textilis** Kurtz (?). 2 specimens.

### Tampa Bay, Fla. Conrad; J. S. Phillips.

No. 72,052. **Turbonilla Conradi**, new species. 1 specimen.
No. 79,024. Too poor for identification. 1 specimen.

### West Florida. C. W. Johnson (?), 1891.

No. 62,800. **Turbonilla incisa**, new species. 3 specimens.
No. 79,023. **Turbonilla incisa** var. **constricta**, new. 2 specimens.

### St. Thomas, W. I. R. Swift.

No. 72,055. **Turbonilla Swiftii**, new species—not *T. pulchella* d'Orb. 9 specimens.
No. 72,044. **Turbonilla inclinata**, new species—not *T. pusilla* C. B. Adams. 1 specimen.
No. 79,010. **Turbonilla unilirata**, new species—not *T. pusilla* C. B. Adams. 4 specimens.
No. 79,011. **Turbonilla Penistoni** Bush, (?) variety (?)—not *T. pusilla* C. B. Adams. 1 young specimen.
No. 79,012. **Turbonilla abrupta**, new species—not *T. pusilla* C. B. Adams. 1 specimen.
No. 72,045. **Turbonilla Pilsbryi**, new species—not *T. Riisei* Mörch. 1 specimen.
No. 72,050. **Turbonilla pyrrha**, new species—not *T. subulata* C. B. Adams. 3 specimens.
No. 79,017. **Turbonilla pyrrha**, variety *a*—not *T. subulata* C. B. Adams. 2 specimens.
No. 79,018. **Turbonilla pyrrha**, variety *c*—not *T. subulata* C. B. Adams. 3 specimens.
No. 79,019. **Turbonilla pyrrha**, variety *d*—not *T. subulata* C. B. Adams. 3 specimens.
No. 72,053. **Turbonilla pyrrha**, variety *b*—not *T. puncta* C. B. Adams. 3 specimens.
No. 72,047. **Cingula** (?) or **Fenella** (?)—not *T. dubia* d'Orb.
No. 79,025. **Cingula** (?) or **Fenella** (?)—not *T. dubia* d'Orb.
No. 79,026. **Cingula** (?) or **Fenella** (?)—not *T. dubia* d'Orb.
No. 79,027. **Cingula** (?) or **Fenella** (?)—not *T. dubia* d'Orb.
No. 79,028. **Cingula** (?) or **Fenella** (?)—not *T. dubia* d'Orb.

### No locality given. R. Swift.

No. 72,046. **Turbonilla substriata** C. B. Adams. 2 specimens.
No. 79,016. **Turbonilla puncta** C. B. Adams—not *T. substriata* C. B. Adams. 5 fragments.
No. 79,020. **Turbonilla pyrrha**, new species—not *T. turris* d'Orb. 2 specimens.
No. 79,021. **Turbonilla pyrrha**, variety *a*—not *T. turris* d'Orb. 1 specimen.
No. 72,054. **Turbonilla pyrrha**, variety *b*—not *T. turris* d'Orb. 1 specimen.
No. 79,022. **Turbonilla pyrrha**, variety *c*—not *T. turris* d'Orb. 1 specimen.
No. 72,048. **Turbonilla pupoides** d'Orb.—not *T. flavocincta* C. B. Adams. 2 specimens.
No. 79,014. **Turbonilla pupoides**, variety **ischna**, new—not *T. flavocincta* C. B. Adams. 4 specimens.

No. 79,015. **Turbonilla compsa,** new species—not *T. flavocincta* C. B. Adams. 1 specimen.
No. 72,056. **Turbonilla pupoides** d'Orb. 1 specimen.

Maldonado Bay, Uruguay, three to six fathoms. Dr. William R. Rush, 1897.

No. 70,537. **Turbonilla atypha,** new species. 2 specimens.
No. 70,535. **Turbonilla Rushii,** new species—not *T. interrupta* (Totten). 1 specimen.

### TURBONILLA.

**Risso,** 1826 (*sensu extenso*).

The genus *Turbonilla* is here taken in its most extended sense to include all species having a more or less elongated form, consisting of few or many planulate or more or less convex, sometimes shouldered, whorls, always ornamented with more or less prominent, transverse ribs, and always having a reversed, flattened or projecting nucleus consisting of about 1½ to 3 whorls, tilted from transverse to the axis to more or less oblique. Intercostal spaces smooth or crossed by more or less distinct, incised, sometimes raised, spiral lines which often also appear on the base, which varies from short, little rounded (the body-whorl subangulated at the periphery), to elongate and well-rounded. Aperture varying from subquadrate with straight pillar-lip, to elongate-ovate, well-rounded and produced below, with curved pillar-lip. Peritreme generally discontinuous, rarely continuous; inner-lip more or less thickened and reflected, usually with a plication or fold, often invisible externally; outer-lip almost always thin, seldom thickened.

In its most restricted sense the genus was proposed by Risso, 1826, from Leach's manuscript, for *Turbo lacteus* Linné, as the type, of which *Helix elegantissima* Montagu is now considered a synonym. This species has an elongated form; an obliquely tilted nucleus of about 1½ flattened whorls; well developed transverse ribs ending at the periphery of the body-whorl, with smooth, intercostal spaces; base smooth; aperture somewhat elongated; pillar-lip straight, thickened and reflected.

Many species have, however, come to light which not only possess these characters in a more or less marked degree, but have others in addition. This has rendered it necessary to introduce new limits for the genus. Many additional names have been proposed by various authors (Carpenter, 1855–7; Monterosato, 1884; Sacco, 1892, and others) for these new divisions, which need much careful study and will be further discussed in the article on the genus now in course of preparation.

**Turbonilla interrupta** (Totten) H. and A. Adams.

*Turritella interrupta* Totten. Amer. Jour. Sci., xxviii, p. 352, fig. 7, 1835.

This very much misinterpreted species was described by Totten, as follows:

"Shell small, subulate, brownish; volutions about ten, almost flat, with about twenty-two transverse, obtuse ribs, separated by grooves of equal diameter, and with about fourteen subequal, impressed, revolving lines, which are arranged in pairs, and entirely interrupted by the ribs; below the middle of the body-whorl, the ribs become obsolete, and the revolving lines continuous; aperture ovate, angular above, regularly rounded below, about one-fifth the length of the shell; right lip, sharp, indistinctly sinuous; length, .22 of an inch; breadth, .07."

Dredged in Newport, R. I, harbor.

The number of specimens is not given, but, as the description is so clearly defined, it is safe to assume that there was only the figured one. My efforts to find whether or not it is still in existence have been unsuccessful.

The specimens found in Dartmouth harbor, Mass., and identified as this species by Prof. C. B. Adams, are still in the cabinet at Amherst College, where I have recently examined them and found that none agree with the original descriptions or figure. Adams[2] mentions that he identified them by the description, but calls attention to the great variation among them, as follows:

"The number of transverse ribs is seldom less than twenty-five, and often exceeds thirty. Above the body-whorl, the number of revolving lines does not exceed eight. The arrangement of them in pairs does not distinctly appear in these specimens."

These facts have been overlooked by more recent authors and these specimens have always been recorded, as the second authentic specimens to have been found. They really represent four (4) distinct species. One specimen (*a*) has the form of *T. areolata* Verrill, but the five (5) spiral lines are not so evenly spaced as in that species. Three specimens (*b*) have the general form of Totten's figure, but there are only five (5) nearly equally spaced,

[2] Boston Journal Nat. Hist., ii, p. 275, 1838.

coarse, spiral lines on the intercostal spaces; they are examples of an undescribed species or possibly a variety of *T. elegans* Verrill. Two specimens (*c*), one badly worn and one young, have the whorls slightly more convex, with seven (7) equally separated, coarse, incised lines between the ribs, and agree with U. S. F. C. specimens of an undescribed species found abundantly in Vineyard Sound. One specimen (*d*), badly worn, is like another undescribed U. S. F. C. species, a comparatively few specimens of which have also been found in Vineyard Sound. The spirals are of unequal size and are arranged in two wide, deep, but little separated grooves, just above the suture; a group of three similar grooves, a little above the middle of the whorls, above and below which are about seven fine, incised lines, sometimes a few finer ones appear, so that there are in all from twenty to twenty-two lines. An example with about 10 whorls is over 7 mm. long and 2 mm. in diameter.

An example of this species, labelled *T. interrupta*, thought to have been identified by Stimpson, has been sent to me by Dr. Dall. Several very poor ones (Nos. 79,008 and 68,426) found at Sea Isle City, N. J., were also received from Philadelphia.

Gould, in his first report on the Invertebrates of Massachusetts (1841, p. 268), redescribes and figures the species, but evidently did not have access to the type, as the figure is very unlike Totten's, and the ribs and spirals are given as follows:

"From twenty-five to thirty straight, blunt ribs crossed by about fourteen revolving lines which are interrupted by the ribs; these lines are arranged in pairs, but so close to each other as not always to be distinguished, and would usually be regarded as one."

Prof. John M. Clarke has recently very courteously consulted the records of the State Museum, Albany, N. Y., and failed to find such a species in the Gould collection, so that the above remarks probably applied to Adams' specimens.

Stimpson, 1851, records additional examples which he found in Boston harbor.

As the locality of the type was Newport, R. I., harbor, it is safe to assume that the species could also be found in the near vicinity, at Narragansett bay; but none of the southern specimens in this collection, identified as *interrupta*, are at all like any form found by the U. S. F. C. in that locality. Figures and descriptions of these northern species will soon be published so that the true *interrupta* may be clearly understood.

All of these forms are distinct from *T. rufa* Philippi, specimens of which, collected in 8–10 fathoms, Church Bay, Ireland, have recently been received from Mr. Chaster, of Southport, England. In these, there are but five, unevenly spaced, incised, spiral lines on the intercostal spaces and three or four, finer ones on the base. In specimens from the same locality, of the smaller, distinct species, *T. fulvocincta* Thompson, the intercostal spaces have a wide, uninterrupted portion next the suture, below which there are six incised lines, varying in size in different specimens, and five, distinct ones on the base. An example with 9 whorls is 6½ mm. long. Two specimens from off Cape Hatteras, N. C., labelled as var. *fulvocincta* Jeffreys, sent me by Dr. Dall, differ decidedly from these. Both have 9 whorls, but differ in length, one measuring 5, the other 5½ mm. The intercostal spaces are cut by unequal spiral lines, varying in number; six or seven, wide and deep ones below, and six or twelve finer ones above, the upper ones scarcely visible.

In 1866, Mr. Krebs, of St. Thomas, W. I., visited Amherst College, and afterwards published "Remarks on the C. B. Adams' Collection," in the *Annals of New York Lyceum*, viii, p. 395, 1866.

Those relating to the species of *Chemnitzia* are as follows:

"*Chemnitzia exilis, C. flavocincta, C. lævis* and *C. subulata* are very like each other.

"*Chemnitzia multicostata* and *C. substriata*, when a sufficient number of specimens are at hand, may prove to be synonyms.

"*Chemnitzia obeliscus* is described from three fragments of different individuals and *C. puncta* from two miserable specimens.

"One species from Jamaica, seven from St. Thomas and three from West Indies are without names."

These show that Adams' specimens must either have been very poor or that the collection, as suggested by Mörch, 1875, had been disarranged when Mr. Krebs made these notes. It certainly is a little peculiar that such different species so carefully described by Adams should be so grouped. It is very unfortunate that only the empty trays are now to be found in the cabinet, the specimens themselves having been taken from the cases and not returned. It is owing to these facts that the present collection is of peculiar importance, as it contains the specimens figured in Tryon's *Manual* as Adams' species.

**Turbonilla Pilsbryi,** new species. Plate VIII, fig. 9.

Shell of good size for the genus, stout, pure opaque white, in some places semitransparent, lustrous, regularly coiled, with the entire surface, except the nucleus and ribs, covered by numerous, unequal, spiral grooves, so crowded that the spaces between them appear like fine, uneven threads. Whorls swollen, indistinctly bevelled on the top, 6 below the prominent, oblique, flattened nucleus. Suture distinct. Transverse ribs about 26, very delicate, scarcely more than little raised lines, slightly oblique, the inclination toward the aperture (to the right), separated by wide, shallow spaces. Body-whorl elongated, well-rounded, with the ribs extending well over the base, gradually decreasing in size to the inner-lip. Aperture oblique-ovate with continuous peritreme; inner-lip represented by a thin glaze; columella having an obscure, median, toothlike swelling; outer-lip thickened within, with well-rounded edge.

Length, about $4\frac{1}{2}$ mm.; diameter, about $1\frac{1}{2}$ mm.; length of aperture, about 1 mm.

One specimen (No. 72,045) found at St. Thomas, W. I , by R. Swift.

This very beautiful species was labelled as *T. Riisei* Mörch, which was originally described by Mörch (*Syn. Moll. Mar. Ind. Occid.*, p. 165, 1875) as having the form of *Rissoina Catesbyana* d'Orbigny (*Hist. l'Ile de Cuba*, atlas, Pl. XII, figs. 1, 2). The type from St. Thomas, W. I., collected by Riise, was club-shaped, thick, deep yellow, white at the suture, with two darker bands, the superior one near the suture and the other median, with very delicate spiral striæ. Costæ numerous, about 40, continuous to the aperture, which is ovate with a continuous thickened peritreme, with a thickened white lip and an indistinct columellar fold. Length, $3\frac{1}{2}$ mm.; diameter, $1\frac{1}{3}$ mm.

The figure given by Tryon (*Manual,* Pl. 76, fig. 27), although said to be figured from the type, represents a species very different from either form.

**Turbonilla asperula,** new species.

Shell small, slender, golden brown, with slight lustre, consisting of 6 moderately convex, somewhat shouldered whorls below the prominent oblique nucleus of but little over one whorl. Transverse ribs 26, slender, prominent, oblique (inclined to the right), with a decided angle at the shoulder of the whorls, and extending over the periphery of the body-whorl, gradually decreasing in size on the base. Interspaces wide and deep, crossed on the last whorl by 5 (sometimes 6) about equal and evenly spaced, raised, rounded, spiral lines, the first just at or a little below the shoulder, and the last just at the periphery; under the microscope they appear to render the sides of the ribs very irregular and the alternating spaces are crossed by scarcely discernible striæ. Base elongate, ornamented between the ribs by 4 more prominent, widely separated, raised, spiral lines, below which there are ill-defined fine ones; aperture ovate; peritreme continuous.

Length of the largest specimen, 3 mm.; diameter, 1 mm.; length of aperture, about $\frac{4}{5}$ mm.

Five specimens of this very distinct species were found at Bermuda by Prof. Verrill and party, 1898.

**Turbonilla pupoides** d'Orbigny. Plate VIII, fig. 5.

*Chemnitzia pupoides* d'Orb., Hist. l'Ile de Cuba, i, p. 224; atlas, Pl. XVI, figs. 32–36, 1853.
*Chemnitzia* (*Mumiola*) *pupoides* Mörch, Syn. Moll. Mar. Ind. occid., p. 164, 1875.
*Turbonilla pupoides* Tryon, Manual, viii, p. 332, pl. 76, fig. 26, 1885.
? *Odostomia phrikalea* Watson, Report Voy. Challenger, Zoöl. Scaphopoda and Gasteropoda, xv, p. 493, Pl. XXXII, fig. 7, 1885.

A single specimen (No. 72,056) in the R. Swift collection, without locality, was labelled as this species, but is too poor to identify with certainty. It has 7 flattened, regularly increasing whorls below the apparently blunt, little raised, tilted nucleus, and in form and size agrees with d'Orbigny's figure.

The 24 straight, prominent, transverse ribs are perpendicular on the upper whorls and oblique (inclined to the left) on the lower ones and extend over the base, gradually decreasing in size. These are separated by wider, deep spaces which, under the microscope, appear much deeper near the suture than below, giving a constricted appearance to the whorls without affecting the ribs. Base elongated, rounded, ornamented between the ribs, except on the lowest portion, by about 7 raised, spiral threads separated by nearly uniform, deep spaces. Such lines are represented in d'Orbigny's figure, but none are mentioned in his description. The specimen is so worn and encrusted that other spiral sculpture, if present, cannot be determined. Under the microscope the whorls are seen to be well-lapped with a rounded undulating edge turning well out at the deep suture. The aperture is broken.

Two other specimens (No. 72,048), also of the R. Swift collection, were labelled *T. flavocincta* C. B. Adams, but the figure given in Tryon's *Manual,* as made from a specimen, does not represent either of them. These differ in some respects from the above example, but agree with others found at Bermuda by Prof. A. E. Verrill and party in 1898. Among these, which number over 40, there is considerable variation. The nucleus is usually but little raised, but sometimes is quite prominent and oblique; the number of lines on the base varies from 7–10, with finer ones below; the number of ribs varies from 22–26, sometimes 30 or more when the specimen has been injured; they are usually straight, sometimes slightly curved, usually perpendicular, sometimes oblique. Some specimens have on the upper portion of the intercostal spaces, two well-separated, inconspicuous grooves, and on fresh examples which are yellow-white, semitransparent and lustrous with bands of waxen color at the sutures and on the periphery of the body-whorl exceedingly fine striæ appear under the microscope. The aperture is ovate, lustrous within, when fresh, with continuous peritreme, the inner-lip represented by a thin layer of enamel having a delicate free edge. The shell increases regularly in diameter to the 6th or 7th whorl, and beyond the increase is more gradual.

Length of a 7-whorled specimen, $3\frac{1}{2}$ mm.; diameter, 1 mm.; length of aperture, about 1 mm.

A worn dead specimen dredged by the "Challenger" in 390 fathoms off Culebra, W. I., was described and figured by Watson as *Odostomia phrikalea.* It agrees so closely with the above examples that there is little doubt of its being the same species.

**Turbonilla pupoides** variety **ischna,** new.

Four specimens (No. 79,014) differ from the typical form, in being much more slender. After the 4th or 5th whorl the increase in diameter is so gradual that the sides of the spire appear nearly parallel. Specimens 4 mm. in length, being of the same diameter as others of but about half that length. Over a dozen of this form were among the Bermuda specimens.

**Turbonilla textilis** (?) Kurtz. Plate VIII, fig. 2.

*Chemnitzia textilis* Kurtz, Cat. Mar. Shells, p. 8, 1860.
*Turbonilla textilis* Tryon, Amer. Mar. Conch., p. 65, 1873 ; Manual, viii, p. 329, pl. 75, fig. 12 (variety), 1885.

Shell small, rather stout, bluntly tapered, white, semitransparent, of dull lustre, with swollen whorls bevelled above, just below the suture, forming a rounded shoulder and having a few, coarse, spiral grooves on the interspaces and a few, raised, spiral threads on the base. Suture linear. Whorls 6 below the good-sized, oblique, flattened nucleus. Transverse ribs, which extend a little below the periphery of the body-whorl, are 26, narrow, rounded, prominent, perpendicular, but a very little inclined to the right on the last whorl, their sides rendered uneven by the cutting in of the spiral grooves, separated by wider, deep spaces, which are crossed by 5 wide, deep, spiral, grooves of about equal size and evenly separated, the top one just at the shoulder of the whorls. Base elongated, rounded, cut by two equally wide, well separated, deep, spiral grooves, interrupted by the ribs which here disappear; below, there are four or five, raised, spiral threads separated by shallow grooves. Aperture very smooth and lustrous within, elongate-ovate with the pillar-lip thin and reflected, especially below.

Length, $3\frac{1}{5}$ mm. ; diameter, $1\frac{1}{5}$ mm. ; length of aperture, 1 mm.

Two live specimens (No. 72,051) found in two fathoms at Marco, Fla., by Mr. H. Hemphill. A badly worn young specimen from Station 2,114, off Cape Hatteras, N. C., in fourteen fathoms, dredged by the U. S. F. C. in 1883, agrees closely with these, but is too poor to identify with certainty. The same is true of an example from Bermuda.

They are easily recognized by the distinctly shouldered whorls and coarse spiral grooves, and may be examples of the true *textilis* of Kurtz. "Whorls shouldered" is the only feature given in the original description which separates that species from many others.

Two small, live specimens (No. 72,043) in the R. Swift collection were collected by Stimpson on the coast of South Carolina and were labelled as *T. textilis* Kurtz, and figured by Tryon. Both have the apex somewhat eroded and the body-whorl has been injured and repaired. They are more slender than the typical form (No. 72,051). The larger has 6 moderately swollen, not distinctly shouldered whorls, below the rather prominent, oblique, flattened nucleus. Suture well impressed. Transverse ribs about 20, narrow, rounded, perpendicular, separated by wider, shallow spaces which are crossed by 5, wide, deep, spiral grooves. Body-whorl slightly angulated at the periphery, rounded and elongated below, crossed by two, wide grooves, interrupted by the ribs, and below by four or five, rather indistinct, raised, spiral threads and wider grooves.

Length, 3 mm.; diameter, 1 mm; length of aperture, $\frac{4}{5}$ mm.

As the well impressed suture gives only a well-rounded summit, and not a distinct shoulder, to the whorls, these specimens cannot be examples of the true *textilis*, but are doubtless a variety of No. 72,051, from which they differ in having flatter whorls, more tapered apex and little rounded base. The form of the aperture in the variety is somewhat angular, expanded below with the columellar-lip straighter, thin and reflected, forming an angle at its juncture with the outer-lip.

**Turbonilla fasciata** d'Orbigny (?).

*Chemnitzia fasciata* d'Orbigny, Voy. Amer. Mérid, p. 496, pl. 76, figs. 4–6, 1847 (?) ; Mörch, Syn. Moll. Mar. Ind. occid., p. 164, 1875.
*Turbonilla fasciata* Tryon, Manual, viii, p. 331, pl. 76, fig. 25, 1885.
Not *Chrysallida fasciata* Carpenter, 1857, nor *Odostomia fasciata* Dunker, 1860, nor *Dunkeria fasciata* Tenison-Woods, 1875.

A few specimens (12) from Bermuda differ from forms of *pupoides* in the greater size and prominence of the very oblique nucleus and in the much shortened, little rounded base over which the transverse ribs do not extend, but become evanescent near the abruptly rounded periphery of the body-whorl. The aperture in all of them is badly broken. The peritreme does not appear to be continuous and the pillar-lip is reflected and considerably thickened, especially below. On some, there are slight indications of spiral lines on the intercostal spaces. Raised, rounded, spiral threads ornament the base.

Length of the largest example, $2\frac{4}{5}$ mm.; diameter, $1\frac{1}{5}$ mm. Length of the smallest, $1\frac{1}{2}$ mm.

D'Orbigny's original description and figures are not accessible to me, but the above characters seem to agree with those given by Tryon.

The line next the figure, indicating its size, as given by Tryon, measures 5 mm., but in the text the size of the species is given as 3 mm.

**Turbonilla Stimpsoni**, new species. Plate VIII, fig. 7.

Shell pure white, slender, with elongated whorls, causing the apex to appear very pointed. Whorls flattened, 9, besides the elongated, smooth, shining, prominent, slightly oblique, flattened nucleus. Suture deep, forming distinct notches in the otherwise straight outlines of the spire, scalloped by the ends of the numerous ribs. These are about 36, narrow, rounded, very oblique (inclined to right), separated by much narrower, rather deep spaces which are crossed by nearly equal, but irregularly spaced, incised lines which form deep pittings. Under a half-inch pocket lens 9 can be counted which increase to 10 or 11 under the microscope, and are seen to cut into the sides of the ribs. On the base the ribs merge into prominent lines of growth which are cut by four widely separated, conspicuous, revolving lines, with a few very fine ones below. Base well-rounded. Aperture elongate-ovate, with the pillar-lip curved and moderately thickened.

Length, $5\frac{2}{5}$ mm.; diameter, 1 mm.; length of aperture, 1 mm.

One specimen (No. 72,042) in the R. Swift collection was found by William Stimpson on the Carolina coast, and was labelled as *T. interrupta* (Totten). It is very unlike all the known northern forms. The *T. ornata* d'Orbigny, 1853, not Gould, 1861, has ribs which extend over the base, but according to d'Orbigny's figure, they are coarser, fewer in number and perpendicular; the whorls are more convex, the spire less acute and the spirals more numerous (*Hist. l'Ile de Cuba*, i, p. 221, atlas, Pl. XVI, figs. 18–20).

**Turbonilla incisa**, new species. Plate VIII, fig. 12.

Shell of medium size, moderately stout, white, semitransparent and lustrous, when fresh, with coarse, spiral, incised lines in the intercostal spaces and on the base. Suture well marked. Whorls flattened, 9 below the rather prominent, slightly oblique, flattened nucleus. Transverse ribs 20, broad, bluntly rounded, straight, perpendicular, with wider, shallow interspaces crossed by 7, rarely 6, coarse, unequal, incised, spiral lines or grooves, about evenly separated. In one example having 6 lines, the last, just above the suture, is very much broader and deeper than the others. Base well-rounded, cut by about 7, evenly spaced, incised, spiral lines. Aperture somewhat elongated; pillar-lip straight, thin, slightly reflected.

Length of the largest example, 6⅖ mm.; diameter, 1⅘ mm.; length of aperture, 1⅖ mm.

Three specimens (No. 62,800) from West Florida were presented by Mr. C. W. Johnson, 1891.

The more slender *Turbonilla virga* Dall is a closely related species In a specimen sent to me by Dr. Dall, the 10 flattened whorls (nucleus wanting) are much more gradually tapered so that it is but about one-half as wide as an example of *incisa* of the same length and the 7 incised lines are equal, and under the microscope appear to cut into the sides of the transverse ribs.

**Turbonilla incisa** variety **constricta**, new.

Two specimens (No. 79,023) from the same locality are of moderate size, slender, irregularly coiled (abruptly contracted in the 6th and 7th whorls), semitransparent, pale yellow (when fresh), with a broad band of brown on the base, and a fainter one at the suture. Upper whorls moderately convex, lower ones flattened. Suture well marked. Whorls 10 below the prominent, oblique, flattened nucleus. Transverse ribs irregularly developed, thin, narrow, but little raised, separated by wide, shallow spaces. On the 5th whorl, the interspaces are wide, but become much narrower on the 6th whorl with more delicate and more numerous ribs, while on the 8th whorl they again become wider, with much stronger ribs; and on the last whorl the ribs number about 26. Base well-rounded, cut by about 7 fine, incised, unevenly separated, spiral lines, the upper one the most distinct. Aperture ovate; pillar-lip thin, well reflected. The spirals on the upper whorls are arranged as in typical *incisa*, but on the lower ones, in the larger specimen, they number 7, but are of equal size, and evenly spaced; under the microscope 2 or 3 finer ones appear below the suture, and on the middle of the whorls; also on the lower portion of the base, numerous, still finer ones. When young, this variety could not be separated from the typical examples, but the peculiarity in its development, seen even in one with 7 whorls easily distinguishes it, at least as a variety.

Length of the larger specimen, 6⅕ mm.; diameter, 1.5 mm.; length of aperture, 1⅕ mm.

**Turbonilla elegans** Verrill (?) variety (?).

*Turbonilla elegans* Verrill. Amer. Jour. Sci., iii, p. 282, Pl. VI, fig. 4, 1872; Invert. Ani. Vineyard Sound, p. 363, Pl. XXIV, fig. 155, 1874.

Not *Chemnitzia elegans* d'Orbigny, 1853, nor *Odostomia elegans* A. Adams, 1860, nor *O. elegans* Monterosato, 1869.

Shell of good size, amber-colored, semitransparent, lustrous. Apex broken, remaining whorls 8; the upper ones are somewhat eroded, but the last one is well-rounded. Transverse ribs 22, rounded, straight, nearly perpendicular, separated by about equally wide shallow spaces which are crossed by 5 equal, well-separated, incised, spiral lines, and 2 (the 1st and 5th) very much finer ones. Base well-rounded, cut by 6 distinct, widely, unevenly spaced, incised, spiral lines. Aperture elongated; pillar-lip straight, thickened, slightly reflected below.

Length, 6 mm.; diameter, $1\frac{4}{5}$ mm.; length of aperture, $1\frac{1}{2}$ mm.

One specimen (No. 60,125) off Micco, Indian river, Fla., in two fathoms, mud. This is considerably larger than any of the northern examples of *elegans* Verrill, but so closely agrees with them in form that with a sufficient series it may prove to be a southern variety.

As the *Chemnitzia elegans* d'Orbigny (1853) is not a *Turbonilla* (in its peculiar thickened base, at which the transverse ribs terminate abruptly, it shows its close relation to *Cerithium turrita* Stearns from Florida), and *Odostomia elegans* A. Adams (1860) is spirally ornamented, and *O. elegans* Monterosato (1869) is smooth, Prof. Verrill's name need not be changed.

**Turbonilla** sp.?

A young specimen (No. 79,006) from off Micco, Indian river, Fla., is amber-colored, semitransparent and lustrous, rather stout, with distinct suture. The upper portion is wanting, the 6 remaining, somewhat flattened whorls are crossed by about 24, narrow, low, slightly oblique ribs inclined to the right, separated by wider, shallow spaces. These are crossed by about 8 (6 about equal and 2 more indistinct) unequal and unevenly spaced, incised, spiral lines. Base well-rounded, cut by numerous (about 15) fine, wavy, incised, spiral lines. Aperture ovate; pillar-lip curved, thin, slightly reflected.

Length, $3\frac{1}{2}$ mm.; diameter, $1\frac{1}{5}$ mm.; length of aperture, 1 mm. With a sufficient series, this might prove to be the same as a similar undescribed species common in Vineyard Sound and vicinity.

**Turbonilla** sp.?

Another young, imperfect specimen (No. 79,007) from the same locality has only the 6 lower whorls, the last one crossed by about 20 transverse ribs which are rounded, straight, and perpendicular, separated by about equally wide, shallow spaces which are cut by about 6 unequal, incised, spiral lines which increase to 10 under the microscope. Base well-rounded, cut by about 10 fine, incised, unevenly spaced, spiral lines. Aperture elongated; inner-lip straight, thin and reflected.

Length, $4\frac{4}{5}$ mm.; diameter, $1\frac{1}{2}$ mm.; length of aperture, about 1 mm.

**Turbonilla Conradi**, new species. Plate VIII, fig. 10.

Shell large, regularly coiled, stout, dirty waxen gray, ornamented with coarse and fine, incised, spiral lines on the intercostal spaces and base. Whorls 12, slightly convex, below the prominent, nearly flattened nucleus, transverse to the axis. Suture well marked, slightly undulating. Transverse ribs, about 22, broad, rounded, straight, slightly oblique, separated by wider, shallow spaces crossed by 4 conspicuous, incised lines, and several indistinct, finer ones. One just above the suture forms a wide and deep groove, another similar one at the middle of the whorls, on either side and well separated from this, a distinct line, the three forming a conspicuous band; above and below this there are other indistinct lines which, under the microscope, number 6 on each space; 2 others also appear on each side of the median groove. Base well-rounded, cut by 3 distinct, well-separated, incised, spiral lines and several finer ones below. Aperture squarish, well-rounded; pillar-lip straight, thickened, well reflected.

Length, $8\frac{1}{2}$ mm.; diameter, about 2 mm.; length of aperture, $1\frac{1}{2}$ mm.

One specimen (No. 72,052) was found by Conrad at Tampa Bay, Fla.

An undescribed species found off Cape Hatteras, N. C., has a band of three unequal incised lines on the middle of the whorls, but in other characters it is quite unlike. The *T. viridaria* Dall also bears a superficial resemblance to it, but when placed side by side the two are found to be very different.

**Turbonilla Rushii**, new species. Plate VIII, fig. 11.

A specimen with the upper portion badly worn is of good size, moderately stout, of 12 (minus the nucleus) regularly coiled whorls, nearly flat, with but a slight convexity a little above the well marked suture. Transverse ribs about 24, a little oblique, inclined to the left, rather narrow, rounded, with much wider, concave interspaces, which are crossed by unequal, incised lines. Under a half-inch pocket lens there are two near the suture and two above the periphery which form pairs of deep grooves of unequal width; besides these the surface is scratched by numerous, fine, unequal and irregularly spaced lines; 8 between the two sets of grooves; still finer ones above, on the upper portion of the whorl and 1 between the two lowest grooves. Under the microscope, a few more lines appear. Base rounded, crossed only by numerous fine, nearly equal, incised, revolving lines. Aperture somewhat elongate; outer-lip broken.

Length, $9\frac{1}{2}$ mm; diameter, $2\frac{1}{2}$ mm.; length of aperture, about 2 mm.

One specimen (No. 70,535) collected by Dr. William R. Rush, at Maldonado Bay, in 3–6 fathoms, Uruguay, was labelled as *T. interrupta* Totten. In form it is nearest the *T. viridaria* Dall, with specimens of which it has been compared, but the number and arrangement of the spiral sculpture easily distinguish it. It is very distinct from *T. dispar* Pilsbry,[3] from the same locality, which has 8, somewhat convex whorls below the somewhat flattened nucleus, transverse to the axis, with ill-defined transverse ribs, the interspaces crossed by 6 unevenly separated, spiral grooves which form oblong punctures.

This is a similar but much larger species than *T. areolata* Verrill, 1874, not Rayneval.

**Turbonilla pyrrha**, new species. Plate VIII, fig. 1.

Shell of moderate size, regularly coiled, delicate yellow (when fresh), thin, semitransparent, the interspaces and base cut by a few, unevenly separated, incised, spiral lines. There are ten slightly convex whorls below the prominent, shining, slightly oblique, flattened nucleus. Suture moderately deep. Transverse ribs about 40, very delicate, but little raised, perpendicular, sepa-

[3] These Proceedings, p. 296, Pl. VI, figs. 5–7, 1897.

rated by wider, shallower spaces which are crossed by comparatively few, incised, irregularly spaced lines, and also by a wide, deep, sutural groove, often stained by oxide of iron. Well separated from the groove, there is a group of from 5–7 equal and evenly spaced lines and a considerable distance above are 4 or 5 somewhat wider, unevenly, but well-separated lines. Base well-rounded, cut by about 7 conspicuous, incised spirals, about evenly spaced. Aperture somewhat elongated, well-rounded; pillar-lip straight, thin, reflected.

Length of the largest example, 6 mm.; diameter, $1\frac{1}{3}$ mm.; length of aperture, $1\frac{1}{3}$.

Three specimens (No. 72,050) from St. Thomas, W. I., and two worn specimens (No. 79,020) without locality. Some of them were labelled as *T. subulata* C. B. Adams, 1850 (not Holmes, 1860) and figured by Tryon. That species was described as "much elongated, subulate, white, or pale brownish white with two spiral bands of pale wax color and a third of the same color anteriorly. Spire with a slightly curved axis, outline scarcely convex; whorls ten, beside the moderately oblique nucleus; rather convex with suture well impressed. Transverse ribs, 28–30, prominent, slender, extending below the convexity of the body-whorl; the interspaces and base crossed by numerous, exceedingly fine crowded spiral striæ, of which one next below the suture is larger. Aperture ovate, acute above, labrum slightly thickened. L., .17; B., .045 inches."

Two smaller specimens (No. 79,017) having only 9 whorls differ from the typical ones in having 42 ribs, two wide, deep grooves on the interspaces, one at the suture and one above the middle of the whorls, between which, and equally well separated from them, a group of 7, equal and evenly spaced, incised lines; above, near the suture, are also two incised lines. These are designated as variety *a*. A badly worn specimen (No. 79,021), without locality, also has 42 delicate ribs.

Three, opaque white, weather-worn specimens (No. 72,053) were labelled *T. puncta* C. B. Adams, and figured by Tryon. In outline they agree with specimens (No. 72,050), but they have but 30 transverse ribs, with the shallow interspaces crossed by a sutural groove and well separated from it, a group of 5, equal and evenly spaced, incised lines, and a considerable distance above, reaching to the suture, 4 evenly spaced ones, the lower one sometimes a little larger than the others. These are designated as variety *b*.

Length of the largest, 5½ mm.; diameter, 1 mm.

Another example (No. 72,054), without locality, was labelled as *T. turris* d'Orbigny, which is described as a very elegant, elongated, very acute, thin, white species of 14 somewhat flattened whorls. Transverse ribs (according to the figure) about 24, narrow, perpendicular, with spiral lines only on the base. Suture impressed. Aperture subtrapezoidal; labrum thin, columellar-lip thickened, straight.

Four specimens (No. 79,018) have more elongated whorls than the typical examples (No. 72,050), so that specimens of the same number of whorls are a little longer. The transverse ribs number but 28 in the largest specimen, in the others, 30. The interspaces are crossed by a sutural groove, above and well separated from it, a group of 5 incised lines; some distance above, a single more distinct line and at an equal distance above, a group of 3 finer ones which reach to the suture. This is called variety *c*. A single specimen (No. 79,022), without locality, differs in having the single line above the periphery as wide and deep as the sutural groove.

Three specimens (No. 79,019) have but 32 ribs and 2 spiral grooves as in variety *a*, but the lower group of incised lines numbers from 7–9, and the upper, 5. This is variety *d*.

**Turbonilla puncta** C. B. Adams.

*Chemnitzia puncta* C. B. Adams, Cont. to Conch., No. 5, p. 72, 1850; Mörch, Syn. Moll. Mar. Ind. occid., p. 162, 1875.

*Turbonilla puncta* Tryon, Manual, viii, p. 331, not Pl. 76, fig. 22, 1885; (?) Dall, Bull. U. S. Nat. Mus., No. 37, p. 128, 1889.

C. B. Adams described this as a much elongated, white species of rectilinear outline with 10 or 11, besides the nucleus, scarcely convex whorls with distinct suture. Transverse ribs 26–30, rather prominent, the interspaces crossed by numerous crowded spiral striæ, one of which, a little above the middle and another at the suture, are wide and deep, resembling spiral series of punctures. Aperture ovate, rhombic; labium scarcely thickened. L., .22; B., .05.

According to Mr. Krebs, of St. Thomas, W. I., who examined the Adams collection in 1866, there were but two miserable specimens. A number of specimens found in from 1–10 feet water at Bermuda by Prof. A. E. Verrill and party, 1898, differ from the above only in having the fine lines also on the base.

An example with the animal consists of 10 flat whorls below the prominent, slightly oblique, flattened nucleus. Opaque white with little lustre, rather stout, regularly coiled. Suture distinct. Transverse ribs 30, narrow, rounded, perpendicular, with wider, deep interspaces cut by numerous, crowded, incised, spiral lines separated by fine, nearly uniform, raised threads, and two very wide and deep grooves, one at the suture and one above the periphery of the whorls, between which, under the microscope, the incised lines number about 26, and between the upper one and the suture about 16. Numerous, crowded, incised, spiral lines entirely cover the slightly rounded base, but the spaces between them are wider and flat, rendered wavy by conspicuous, irregular lines of growth. Aperture elongated; pillar-lip but little thickened, straight and slightly reflected.

Length, $6\frac{1}{5}$ mm.; diameter, $1\frac{1}{2}$ mm.; length of aperture, $1\frac{1}{5}$ mm.

Fragments (No. 79,016) without locality were found with the following species.

Another specimen from Bermuda differs in being much stouter, with 9 shorter whorls with somewhat angular body-whorl, and having only 24 transverse ribs, and but 20 incised lines between the grooves on the interspaces. In specimens which have been injured, the number of ribs is over 40.

The *T. punicea* Dall is a related species, and was dredged in considerable numbers in shallow water off Cape Hatteras, N. C., by the U. S. Fish Commission in 1883–1884. It is a small, slender species, with rounded base cut by several (about 7) fine, irregularly arranged, incised, spiral lines. The transverse ribs are little prominent with their interspaces cut by two distinct shallow grooves, one sutural and the other a little wider, peripheral, between which are fine, incised, unequally separated, spiral lines which vary in number from 4–7 above and below the middle groove; their distinctness and arrangement very inconstant. There is also a variety having still more numerous, finer and more regularly arranged lines, 8 below and 8–13 above the peripheral groove. An example loaned me by Dr. Dall is of a dull waxen color, changing to pinkish brown on the last whorl and has twelve, somewhat flattened whorls below the nucleus, which is injured. There are about 20 transverse ribs on the body-whorl, thin, narrower than their interspaces which, under the microscope, are crossed by about 7 fine lines below and from 4 to 7 above the central groove. The lines show more clearly in some positions than in others.

Length, 8 mm.; diameter, $1\frac{3}{5}$ mm.; length of aperture, $1\frac{2}{5}$ mm.

**Turbonilla substriata** C. B. Adams.

*Chemnitzia substriata* C. B. Ad., Cont. to Conch., No. 5, p. 73, 1850; O. A. L. Mörch, Syn. Moll. Mar. Ind. occi., p. 162, 1875.

*Turbonilla substriata* Tryon, Manual, viii, p. 330. pl. 76, fig. 21 (very poor), 1885.

"Shell moderately elongated white, with a slight tinge of wax color next above the suture, with about 22–24 transverse, rather stout ribs; in the intercostal spaces and anteriorly with very numerous crowded excessively minute spiral striæ, which are scarcely perceptible under a common magnifier; on the middle of the whorls is a series of spiral shallow pits in the intercostal spaces; on the last whorl, with the anterior extremity of the intercostal spaces moderately depressed, below the surface of the anterior region; spire with rectilinear outlines; whorls about eight, planulate, with a distinct suture; aperture rhombic-ovate; labium scarcely thickened; umbilical region scarcely indented. Length, .115 inch; breadth, .04 inch."

Two specimens (No. 72,046) without locality, were labelled as this species. They are white, semitransparent and lustrous. The nucleus is prominent, slightly oblique, somewhat flattened. The body-whorl subangulated at the periphery with a short, but little rounded base which, with the wide intercostal spaces are cut by numerous, very fine, shallow, incised, spiral lines, interrupted on the middle of the whorls by a much wider, inconspicuous, shallow line or groove, seen only in a good light, and under the microscope; above and below this, the spirals number about 30. The ends of the spaces are very deep, but the fine spirals cover the entire surface.

Length of the larger specimens, $3\frac{4}{5}$ mm.; diameter, $1\frac{1}{5}$ mm.; length of aperture, 1 mm.

This species is closely related to *T. puncta* C. B. Adams, but the whorls are shorter, the ribs narrow, perpendicular, with wide interspaces, and the spirals are not so deeply cut.

**Turbonilla unilirata**, new species. Plate VIII, fig. 6.

Shell small, very slender, gradually tapered, dead white (weather worn), without incised, spiral lines on the intercostal spaces and base. Whorls very slightly convex, 9, in the largest example, below the small nucleus, which is transverse to the axis, with very projecting whorls. Suture deep and straight. Transverse ribs narrow, rounded, slightly oblique, inclined to the left, varying from 20–24, with wider, deep, flattened interspaces ending at the periphery of the body-whorl with deeper, square-cut ends. The interspaces are crossed by a single, conspicuous, raised, spiral thread or lira, a little below the sutures. Base rounded, smooth. Aperture somewhat elongate; pillar-lip straight, thin and slightly reflected. In some of the examples the outer-lip is broken, revealing a spiral, tooth-like ridge on the columella.

Length of the type, 3 mm.; diameter, $\frac{1}{5}$ mm.; length of aperture, about $\frac{3}{5}$ mm. A larger specimen is $3\frac{1}{2}$ mm. long and about $\frac{4}{5}$ mm. wide.

Four specimens (No. 79,010) from St. Thomas, W. I., and a single worn, imperfect specimen, dredged by the U. S. Fish Commission, in 1884, off Cape Hatteras, N. C., at station 2,277, in 16 fathoms.

This species was labelled as *T. pusilla* C. B. Adams, 1850 (not Philippi, 1844), and appears to be the one figured by Tryon (*Manual*, Pl. 76, fig. 19) as an example of that species.

**Turbonilla Penistoni**, new species.. Pl. VIII, fig. 14.

*Turbonilla pulchella* Heilprin, The Bermudas, p. 173, 1889.

Shell white, exceedingly slender, gradually tapered, semitransparent, lustrous. Whorls moderately convex, 11, below the small nucleus of $2\frac{1}{2}$ very projecting whorls, transverse to the axis. Suture deep. Transverse ribs about 15 (the specimen has been injured) stout, rounded, oblique, slightly sigmoid, separated by about equally wide, deep spaces which terminate at the periphery of the well-rounded body-whorl with square-cut ends. Base rounded, smooth. Aperture somewhat elongated, with the pillar-lip straight, moderately thickened, reflected and forming a decided angle at its juncture with the thin outer-lip. Under the microscope the entire surface is covered with very fine, spiral striæ.

Length, $4\frac{1}{2}$ mm.; diameter, 1 mm.; length of aperture, about 1 mm.

The type (No. 70,024) was found by Prof. A. Heilprin and party at Bermuda in 1888, and identified as *T. pulchella* d'Orbigny, from which species it differs decidedly in its nucleus, more slender form, and oblique and curved ribs.

Several specimens and fragments were also found at Bermuda, in 10–40 feet, by Prof. A. E. Verrill and party, in 1898. In these, which are regularly developed, there are 18 ribs; but one example, the same size as the type, has the ribs inconstantly developed, there being 18 on the penultimate whorl and about 30 much fainter ones on the body-whorl. This irregularity seems due to a slight injury at the suture. There are also distinct lines of growth on the base and the angles of the aperture are rounded.

A single dead specimen (No. 79,011), without locality, in the R. Swift collection, has a similar prominent, projecting, transverse nucleus, convex whorls and form of aperture, but the 8 whorls increase very gradually, more so than in *T. Swiftii*, the base is but little rounded with a single brown spiral line. There are 16 transverse ribs.

Length, 3 mm.; diameter, about $\frac{3}{5}$ mm.

With a sufficient series, this may prove to be the young of a distinct species as the proportions are so unlike other examples of this species.

This beautiful shell is named in honor of Miss Annie Peniston, of Bermuda, who, through her keen interest in collecting specimens, has aided so much in increasing the knowledge of Bermuda shells.

**Turbonilla Swiftii,** new species.

Shell much elongated, very slender, gradually tapered, semi-transparent, lustrous. Whorls slightly convex, 13 in the most perfect specimen (16 or 17 in the largest, which is broken away at the top) below the prominent nucleus which is oblique, of $2\frac{1}{2}$ projecting whorls. Suture very distinct, deep, linear, giving a noticeable clean-cut effect. Transverse ribs, varying from 20–26, rounded, narrow, oblique, more or less curved, separated by much wider, deep spaces, which terminate on the periphery of the body-whorl with more or less square-cut ends. Base rounded, smooth. Outer-lip broken in all the specimens, inner-lip thin, reflected; aperture somewhat elongate, expanded below, with rounded angles. In some specimens there is a spiral, tooth-like ridge on the pillar-lip. Fine, microscopic striæ appear only on the base.

Length of the most perfect specimen, 6 mm.; diameter, 1 mm.; length of aperture, about 1 mm. The largest specimen, when perfect, probably measured over 7 mm.

Nine live and dead specimens (No. 72,055) from St. Thomas, W. I., in the R. Swift collection were labelled as *T. pulchella* d'Orbigny (not *Odostomia pulchella* A. Ad., 1861). That species seems, however, very different, for in a length of 7 or 8 mm. it is described as having but 12 convex whorls with the nucleus, which, according to the figure, is but slightly and peculiarly tilted. The number of transverse ribs is not given, but in the figure there are about 18, nearly perpendicular ones.

*T. Swiftii* differs from *T. Penistoni*, to which it is closely related, in its much more elongated, more evenly tapered form, deep suture, much narrower, more oblique ribs with wider interspaces, and especially in its less projecting, oblique nucleus.

**Turbonilla leuca**, new species.

Shell small, slender, white, semitransparent with considerable lustre. Whorls convex, 9 below the prominent nucleus transverse to the axis, with 2½ very projecting whorls. Suture well impressed. Ribs prominent, nearly perpendicular, slightly curved, from 20–24 (the last whorl has been injured), separated by little wider, deep spaces, terminating in rounded ends. Base well-rounded. Aperture somewhat elongated with curved, little thickened and reflected inner-lip.

Length, 4½ mm.; diameter, 1⅕ mm.; length of aperture, 1 mm.

One fresh and two dead specimens were found at Bermuda, by Prof. A. E. Verrill and party, 1898.

**Turbonilla Heilprini**, new species. Plate VIII, fig. 13.

Shell small, very slender, gradually tapered, white, semitransparent, very lustrous, whorls moderately convex, 8 below the prominent, slightly oblique, nearly flat nucleus of 1½ but slightly projecting whorls. Suture distinct, straight. Transverse ribs about 18, straight, nearly perpendicular, clean-cut, rounded, separated by equally wide, deep spaces terminating at the periphery of the body-whorl with square-cut ends. Base well-rounded, smooth. Outer-lip broken; inner-lip thickened. No microscopic striæ.

Length, 2½ mm.; diameter, about ⅗ mm.; length of aperture, ½ mm.

The type (No. 79,009) was placed with *T. Penistoni,* from which it is readily separated by its small size, straight ribs and very different nucleus.

**Turbonilla abrupta,** new species. Plate VIII, fig. 4.

Shell of moderate size, rather stout, dead white, irregularly coiled. The first 3 or 4 whorls enlarge quite abruptly, while below the increase is very gradual. Whorls flattened, 9 below the small nucleus, transverse to the axis, with projecting whorls. Suture deep, nearly straight. Transverse ribs about 20, rounded, oblique, nearly straight, separated by wider, deep, flat-bottomed spaces which terminate just above the suture in very square-cut ends. Base well-rounded, smooth. Aperture somewhat elongated, expanded below with rounded angles; inner-lip thin, reflected.

Length, 4 mm.; diameter, 1 mm.; length of aperture, 1 mm.

One specimen (No. 79,012) from St. Thomas, W. I., in the R. Swift collection was labelled as *T. pusilla* C. B. Adams. That species is described as having 10 or 11 whorls below the very oblique nucleus, ornamented by 12 stout, transverse-ribs. L., .135; B., .03 inches.

**Turbonilla inclinata,** new species.

Shell small, slender, gradually tapered, dead white (weather worn). Whorls flattened, 9 below the small nucleus, which has very projecting whorls and is transverse to the axis. Suture deep and straight. Transverse ribs, about 20, exceedingly oblique, inclined to the left, straight, flattened, rather narrow, with wider, flat-bottomed, moderately deep interspaces terminating at the periphery of the body-whorls in square, clean-cut ends. Pillar-lip thin, reflected; outer-lip broken.

Length, about $3\frac{1}{2}$ mm.; diameter, $\frac{4}{5}$ mm.; length of aperture, about $\frac{3}{5}$ mm.

One broken, dead specimen (No. 72,044), from St. Thomas, W. I., in the R. Swift collection. It is very different from all other known species, and is easily distinguished by the great obliquity of the transverse ribs, in which character it resembles the much larger species, *T. Campanellæ* Philippi.

**Turbonilla compsa,** new species.

One very poor specimen (No. 79,015), without locality, in the R. Swift collection, although without nucleus and with the outer-lip badly broken, differs so decidedly from the other species in the abrupt taper of its spire, flattened whorls and numerous, nearly straight ribs, as to seem worthy of description.

It is small, opaque white, with considerable lustre, with upper portion much more abruptly tapered than the lower. The 8 whorls flattened, the only curvature being just above the suture which is so deep and straight that each whorl extends out abruptly beyond the preceding one. Transverse ribs irregularly developed due to an injury, about 30 narrow, perpendicular, straight on the upper whorls, becoming slightly curved above, on the lower whorls, separated by wider, moderately deep spaces, which end at the periphery of the well-rounded body-whorl in clean-cut, rounded ends. Base elongate, well-rounded. Inner-lip straight, thickened.

Length, $3\frac{2}{5}$ mm.; diameter, about 1 mm.

**Turbonilla Dalli**, new species. Plate VIII, fig. 8.

This is a large, stout, regularly coiled, very beautiful species. bluish white, semitransparent, with dull lustre. Suture unusually deep, but not channeled. Whorls very convex, 12 below the prominent nucleus of 2 projecting whorls transverse to the axis. Transverse ribs 16, often opaque white, very prominent, slightly oblique, separated by very deep, concave, about equally wide spaces, which terminate in clean, square-cut ends, sometimes just above the suture. Base short, moderately convex, smooth. Aperture squarish; the outer-lip thin, greatly expanded, turning in abruptly to meet the straight, much thickened, not reflected, pillar-lip in a rounded angle. The entire surface covered with exceedingly fine microscopic striæ.

Length of largest specimen (apex gone), $8\frac{2}{5}$ mm.; diameter, $2\frac{1}{6}$ mm.; length of aperture, $1\frac{1}{2}$ mm.

Three live specimens (No. 72,049) were found at Sarasota Bay, Fla., by Mr. H. Hemphill. A single, large, imperfect specimen (No. 94,804, U. S. N. M.), from Cape Hatteras, N. C., loaned me by Dr. Dall, agrees perfectly with these specimens.

A poor worn specimen (No. 10,310, Peabody Museum), from Egmont Keys, Fla.

**Turbonilla Hemphilli**, new species. Plate VIII, fig. 3.

This species is closely related to the preceding, but is more slender, longer, with more pointed apex, smaller nucleus, less convex whorls, more numerous ribs and more elongated aperture.

Suture well marked. Whorls but slightly convex, 12 below the small nucleus, with projecting whorls, transverse to the axis. Transverse ribs about 20, rather stout, nearly perpendicular, rounded, separated by about equally wide, deep, concave spaces terminating at the periphery of the body-whorl in clean-cut ends. Base rounded, smooth. Aperture squarish, somewhat expanded below, with rounded angles; inner-lip thickened, reflected. Entire surface covered by very fine, microscopic striæ.

Length of the largest specimen (apex gone), 9 mm.; diameter, 2 mm.; length of aperture, $1\frac{1}{2}$ mm.

Three live specimens (No. 79,013) were found at Sarasota Bay, Fla., by Mr. H. Hemphill.

Three poor, worn specimens (No. 10,302, Peabody Museum) from West Florida, collected by Col. Jewett.

**Turbonilla atypha**, new species.

Two badly worn, imperfect specimens (No. 70,537) from Maldonado Bay, in 3–6 fathoms. Uruguay, both destitute of apices and having the outer-lip broken away, are so distinct from any other species as to be worthy of mention.

Shell of good size, long and moderately slender, thick, opaque white, tinted with yellow at the sutures, with considerable lustre. The larger specimen has 10 flattened whorls, having a slight bulge just above the well marked suture. Transverse ribs about 20, ill-defined, not reaching quite to the lower suture, broadly rounded, straight, very oblique, gradually decreasing in prominence as the shell increases, so that on the body-whorl they show but faintly. Interspaces narrow and shallow. Base elongate, well-rounded, smooth. Aperture badly broken; inner-lip considerably thickened and reflected.

Length of the larger specimen, $7\frac{1}{2}$ mm.; diameter, $1\frac{4}{5}$ mm.; length of aperture, about $1\frac{1}{2}$ mm.

This species is more slender and more gradually tapered, with fewer and less distinct ribs than *T. Uruguayensis*, described and figured by Mr. Pilsbry, 1897.

*References to the original descriptions of the species of Turbonilla belonging to this region.*

1826. Say, Thomas.—Journal Academy Natural Sciences of Phila., v, p. 208. Descriptions of Marine Shells Recently Discovered on the Coast of the United States.

1844. Philippi.—Mollusca Sicily, ii, p. 137, Pl. XXIV.

1847 (?). d'Orbigny, Alcide.—Voyage dans l'Amérique Méridionale, pp. 397 and 496, Pls. LIII and LXXVI.

1850. Adams, C. B.—Contributions to Conchology, No. 5, pp. 72–75. Descriptions of Supposed New Species of Marine Shells which Inhabit Jamaica.

1853. d'Orbigny, Alcide.—Histoire de l'Ile de Cuba, i, pp. 218–227, atlas, Pls. XVI–XVII.

1860. Kurtz, J. D.—Catalogue of Recent Marine Shells found on the Coasts of North and South America, p. 8.

1862. Gould, A. A.—Proceedings Boston Society of Natural History, viii, p. 280. Descriptions of New Genera and Species of Shells.

1875. Mörch, O. A. L.—Mal. Blätt., xxii, pp. 159–169. Synopsis Molluscorum marinorum Indiarum occidentalium.

1883. Dall, W. H.—Proceedings U. S. National Museum, vi, p. 332. On a Collection of Shells sent from Florida by Mr. Henry Hemphill.

1885. Watson, R. B.—Report Voyage Challenger, Zoölogy, Scaphopoda and Gasteropoda, xv, pp. 488–493, Pl. XXXII.

1889. Dall, W. H. — Bulletin Museum Comparative Zoölogy, xviii, pp. 335–337, Pl. XXVI.

1897. Pilsbry, H. A.—These Proceedings, p. 296, Pl. VI.

*References to descriptions and figures of fossil species.*

1860. Holmes, F. S.[4]—Post-pleiocene Fossils of South Carolina, pp. 82–83, Pl. XIII.

1887–1888. Meyer, Otto.[5]—On Invertebrates from the Eocene of Mississippi and Alabama, p. 51, Pl. III. On Miocene Invertebrates from Virginia, p. 141, fig. 2.

1896. Guppy, R. J. L., and Dall, W. H.—Tertiary Fossils from Antillean Region. Proceedings U. S. National Museum, xix, pp. 316–317, Pls. XXVII and XXVIII.

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[4] The species given on p. 83 as *Turbonilla nivea* Stimpson and figured on Plate XIII is a much stouter species and very different from the *T. nivea* St. (1851) of Verrill (not *Odostomia nivea* A. Adams, 1860) = *T. Holmesii* Bush.

The *T. interrupta* Totten may be a stout variety of the Northern species.

[5] The fossil form described and figured as *T. paucistriata* Jeffreys, is a distinct species which may be designated as *T. Meyeri*.

*List of the species arranged in two sections, as they have not or have spiral sculpture; subsections, as the ribs are absent or present on the base; and again divided by the character of the spirals.*

### 1.—NO SPIRAL SCULPTURE.

A.—Transverse ribs ending at periphery of body-whorl; ribs clearly defined = *Turbonilla* restricted.—Type. *T. lactea* (Linné) = *T. elegantissima* (Montagu).

*T. kymatoëssa* Watson—whorls 6 + the oblique, flattened nucleus; ribs 14. L. .12 × w. .038 inch. Deep water.

*T. modesta* (d'Orbigny), 1853—not *O. modesta* Stimpson, 1851—wh. 7 with the transverse nucleus; ribs about 16. 2 × $\frac{1}{2}$ mm.

*T. Heilprini* Bush—wh. 8 + the slightly oblique, flattened nucleus; ribs about 18. 2$\frac{1}{2}$ × about $\frac{3}{5}$ mm.

*T. compsa* Bush—wh. 8 + (nucleus wanting); ribs about 36. 3$\frac{2}{5}$ × about 1 mm.

*T. leuca* Bush—wh. 9 + the transverse, very projecting nucleus; ribs about 24. 4$\frac{1}{2}$ × 1$\frac{1}{5}$ mm.

*T. inclinata* Bush—wh. 9 + the transverse, very projecting nucleus; ribs about 20. 3$\frac{1}{2}$ × $\frac{4}{5}$ mm.

*T. abrupta* Bush—wh. 9 + the transverse, projecting nucleus; ribs about 20. 4 × 1 mm.

*T. rhabdota* Watson—wh. 9 + the oblique, projecting nucleus; ribs 14. .18 × .04 inches. Deep water.

*T. curta* Dall—wh. 9–10 + the oblique, projecting nucleus; ribs about 25. 8.3 × 2.9 mm. Deep water.

*T. levis* C. B. Adams, 1850—not *O. lævis* Angas, 1867—wh. 9–10 + the very oblique nucleus; ribs 28–30. .165 × .04 inches.

*T. æqualis* (Say)—wh. 10 with the transverse, projecting nucleus; ribs 20–22. $\frac{1}{5}$ inch or 4$\frac{1}{2}$ × 1$\frac{1}{4}$ mm.

*T. pusilla* C. B. Adams, 1850—not *T. pusilla* Philippi, 1844, nor *O. pusilla* Jeffreys, 1869 and 1884—wh. 10–11 + the very oblique nucleus; ribs 12. .135 × .03 inches. (= *T. minor* Bush).

*T. Penistoni* Bush—wh. 11 + the transverse, very projecting nucleus; ribs about 18. 4$\frac{1}{2}$ × 1 mm.

*T. pulchella* (d'Orbigny), 1853—not *O. pulchella* A. Ad., 1861—wh. 12, with slightly, oddly tilted nucleus; ribs about 18. 7–8 × 1$\frac{1}{2}$ mm.

*T. Dalli* Bush—wh. 12 + the transverse, projecting nucleus; ribs 26. $8\frac{2}{5} \times 2\frac{1}{5}$ mm.

*T. Hemphilli* Bush—wh. 12 + the transverse, projecting nucleus; ribs 20. 9+ × 2 mm.

*T. Swiftii* Bush—wh. 13–17 + the oblique, projecting nucleus; ribs 20–26. 6–7+ × 1 mm.

*T. exarata* (Lea)—not *Menestho exarata* A. Ad., 1861—wh. 15 with nucleus; ribs about 22.

B.—Transverse ribs not always reaching periphery of body-whorl; ribs ill-defined.

*T. atypha* Bush—wh. 10 + (nucleus wanting); ribs 20. $7\frac{1}{2}+ \times 1\frac{4}{5}$ mm.

*T. Uruguayensis* Pilsbry—wh. 11 + the transverse, very projecting nucleus; ribs about 26. 10.3 × 3 mm.

*T. belotheca* Dall—wh. 15 + (nucleus wanting); ribs about 20. 14 × 3 mm. Deep water.

2.—SPIRALS PRESENT.

A.—Transverse ribs ending at periphery of body-whorl; base usually smooth; spirals = raised, rounded threads.

*T. reticulata* C. B. Adams—wh. 7 + the very oblique, flattened nucleus; ribs 26–30; threads coarse, distant, decussating the ribs. .125 × .04 inches.

*T. multicostata* C. B. Adams—wh. 9 + the very oblique, flattened nucleus; ribs 34–38; threads coarse, distant, traversing the ribs on their lower portion. .165 × .045 inches.

*T. unilirata* Bush—wh. 9 + the transverse, projecting nucleus; ribs 20–24; 1 thread just below suture. $3\frac{1}{2} \times$ about $\frac{4}{5}$ mm.

B.—Transverse ribs ending at periphery of body-whorl; base sculptured; spirals = incised lines ; no spirals above.

*T. turris* d'Orbigny—wh. 14, with oblique, flattened nucleus; ribs about 22; intercostal spaces smooth; base spirally striated. 7 × $1\frac{1}{3}$ mm.

B′.—Transverse ribs ending at periphery of body-whorl; base usually sculptured ; spirals above.

*a.*—SPIRALS COARSE, EQUAL OR NEARLY SO = *Pyrgostelis* Monterosato, 1884. Type, *T. rufa* Philippi.

*T. virga* Dall—wh. 10 + (nucleus wanting); ribs about 20; spirals = 7 lines on intercostal spaces. 6 × $1\frac{1}{2}$ mm.

*T. dispar* Pilsbry—wh. 8 + the transverse, flattened nucleus; ribs indistinct; spirals = about 5 lines. 8.2 × 2.3 mm.

*T. incisa* Bush—wh. 9 + the slightly oblique, flattened nucleus; ribs 20; spirals = 6 or 7 lines. $6\frac{2}{5} \times 1\frac{4}{5}$ mm.

*b.*—SPIRALS UNEQUAL, COARSE AND FINE.

*T. Rushii* Bush—wh. 12 + (nucleus wanting); ribs 24; spirals = 2 subequal grooves just above suture, 2 similar ones above middle, and finer lines. $9\frac{1}{2} \times 2\frac{1}{2}$ mm.

*T. Conradi* Bush—wh. 12 + the transverse, flattened nucleus; ribs about 22; spirals = 1 groove above suture, a band of 3 unequal ones on middle, and fine lines. $8\frac{1}{2}$ × about 2 mm.

*T. pyrrha* Bush—wh. 10 + the slightly oblique nucleus; ribs 28–42; spirals variable = 1 sutural groove, sometimes a second above middle, and fine lines. About $6 \times 1\frac{1}{5}$ mm.

*T. obeliscus* C. B. Adams, 1850—not *T. obeliscus* Gould, 1861, nor *O. obeliscus* Garrett, 1871, nor Jeffreys—wh. 11 + (nucleus wanting); ribs 26–30; spirals = 1 broad line above middle, similar ones on middle and anterior of body-whorl, and crowded striæ. .25 × .05 inches.

*T. punicea* Dall—wh. 13, with transverse, flattened nucleus; ribs 18–22; spirals = 1 sutural and 1 median groove with several fine lines. 8 × 1.75 mm.

*T. puncta* C. B. Adams—wh. 10–11 + the oblique, nearly flattened nucleus; ribs 26–30; spirals = 1 sutural groove, 1 similar one above middle, and very fine, crowded lines. .22 × .05 inch, or $6\frac{1}{5} \times 1\frac{1}{2}$ mm.

*T. substriata* C. B. Adams—wh. 8 + the oblique, nearly flattened nucleus; ribs 22–24; spirals = 1 inconspicuous, median groove, and exceedingly fine lines. .115 × .04 inch.

*T. subulata* C. B. Adams, 1850—not Holmes, 1860, nor *O. subulata* Philippi, 1860—wh. 10 + the oblique nucleus; ribs 28–30; spirals = exceedingly fine crowded lines, one next below suture larger. .17 × .045 inch.

*T. suturalis* Gould, 1862—not *O. suturalis* Philippi, 1844—wh. 7–8 with nucleus (?); ribs 10–12; spirals = very fine striæ, 1 near suture more impressed. 3 + × 1 mm. Near preceding.

*T. fulvocincta* (Jeffreys) Dall—not Thompson—wh. 9 + the transverse, nearly flattened nucleus; spirals = 6 or 7 coarse lines and 6–12 fine ones. $5\frac{1}{2} \times 1\frac{3}{5}$ mm. (= *T. lineolata* Bush).

*T. viridaria* Dall—wh. 16, with blunt, sinistral nucleus; ribs about 25; spirals = 5 coarse and a few fine lines. 11 × 2.25 mm.

*T. elegans* Verrill, 1874 (?) variety (?)—not *Ch. elegans* d'Orb., 1853, nor *O. elegans* A. Ad., 1860, nor Monterosato, 1869—wh. 8 + nucleus wanting; ribs 22; spirals = 5 coarse and 2 fine lines. 6 × $1\frac{4}{5}$ mm.

*T. sp.* (young)—wh. 6 + nucleus wanting; ribs about 24; spirals = 6 coarse and 2 fine lines. $3\frac{1}{2}$ × $1\frac{1}{5}$ mm.

*T. sp.* (young)—wh. 6 + nucleus wanting; ribs about 20; spirals = 6 coarse and several fine lines. $4\frac{4}{5}$ × $1\frac{1}{2}$ mm.

### *c.*—SPIRALS FINE, EQUAL OR NEARLY SO.

*T. exilis* C. B. Adams, 1850—not *O. exilis* Garrett, 1873—wh. 10 + the transverse, nearly flattened nucleus; ribs 15–18; spirals numerous, not on base. .165 × .037 inch.

C.—Transverse ribs reaching below periphery of body-whorl. Spirals = incised lines and raised, rounded threads.

*T. textilis* Kurtz (?)—wh. 6 + the oblique, flattened nucleus; ribs 20–26; spirals = wide, deep grooves on whorls, and raised, rounded threads on base. $3\frac{1}{5}$ × $1\frac{1}{5}$ mm.

*T. fasciata* d'Orbigny, 1847 (?)—not Carpenter, 1857, nor *O. fasciata* Dunker, 1860, nor Tenison-Woods, 1875—wh. 9 + nucleus (?); ribs about 20; spirals = striæ on whorls and raised threads on base. $2\frac{4}{5}$ × $1\frac{1}{5}$ mm.

D.—Transverse ribs extending over base. Peritreme not continuous.

*T. flavocincta* C. B. Adams—8–9 + the very oblique nucleus; ribs 28; spirals = exceedingly minute lines, coarser and traversing the ribs anteriorly. .145 × .04 inch.

*T ornata* d'Orbigny,[6] 1853—not Gould, 1861—wh. 10, with tilted nucleus; ribs about 24; spirals fine on all intercostal spaces. 6 × 1 mm.

*T. Stimpsoni* Bush—wh. 9 + the slightly oblique, flattened nucleus; ribs about 36; spirals = several on all intercostal spaces. $5\frac{2}{5}$ × 1 mm.

D′.—Transverse ribs extending over base. Peritreme continuous.

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[6] d'Orbigny's types were presented to the British Museum.

*a.*—SPIRALS FINE, NEARLY UNIFORM.

*T. latior* C. B. Adams—wh. 9 + the nearly transverse, flattened nucleus; ribs 20–24; spirals = numerous, crowded, cutting into sides of ribs. .215 × .065 inch.

*T. Riisei* Mörch, 1875—not Dall, 1889—wh. ? + nucleus ?; ribs about 40; spirals = fine striæ on all intercostal spaces. $3\frac{1}{2} \times 1\frac{1}{3}$ mm.

*T. Pilsbryi* Bush—wh. 6 + the oblique, flattened nucleus; ribs about 26; spirals = exceedingly fine on all intercostal spaces. $4\frac{1}{2} \times 1\frac{1}{2}$ mm.

*b.*—SPIRALS INCISED AND RAISED.

*T. pupoides* d'Orbigny—wh. 7–8 + the nearly transverse, flattened nucleus; ribs 22–30; spirals = scarcely discernible lines on whorls and raised rounded threads on base. $3\frac{1}{2}$–4 × 1 mm.

*T. phrikalea* Watson—wh. 7, with tilted nucleus; ribs 25; spirals = raised rounded threads on base. .13 × .039 inch. Deep water. Same as preceding.

*c.*—SPIRALS RAISED.

*T. asperula* Bush—wh. 6 + the oblique, flattened nucleus; ribs 26; spirals = raised, rounded threads on all intercostal spaces. 3 × 1 mm.

*List of other species of Chemnitzia which are not referable to the genus Turbonilla, with notes.*

*Chemnitzia Americana* d'Orbigny, 1847 (?)—Generic relations doubtful. Original description not accessible; the figure, as reproduced by Tryon, strongly resembles some species of *Scala.*

*Chemnitzia Babylonica* C. B. Adams, 1846—Strongly carinated *Odostomia* (*Cingulina*).

*Chemnitzia cancellata* d'Orbigny, 1853—not *Dunkeria cancellata* Carpenter, 1857—Spirally granulose *Odostomia.*

*Chemnitzia dubia* d'Orbigny, 1853—not *Odostomia dubia* Jeffreys —Has not the nucleus of a *Turbonilla.* The figure given in atlas, *Ile de Cuba,* does not agree with the description. Can possibly be referred to the genus *Fenella.*

*Chemnitzia elegans* d'Orbigny, 1853—not *Turbonilla elegans* Verrill, 1872, nor *Odostomia elegans* A. Adams, 1860, nor Monterosato, 1869—Relations doubtful. In its peculiar thickened base, it resembles *Cerithium turrita* Stearns.

*Chemnitzia erythrosclera* Mörch, 1875, and *Chemnitzia Krebsii* Mörch, 1875—Relations doubtful. Nuclei not described.

*Chemnitzia lævigata* d'Orbigny, 1853—True *Odostomia.*

*Chemnitzia simplex* d'Orbigny, 1853—not *Odostomia simplex* Angas, 1871—*Eulimella.*

*Chemnitzia spirata* Kurtz and Stimpson, 1851—not *Odostomia spirata* A. Adams, 1860—Finely striated *Odostomia* (*Auriculina* or *Ondina*).

*Chemnitzia turritella* Pfr. (Mörch, 1875.)—Relations Doubtful.

## EXPLANATION OF PLATE VIII.

The figures are camera-lucida drawings by Mr. A. H. Verrill.

Fig. 1. *Turbonilla pyrrha* Bush, p. 160—Type (No. 72,050); 6 mm. long × $1\frac{2}{5}$ mm. diameter.

Fig. 2. *Turbonilla textilis* Kurtz (?), p. 154—Specimen (No. 72,051); 4 mm. × $1\frac{1}{5}$ mm.

Fig. 3. *Turbonilla Hemphilli* Bush, p. 169—Type (No. 79,013); $5\frac{1}{5}$ mm. × $1\frac{1}{2}$ mm.

Fig. 4. *Turbonilla abrupta* Bush, p. 168—Type (No. 79,012); 4 mm. × 1 mm.

Fig. 5. *Turbonilla pupoides* d'Orbigny, var. *ischna* Bush, p. 153—Type (No. 79,014); $3\frac{3}{5}$ mm. × 1 mm.

Fig. 6. *Turbonilla unilirata* Bush, p. 165—Type (No. 79,010); 3 mm. × $\frac{4}{5}$ mm.

Fig. 7. *Turbonilla Stimpsoni* Bush, p. 156—Type (No. 72,042); $5\frac{2}{5}$ × about 1 mm.

Fig. 8. *Turbonilla Dalli* Bush, p. 169—Type (No. 72,049); 8 mm. × $2\frac{2}{5}$ mm.

Fig. 9. *Turbonilla Pilsbryi* Bush, p. 151—Type (No. 72,095); $4\frac{1}{2}$ mm. × $1\frac{3}{5}$ mm.

Fig. 10. *Turbonilla Conradi* Bush, p. 159—Type (No. 72,052); $8\frac{3}{5}$ mm. × 2 mm.

Fig. 11. *Turbonilla Rushii* Bush, p. 160—Type (No. 70,535); $9\frac{1}{2}$ mm. × $2\frac{2}{5}$ mm.

Fig. 12. *Turbonilla incisa* Bush, p. 156—Type (No. 62,800); $6\frac{2}{5}$ mm. × $1\frac{1}{2}$ mm.

Fig. 13. *Turbonilla Heilprini* Bush, p. 167—Type (No. 79,009); $2\frac{1}{2}$ mm. × mm.

Fig. 14. *Turbonilla Penistoni*, Bush, p. 165—Type (No. 70,024); $4\frac{1}{2}$ mm. × 1 mm.

MARCH 7.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Eleven persons present.

Papers under the following titles were presented for publication:

"A Small Collection of Reptiles and Batrachians from Eastern Mongolia," by Witmer Stone.

"A New and Little-known Species of Pristoloma," by Henry A. Pilsbry.

"Ashmunella, a New Genus of Helices," by H. A. Pilsbry and T. D. A. Cockerell.

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MARCH 14.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Thirty-eight persons present.

A paper entitled, "Contributions to a Knowledge of the Hymenoptera of Brazil, No. 6.—A Collection from Rio Grande do Sul and Sao Paolo," by William J. Fox, was presented for publication.

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MARCH 21.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Twenty-three persons present.

A paper entitled, "Some Untenable Names in Ornithology," by Harry C. Oberholser, was presented for publication.

The death of Prof. Othniel C. Marsh, a correspondent, was announced.

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MARCH 28.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Forty-three persons present.

DR. DIXON made a communication on *Bacillus typhosus* (no abstract).

The following were ordered to be printed:

## NOTES ON A SMALL COLLECTION OF CHINESE FISHES.

BY HENRY W. FOWLER.

During the summer of 1897, Dr. A. Donaldson Smith and Messrs. J. Edward and George Farnum collected the material which forms the basis of this paper while travelling through eastern China and Mongolia. The specimens were collected in several localities. All the Cobitidæ and *Leuciscus costatus* were obtained from a fisherman, who caught them in the Tan lan Ho, a tributary of the Shu lan Ho, June 11. This locality is about thirty miles northeast of Lama-miau or Dolon-nor, in the Province of Pechili. *Carassius auratus* and two specimens of *Leuciscus farnumi* are from Delai Nor. These were purchased July 4. The type of *Leuciscus farnumi* and the specimens of *Pseudaspius leptocephalus* and *Opsariichthys bidens* were taken in the Tore river, a tributary of the Sungari, July 27.

Through the liberality of the above-mentioned gentlemen, the collection becomes the property of the Academy of Natural Sciences of Philadelphia, and adds several species which are new to its collections.

### CYPRINIDÆ.

**1. Carassius auratus** (L.).

No. 16,379.

**2. Leuciscus farnumi** sp. nov.

Head, $3\frac{2}{3}$; depth nearly 4. D., 8; A., 11; scales, 50; teeth, 3, 5–5, 3. Eye, $4\frac{2}{7}$ in head, its posterior margin before the centre, $1\frac{3}{4}$ in the interorbital width. Mouth protractile, the upper jaw projecting, its cleft reaching the anterior margin of the orbit. Top of head somewhat convex. Pseudobranchiæ present. Air-bladder in two parts. Pectorals reaching $1\frac{3}{10}$ to ventrals. Dorsal over ventral. Ventrals not reaching vent, and with developed sheaths. Origin of the anal, behind dorsal. Lateral line much decurved, not running along the centre of the caudal peduncle laterally, but below it. Color in alcohol dark brownish above, whitish below. Dorsal and caudal brownish, the other fins pale like the lower surface of the body. Caudal forked. Total length, $5\frac{1}{2}$ inches.

No. 16,380.

Two dried specimens in a rather poor state of preservation are referable to this species; they measure about 8 inches.

Nos. 16,381, 16,382.

3. **Leuciscus costatus** sp. nov.

Head conical, convex above. Premaxillaries not projecting beyond the snout. Mouth nearly reaching anterior margin of the eye. Eyes placed laterally and before the centre of the head, contained $4\frac{1}{3}$ times in the head and $1\frac{2}{3}$ in the interorbital space. Origin of the dorsal wholly behind the ventral basis and nearer the tip of caudal than tip of snout. Origin of the anal behind the dorsal. A fleshy appendage to the genital aperture developed in three specimens, which are presumably males, somewhat large. Depth of the emargination of the caudal about $\frac{1}{3}$ its length. Both caudal lobes are rounded and the upper is longer than the lower. Color in alcohol, brownish above, lighter beneath. Sides and upper parts with fine dots and spots of blackish and dark brownish. Fins all plain colored, the dorsal and caudal a shade or so darker than the others. Body covered with small scales, about 75 to 84 in the lateral line, which is only slightly decurved. D., 8; A., 8. Teeth, 2, 5–5, 2. Four specimens, Nos. 16,383, 16,384, 16,385, 16,386. A comparison of them shows the first, a female, is the largest, as follows:

| HEAD IN BODY. | DEPTH IN BODY. | PECTORAL IN HEAD. | LENGTH. |
|---|---|---|---|
| $3\frac{10}{17}$ in. | $4\frac{1}{15}$ in. | $1\frac{7}{10}$ in. | $2\frac{9}{10}$ in. |
| $3\frac{24}{27}$ in. | $4\frac{1}{26}$ in. | $1\frac{10}{17}$ in. | $2\frac{1}{2}$ in. |
| $3\frac{22}{25}$ in. | $4\frac{9}{22}$ in. | $1\frac{7}{15}$ in. | $2\frac{9}{25}$ in. |
| $3\frac{7}{23}$ in. | 4 in. | $1\frac{7}{16}$ in. | 2 in. |

4. **Pseudaspius leptocephalus** (Pall.).

One specimen, No. 16,387.

5. **Opsariichthys bidens** Günth.

Two specimens, Nos. 16,388, 16,389.

## COBITIDÆ.

6. **Misgurnus anguillicaudatus** (Cantor).

A comparison of the specimens belonging to this species shows: Head, $5–6\frac{3}{7}$; depth, $8\frac{1}{3}–10\frac{1}{3}$; D., 7; A., 6; total length, $3\frac{3}{4}–6$ inches.

Nos. 16,390, 16,391, 16,392.

**7. Nemachilus dixoni** sp. nov.

Head, $4\frac{1}{6}$; depth, $6\frac{1}{6}$; D., 7; A., 6. Body moderately elongated rounded anteriorly and much compressed along the caudal peduncle. Eye placed above and anterior to the centre of the head. Eye 6 in head and $2\frac{1}{2}$ times in the interorbital space. Six barbels around the upper jaw, the posterior pair reaching beyond the posterior margin of the eye. Snout furnished with a pair of nasal barbels placed laterally, they are formed over the apertures of the anterior nares and extend to the centre of the orbit. The posterior nares are placed in front and above the centre of the eyes. Lips fleshy, the lower without barbels. Origin of the dorsal falling behind that of the ventrals. In the space between the base of the pectoral and the ventral fins the length of the pectoral is contained about $2\frac{1}{8}$ times. Anus below the hind edge of the dorsal. Rudimentary caudal rays well developed. Caudal nearly as long as head, rounded. Color in alcohol olivaceous, dusky above, whitish below. A lateral streak the same color as the top of the back and a jet-black spot in the centre of the base of the caudal. Dorsal and caudal with numerous fine dark-brown spots. Remaining fins less distinctly spotted with the same color as the sides, which, together with the upper parts, are also spotted with darker spots than the ground color. Scales small and indistinct. Lateral line imperfect. Total length, $2\frac{19}{20}$ inches. One specimen, No. 16,393.

**8. Nemachilus pechiliensis** sp. nov.

Head, $4\frac{4}{5}$; depth, $6\frac{2}{3}$; D., 8; A., 6. Body somewhat long and compressed. Eye 9 in head, $1\frac{1}{2}$ in the distance from its frontal margin to the anterior nare. The anterior nares are closer together than the posterior pair. Six barbels around the upper jaw. Lips rather thin. Pectoral nearly as long as the dorsal or caudal, and reaching half-way to the ventrals. Ventrals beginning a little in advance of the origin of the dorsal. Anal tube prominent from the ventrals to the aperture in front of the anal fin. Rudimentary caudal rays well developed. Caudal truncate. Color in alcohol olivaceous—dusky above, grayish-white below. Back and upper parts of the sides of the body, with flakes of dusky which are not numerous, and are somewhat irregularly distributed. Dorsal with dusky spots. Several indistinct broad dusky stripes on the caudal. Other fins like the belly in color, but the pectorals have the upper surface faintly washed with dusky. Lateral line present. Scales present, but inconspicuous. Total length, $4\frac{7}{10}$ inches. One specimen, No. 16,394.

9. **Cobitis sinensis** Sauvage and DeThiersant.

Head, 5; depth, $8\frac{1}{3}$; D., 8; A., 6. Body elongated and compressed. Eyes placed above the centre of the upper fourth of the head. Interorbital space about equal to the diameter of the eye. Nares nearer the eyes than to the tip of the snout. Suborbital spines moderate. Tip of the posterior maxillary barbel does extend as far posteriorly as the larger prong of the suborbital spine. Eight barbels. Two median barbels of the upper jaw much shorter than the others. Lips fleshy, the lower in 2 lobes. Origin of the dorsal over that of the ventrals. Length of pectoral a little over one-third the distance between its base and that of the ventral. Rudimentary caudal rays well developed. Caudal truncate, edges somewhat rounded. Color in alcohol, above grayish-white with an olivaceous tinge. Eight more or less distinct blotches of brownish between the nape and the origin of dorsal and seven between it and the base of caudal. Between a blackish band from the operculum to the caudal and the dark color of the back is a light band of the same color as the belly. Above this band is a narrow band of blotches of the same color as the median band of blotches on the back. Back with mottlings. Dorsal and caudal with dark spots, other fins and lower part of body whitish. Black spot on upper rays and at base of caudal. Black streak from eye to tip of snout. Scales minute. Lateral line imperfect or wanting. Length, 3 inches. One specimen, No. 16,395.

## A SMALL COLLECTION OF REPTILES AND BATRACHIANS FROM EASTERN MONGOLIA.

BY WITMER STONE.

Through the generosity of Messrs. J. Edward and George Farnum, and of Dr. A. Donaldson Smith, the Academy has received a small collection of Reptiles and Batrachians collected by them on an expedition through eastern Mongolia, undertaken in May–July, 1897.

Although none of the species represented are new to science, a list of them will prove of value as adding to our knowledge of their geographic distribution.

### BATRACHIA.

**Rana dybowskii** Günth.

Three specimens taken east of the Kiu-ghan mountains. Boulenger regards this Asiatic form as identical with the *R. temporaria* of Europe. It is probable, however, that it represents at least a geographic race.

**Rana chinensis** Osbeck.

One specimen from Khiu-ghan mountains, and two from Lama-mio.

This frog is clearly distinct from *R. esculenta.* Boulenger regarded it as a subspecies in his *Catalogue of the Batrachia Salientia* and named it *japonica.* *R. marmorata* of Hallowell has clear priority over this name and, according to Boulenger (*Tailless Batrachia of Europe*), *R. chinensis* Osbeck is based upon the same animal and is prior to either.

**Bufo japonicus** Schleg.

Two specimens from the Tore river.

I follow the British Museum Catalogue in regarding the Asiatic and Japanese animals as identical. Should they prove recognizable races, the above name will apply to the island form.

**Bufo raddei** Strauch.

One specimen from a lake near Lama-mio and seven others from various localities in eastern Mongolia.

One other example from Tore river is almost unicolor above, and the pores of the dorsal warts are swollen up into minute pustules. These peculiarities are probably due to the very strong formalin solution in which this specimen was preserved.

**Hyla chinensis immaculata** Boetger.

Three specimens of Tree Toads from near Tore river are referred to this form, though lack of material for comparison makes a satisfactory identification difficult. One individual is practically immaculate, the others have indistinct dusky spots on the sides and obscure bands on the legs, and mottlings on the backs of the tibiæ and tarsi.

## REPTILIA.

**Eremias argus** Peters.

Four specimens from the Kiu-ghan mountains.

**Amphiesma tigrinum** Boie.

One specimen from Peking, and one from northern Pechili.

**Coluber dione** Pall.

One adult and one very young specimen from northern Pechili. The latter is marked with great distinctness.

**Halys blomhoffii** (Boie).

One specimen from northern Pechili, and another from Mongolia east of the Kiu-ghan mountains The latter has eight upper labials on one side and seven on the other.

## NEW AND LITTLE-KNOWN SPECIES OF PRISTILOMA.

BY HENRY A. PILSBRY.

In the handbooks of American land mollusks published by Mr. W. G. Binney, as well as in the more general *Manual* of Tryon, but two species of the genus *Pristiloma* are recorded: *P. Lansingi* and *P. Stearnsi*, both described by Thomas Bland in 1875. The original figures and descriptions may also be found in Binney's *Manual of American Land Shells* (1885), and additional information, especially as to distribution, is given by the same industrious author in the *Supplements to the Fifth Volume of Terrestrial Mollusks.* To these sources reference is made for the literature of the species.

A third species, apparently of this genus, was described from Point Barrow, Alaska, by Mr. E. Lehnert, in 1884, under the name *Hyalina arctica;* and Mr. E. G. Vanatta has quite recently described a fourth one.[1] In adding the fifth species to the genus, I have felt it incumbent on me to redefine and figure Lehnert's *Hyalina arctica,* until now unfigured, and not described with sufficient exactness to insure recognition,[2] nor mentioned in the *Zoological Record.*

*Pristiloma* is probably closely allied to *Conulus,* differing from that genus chiefly, so far as known, in the ribbed or plaited jaw. But it is only in *P. Lansingi* and *P. Stearnsi* that this form of jaw has been demonstrated; and the other species herein considered to be congeneric with those mentioned are referred to that genus solely upon the resemblance of the shells. Some of them may prove to be depressed forms of *Conulus,* as Dall (*in litt.*) suggests to me.

**Pristiloma Taylori** n. sp. Pl. IX, figs. 6, 7, 8.

Shell imperforate, discoidal, thin, transparent, corneous, clearly showing the yellow soft parts when these are dried in it; surface

[1] These Proceedings, p. 120.

[2] That this is the case is shown by the fact that it has hitherto been referred to *P. Stearnsi* as a synonym, though it is much more nearly allied to *P. Lansingi.*

smooth and glossy, with faint growth-striæ. *Spire almost flat, comparatively narrow*, slightly more than half the greatest diameter of the shell; whorls four, the nucleus rather large, whorls slowly increasing, *the last wide, double the width of the preceding*, equably rounded at the periphery, flattened beneath, with a deep indentation around the axis. Aperture oblique, *broadly* lunate; peristome simple, thin and acute, *the upper termination inserted decidedly above the periphery*, baso-columellar margin straightened. Alt., 1.1; greatest diameter, 2.5; lesser, 2.16 mm.

Nanaimo, Vancouver Island, near the water-works (Rev. George W. Taylor, July 25, 1895).

This species is named in recognition of Mr. Taylor's services to malacological science, and especially to the conchology of British America. It differs conspicuously from all the species hitherto known by the narrow spire, the last whorl embracing a much more considerable portion of the preceding, the conspicuously wider aperture, and the almost flat upper surface. Generic position unverified.

**Pristiloma arctica** (Lehnert). Pl. IX, figs. 3, 4, 5.

*Hyalina arctica* Lehnert, Science Record, ii, p. 172, June 16, 1884 (Boston, S. E. Cassino & Co.).

Through the kindness of Prof. W. H. Dall, I have been enabled to figure one of the original specimens of this species, No. 108, 228, U. S. National Museum. It is a glossy shell with the general features of *P. Lansingi;* growth-striæ faint, spire low-conic, whorls $4\frac{3}{4}$, slowly and regularly increasing, the last not disproportionately wide as in *P. Taylori*, but about as in *P. Lansingi*. Aperture narrowly crescentic as in the last-named species. It measures, alt., 1.58; diam., 2.66 mm. The width of the spire a little exceeds two-thirds the greatest diameter of the shell.

Point Barrow, Alaska; found among moss, lichens and other plants used for packing material.

The specimen figured had been broken on the front of the body-whorl, and the outline there has been restored in figures 4 and 5.

It differs from *P. Stearnsi* (Bld.) in surface sculpture and smaller size; from *P. Lansingi* (Bld.), with which it agrees in the characters mentioned, as well as in the nearly vertical aperture, it differs in the lower, submedian position of the periphery, and in wanting the denticulate lip-rib so prominent in that species.

For comparison I have figured a specimen of *P. Lansingi* (Pl.

IX, figs. 1, 2), as the original figures given by Bland and reproduced by Binney are rather crude. This specimen measures, alt., 1.58; greatest diameter, 2.62; lesser diam., 2.4 mm., almost exactly the same as *P. arctica.* It has fully $5\frac{1}{2}$ whorls.

Whether the lip-rib will prove a constant character of *P. Lansingi,* and constantly wanting in *P. arctica,* can only be decided by larger series than have yet been collected; but the slightly greater number of whorls of *Lansingi* in a shell of the same size, with the higher position of the periphery, apparently indicate that *P. arctica* is specifically distinct, and unless specimens of intermediate characters come to light, it must stand as a species.

Prof. William H. Dall tells me that he collected *arctica* at Coal Harbor in the Shumagin islands, and it was taken by Turner at Unalashka. He believes it may prove to be a flat-topped species of *Conulus.*

The species of *Pristiloma* now known may be recognized by the following key:

*a.*—Shell sculptured with radial grooves above; lip simple and acute.
- *b.*—Grooves crowded, not very deep; spire conic; whorls about 7; diam. 3 or 4 mm. . . *P. Stearnsi* (Bld.).
- *b'*—Grooves deep, separated, the whorls with a corona of low tubercles; whorls $5\frac{1}{2}$; diam. 2.56 mm. *P. Pilsbryi* Van.

*a'*.—Shell nearly smooth throughout.
- *b.*—Aperture broadly lunate; no lip-callus; spire narrow, almost flat; whorls 4, the last wide; diameter more than double the altitude; diam. 2.5, alt. 1.1 mm., *P. Taylori* Pils.
- *b'*.—Aperture narrowly crescentic; spire low-conic; whorls regularly widening; diameter less than double the altitude.
  - *c.*—A denticulate lip-rib within the margin of the outer lip; periphery above the middle; whorls $5\frac{1}{2}$; alt. 1.58, diam. 2.62 mm. . . *P. Lansingi* (Bld.).
  - *c'*.—No lip-rib; periphery submedian; whorls $4\frac{3}{4}$; alt. 1.58, diam. 2.66 mm. . . . . *P. arctica* (Lehn.).

## ASHMUNELLA, A NEW GENUS OF HELICES.

BY H. A. PILSBRY AND T. D. A. COCKERELL.[1]

The boundaries of New Mexico and Arizona fairly define a region of arid plains from which rise numerous mountain ranges, upon whose summits the humidity refused by the dry and warmer air of the plains is precipitated. Upon the elevations thus set apart by the circumstance of a moister and colder climate, the snails inhabiting the region are chiefly found. And standing island-like in a waterless sea, the mountains exhibit to a considerable extent the peculiarities of insular faunas, each range having its own special assembly of forms, specific or varietal, in addition to a series of species common to ranges over the greater part of the region.

A characteristic element in this fauna is the series of helicoid snails now segregated under the generic name *Ashmunella*, so called in recognition of the fact that the Rev. E. H. Ashmun, of Albuquerque, N. M., discovered most of the species. This genus occurs in New Mexico from the latitude of Santa Fé to the White mountains, and westward to S. E. Arizona. It is not impossible that it may yet be found in the Sierra Madre mountains of Mexico; but it surely does not extend to California or Colorado. It is an interesting coincidence, if nothing more, that its northern limit is nearly that of the supposed southern limit of glaciers in the Rocky mountain region during the ice age.

The more important characters of *Ashmunella* may be stated as follows:

*Generic Characters of Ashmunella.*[2]

The shell offers no characters different from the *Triodopsis* or

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[1] We would here acknowledge our indebtedness to Mr. E. G. Vanatta for the illustrations of this paper, the dissections from which they were drawn, and various observations on the subject.

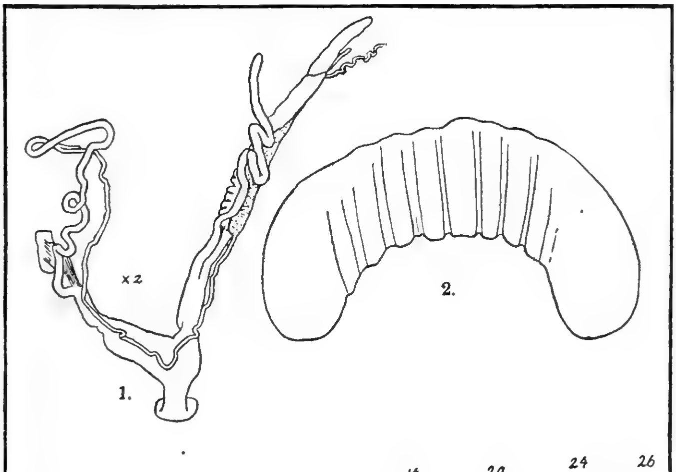
One of the authors communicated the substance of this paper to the Academy of Natural Sciences at the meeting of January 10, 1899, brief notices of that communication appearing in *Science*, ix (new series), p. 182, and *Nautilus*, xii, p. 107.

[2] The internal anatomy is known in *A. miorhyssa* only, from specimens collected by Prof. C. H. T. Townsend.

*Mesodon* sections of *Polygyra.* It is helicoid, depressed and umbilicated, dull colored, not banded so far as known, with lunate aperture and reflexed peristome; parietal tooth, when present, simple, not V-shaped or biramose.

External features of the soft parts as in normal *Polygyra* or *Epiphragmophora* species. In *A. miorhyssa* the whole foot is grayish white; the tentacles and the dorsal surface of the animal anteriorly are dark plumbeous.

Retractor muscles of buccal mass and tentacles of the ordinary type, the right ocular and tentacular retractor passing between the ♂ and ♀ branches of the genital system.




♂ system: *Penis* composed of a narrow upper portion and an abruptly much more capacious lower portion; lumen with three strong longitudinal ribs along the outer wall and numerous much smaller folds elsewhere, no papilla or distinct pilaster. Penis retractor muscle very short, inserted upon the epiphallus near its lower end, a portion of it passing to the apex of the penis. *Epiphallus* distinctly differentiated from both penis and vas deferens, very long, terminating in a very short *flagellum* and the long free vas deferens.

♀ system: Vagina moderately long, with internal folds continuous with those of the atrium. Spermatheca long, *not differentiated into duct and spermatheca proper*, but consisting of a long, somewhat folded tube of nearly equal diameter throughout, the apex free and lying near the heart. Talon simple, vermiform. Other organs as usual (fig. 1). Measurements of the principal organs, pulled straight, are as follows: Length of penis, $10\frac{1}{2}$ mm.; of epiphallus, 31; of flagellum, 2 mm. Length of spermatheca, 27 mm., including the inseparable duct.

The lung is of normal proportions; there is a single large pulmonary vein with numerous much smaller branches on each side; heart at base of kidney, the pericardium thin and transparent. Kidney small and rather short, though slightly over double the length of the heart, with distinct reflexed ureter, the "secondary ureter" ("*Darmharnleiter*") apparently closed throughout.

Jaw (fig. 2) quite arcuate, with about eight ribs denticulating the basal margin, the ends free from ribs.

Radula with 26–1–26 teeth (fig. 3), the rhachidian row tricuspid, the side cusps small, laterals with the usual large mesocone, small ectocone and rudimentary entocone, marginals with the mesocone bifid at tip, the outer ones with the ectocone split. The transition from laterals to marginals occurs from the eleventh to the thirteenth teeth.

### *Affinities of the Genus.*[3]

The appearance of the shell is so completely that of *Polygyra* that in attempting to decide its affinities one approaches the question somewhat prejudiced. Turning to the genitalia, we find that the male system is completely that of *Epiphragmophora* and the Belogonous Helices generally. The well-developed epiphallus and the short but unmistakable flagellum are structures which are wholly foreign to *Polygyra*.[4] Again, the long spermatheca with its apex lodged near the heart, utterly unlike the short and differently situated spermatheca of *Polygyra*, is like *Epiphragmophora* and

[3] By H. A. Pilsbry alone.

[4] The genitalia of nearly every United States species of *Polygyra* are known, either by the published work of Mr. W. G. Binney or by MS. descriptions and drawings of Messrs. H. A. Pilsbry and E. G. Vanatta.

other Belogonous genera, though peculiar in wanting a differentiated receptacle and duct.

In the genital system, therefore, *P. miorhyssa* has no resemblance to *Polygyra* and its allies, *Praticolella* and *Polygyrella*; and, in fact, could not be included among the Protogonous Helices. The genitalia are those of the *Epiphallogona* or of *Belogona* which have undergone degeneration of the dart sack and associated mucous glands.[5] The first of these groups includes the large, heavy, dark-colored Helices of the West Indies and South America (*Pleurodonte*), and various Oriental forms (*Camæna*, *Planispira*, etc.), all quite unlike *Ashmunella* conchologically. The characters of the lung and kidney cannot be adequately discussed owing to the lack of published data of sufficient exactness, but the high value of these organs in classification demonstrated by a mass of unpublished data demands brief mention here. In *Polygyra* the kidney is very long, usually over half the entire length of the lung cavity,[6] and is band or ribbon-shaped, while *Epiphragmophora* has a short kidney, hardly one-third the length of the lung cavity. In *A. miorhyssa* the kidney is short, like that of *Epiphragmophora*, and quite unlike the kidney of any *Polygyra* yet examined.

The jaw and radula give no characters differentiating *Ashmunella* from *Polygyra*, *Epiphragmophora* or numerous other genera of ground-living helices. The teeth are very similar to those of *Polygyra*.

In the shell we can find no characters whatever which are not readily paralleled in *Polygyra*. Some of the Epiphragmophoras of the islands off California and Lower California are somewhat similar in shell characters.

Upon the whole, it seems likely that *Ashmunella* is a member of the *Belogona Euadenia* or Asiatico-American group of dart-

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[5] See under *Metafruticicola*, etc., in the "Guide to the Study of Helices." American examples of partial degeneration of these appendages are *Epiphragmophora guadalupiana* and the genus *Glyptostoma*. See Proc. Acad. Nat. Sci. Phila., 1898, p. 67.

[6] The exceptions are *P. septemvolva* and probably its immediate allies, with very narrow whorls, in which the lung, in common with the whole mantle, is excessively lengthened in harmony with the narrow cavity of the shell, while the kidney and heart retain the form found in species with normally proportioned shells. This exception is no argument against the value of the form of the kidney as an index of affinity, but rather one in its favor.

bearers, which has lost the dart apparatus, and developed apertural characters in the shell similar to those of *Polygyra;* though it is possible that the genus is a member of the *Epiphallogona*, with which *Ashmunella* agrees better technically in the features of the genitalia.

*Species of Ashmunella.*

*A. miorhyssa* only is known anatomically, but the following species will probably be found to belong to the genus.

**A. Thomsoniana** (Ancey).

*Helix Levettei* var. *Thomsoniana* and *orobæna* Anc., Conchologist's Exchange, Vol. ii, p. 64 (Nov., 1887).

Santa Fé canyon, N. M.

**A. pseudodonta** (Dall).

*Polygyra pseudodonta* Dall, Proc. U. S. Nat'l Mus., Vol. xix, p. 343 (1896).

White Oaks, N. M. (*Ashmun*).

**A. pseudodonta capitanensis**, Ashmun and Ckll., Nautilus, Vol. xii, p. 131 (March, 1899).

Capitan mountains, N. M. (*Ashmun*).

**A. Ashmuni** (Dall).

*Polygyra Ashmuni* (Dall), Proc. U. S. Nat'l Mus., Vol. xix, p. 342 (1896).

Bland, N. M. (*Ashmun*).

**A. altissima** (Cockerell).

*Polygyra altissima* Ckll., Nautilus, Vol. xii, p. 76 (Nov., 1898).

Summit of Sierra Blanca, N. M., 11,092 feet (*Townsend*).

**A. chiricahuana** (Dall).

*Polygyra chiricahuana* Dall, Proc. U. S. Nat'l Mus., Vol. xviii, p. 2 (1895).

Jemez mountains, near Bland, N. M., 8,000 to 10,000 feet (*Ashmun*); Fly Park, Chiricahua mountains, Ariz., 10,000 feet (*Fisher*).

**A. rhyssa** (Dall).

*Polygyra rhyssa* Dall, Nautilus, Vol. xi, p. 2 (May, 1897).

Sierra Blanca, N. M., at about 8,500 feet (*Ashmun* and *Townsend*).

**A. rhyssa hyporhyssa** (Ckll.).

*Polygyra rhyssa hyporhyssa* (Ckll.)., Nautilus, Vol. xii, p. 77 (Nov., 1898).

Sierra Blanca, N. M., 9,500 feet (*Townsend*).

**A. miorhyssa** (Dall).

*Polygyra miorhyssa* Dall, Nautilus, Vol. xii, p. 75 (Nov., 1898).

Eagle Creek, Sierra Blanca, N. M. (*Ashmun* and *Townsend*).

The species are unequally related. Their relationships *inter se* are shown by the following keys for the determination of known forms:[7]

*a.*—Aperture strongly tridentate. . . . . . *Thomsoniana.*
*a'.*—Aperture toothless or without teeth on the outer lip.
  *b.*—Diameter less than double the altitude. *rhyssa,* including *miorhyssa.*
  *b'.*—Diameter about double the altitude.
    *c.*—Surface heavily ribbed; a slight basal tooth or none. *altissima.*
    *c'.*—Surface nearly smooth.
      *d.*—Basal lip with two contiguous teeth; a parietal tooth or none. . . . . . . *pseudodonta.*
      *d'.*—Basal lip toothless.
        *e.*—Whorls 5; diam. 12–14 mm. . *Ashmuni.*
        *e'.*—Whorls 6; diam. 16–19 mm.; peristome slighter. . . . . . . *chiricahuana.*

The three main groups indicated in the above table are *Thomsoniana—rhyssa* including *miorhyssa* and *hyporhyssa—altissima, pseudodonta, Ashmuni, chiricahuana.*

Mr. Cockerell arranges the forms somewhat differently, thus:

1. Aperture hardly dentate, with at most a small parietal denticle and a callus or pair of low and small denticles on the basal part of the aperture. . . . . . . . . . . . 2
   Aperture strongly dentate, both on the parietal wall and lip; whorls 5½ . . . . . . . . . . *Thomsoniana* (Ancey).
2. Shell distinctly ribbed. . . . . . . . . . . . . . 3
   Shell striate or nearly smooth. . . . . . . . . . . 4
3. Compact, spire elevated; diam. 15–17 mm. . *rhyssa* (Dall).
   Small and flat; diam. 12 mm. . . . . . *altissima* (Ckll.).
4. Shell compact, with rounded whorls; spire elevated; last whorl large; striation well marked. . . . . . . . . . 5
   Flattened, with a depressed spire; shell feebly striate or nearly smooth, with more or less distinct spiral incised lines; umbilicus wide, broadly exposing the penultimate whorl. . . 6

[7] The first key is by Mr. Pilsbry, the second by Mr. Cockerell.

5. Larger, aperture broader and more circular; umbilicus narrow. *miorhyssa* (Dall).
   Smaller, aperture semilunar; umbilicus wider, broadly exposing the penultimate whorl. . . . . . *hyporhyssa* (Ckll.).
6. Max. diam. less than 15 mm. . . . . . . . . . . . 7
   Max. diam. over 15 mm. . . . . . . . . . . . . . 8
7. Basal part of aperture with a couple of obtuse denticles, *pseudodonta* (Dall).
   Basal part of aperture without any denticles. *Ashmuni* (Dall).
8. Deeper colored; basal part of aperture with a more or less bifid callosity. . . . . . . *capitanensis* Ashmun and Ckll.
   Paler; basal part of aperture without any callosity. *chiricahuana* (Dall).

It is a matter of taste how many of the above are to be regarded as species. The characters appear to be uniform in series of specimens, and each form inhabits its own special region. There are three distinct groups: the first, consisting of *rhyssa*, *altissima*, *miorhyssa* and *hyporhyssa*, is confined to Sierra Blanca and the immediate vicinity, so far as known; the second, containing *pseudodonta*, *Ashmuni*, *capitanensis* and *chiricahuana*, occurs in the Capitan mountains and vicinity (the forms with the bifid basal callus), in the Jemez mountains and vicinity, and in southeast Arizona (forms without a basal callus on aperture); the third, possibly distinct from true *Ashmunella*, includes *Thomsoniana*, from the Santa Fé region.

## CONTRIBUTIONS TO A KNOWLEDGE OF THE HYMENOPTERA OF BRAZIL, NO. 6.—A COLLECTION FROM RIO GRANDE DO SUL AND SÃO PAULO.

BY WILLIAM J. FOX.

The small collection on which the present paper is based was received for identification from the Museu Paulista of São Paulo, Brazil, and is of interest through the large number of species which are not represented in the Herbert Smith collection, on which the previous papers of this series are based, which would seemingly indicate that the fauna of the southeastern region of Brazil differs considerably from that of the more inland northern States, Matto Grosso and Para, where the Smith collection was largely made.

Unless otherwise stated, the specimens were collected in Rio Grande do Sul. The types of new species are the property of the Museu Paulista.

**Elis hyalina** Sauss.
**Elis nigra** Sauss.
**Elis regina** Sauss.
**Elis costalis** Lep.
**Elis Servillii** Lep.
**Elis Gerstaeckeri** Sauss.
**Elis Lucasia** Sauss.

The specimen before me agrees with Saussure's description except that it is much larger than any of his specimens; it measures 45 mm. in length.

**Tiphia cayennensis** Spin.
**Pepsis nuda** n. sp.

♂.—Blue-green, legs bluest; antennæ with first two joints bluish, the third to seventh or eighth fuscous, the remaining joints fulvous; wings black with purplish and bluish iridescence, crossed by a broad yellowish white band which is separated from base of wing by a distance almost equalling its width, and its outer margin is just about in the centre of anterior wing; in the hind wing this band is somewhat broader; pubescence throughout dark

Clypeus emarginate, but not deeply; frontal impression strong. Middle segment raised somewhat down middle of upper surface, with coarse irregular transverse rugæ extending to, but not on, the sides, and are weakest in the depressed portion of upper surface; the latter is scarcely separated from the posterior face or vertical part, the two uniting rather evenly; transverso-median fold distinct, short and rather high; lateral teeth not strong, blunt; stigma-tubercle obtuse, rounded; horizontal surface not rugose. Abdomen fusiform narrowest anteriorly; fourth and fifth ventral segments highly polished, entirely nude; subgenital plate a little widened apically and truncate, not keeled; third submarginal cell at top somewhat broader than at base. Length, 16 mm.

Rio Grande do Sul. One example. Allied to and resembles *P. dimidiata* Fabr., but the abdomen lacks the ventral bristles, and the wing fascia is widely separated from base of wings.

**Pepsis pulchripennis** Mocs.
**Pepsis dimidiata** Fabr.
**Pepsis chrysoptera** Burm.
**Pepsis aurimacula** Mocs.

Rio Grande do Sul and Estado do São Paulo.

**Pepsis vitripennis** Sm.
**Pepsis amabilis** Mocs.
**Pepsis planifrons** R. Luc.
**Pepsis pubiventris** R. Luc.
**Pepsis discolor** Tasch.

Rio Grande do Sul and Ypiranga.

**Pepsis sinnis** R. Luc.
**Salius (Cyphononyx) notatipennis** n. sp.

♀.—About equally blue and black; head black, shining; thorax and legs changing from blue to black in certain lights; abdomen black, with blue pile on basal segments; wings fuscous, more or less yellowish—all the cells except median and submedian spotted with yellow, costal cell and base of wing blackish, apex subhyaline; hind wings yellow, darker apically; head sparsely punctured, with four depressed areas, one at each side of front and another between ocelli and eyes; antennæ short and thick; clypeus transverse, coarsely punctured anteriorly, subtruncate, bearing a few long black hairs; pronotum almost square anteriorly; middle segment subtruncate, in shape rather square, coarsely striated, the upper surface depressed medially and more broadly near sides, the postero-lateral angles rather prominent; the pile on first two dorsal segments gives them a striated appearance; dorsals 3–5, very sparsely punctured; second ventral distinctly impressed transversely near base; ventral segments sparsely and last dorsal densely, with black hairs. Length, 22 mm.

One specimen. Allied to *S. brevicornis* Tasch.

**Salius (Priocnemis) carinatus** Lep.

♀.—Bluish; flagellum, mandibles and labrum black; middle segment purplish; wings black, with bluish and purplish reflections, the nervures ferruginous; clypeus incurved medially; first joint of flagellum about as long as second and two-thirds of third joints; eyes slightly converging above, the space between them at top slightly exceeding length of first flagellar joint; pronotum strongly swollen on each side; middle segment coarsely striated, medially impressed above, and with a large tubercle just behind each stigma; second ventral segment with two transverse, widely separated tubercles which are connected by a smooth fold in the form of an arch; between these tubercles the segment is depressed; abdomen beneath and apically with long black hairs. Length, 25–26 mm.

♂.—First joint of flagellum a little longer than second; middle segment above bearing three longitudinal, deep furrows, the two outer diverging somewhat; abdomen beneath with large, sparse punctures, the tubercles obtuse, or absent, the second ventral bearing a strongly sinuous fold; subgenital plate elongate, obtusely truncate, punctate, and indistinctly impressed down the middle. Length, 22 mm.

Numerous specimens. Resembles *bituberculatus* Guerin, but the color is a lighter blue and the flagellum is entirely black. The subgenital plate in *bituberculatus* is a broad, apically rounded area, raised medially.

**Salius (Priocnemis) apicipennis** n. sp.

♂.—Bluish, changing to black in certain lights; middle segment, mandibles and first two joints of flagellum black; flagellum joints 3 and following fulvous, the two apical joints fuscous; wings black, with purplish reflection, apex of anteriors whitish; veins black; clypeus incurved; scutellum high; middle segment coarsely striated, with two approximate, parallel, raised lines on carina extending down middle of upper surface to posterior face where they suddenly diverge and extend beyond its middle, no tubercle behind stigma; second segment constricted at base, the ventral surface not tuberculate; subgenital plate large, broad, rounded at apex, covered with short black hairs. Length, 22 mm.

Ypiranga. One specimen.

**Salius (Priocnemis) tinctipennis** n. sp.

♀.—Bluish, with blackish or purplish reflections in lights; middle segment purplish; mouth and first two joints of flagellum, black; remaining joints fulvous; anterior wings fusco-ferruginous—black at extreme base, then ferruginous—yellow predominating as far as marginal cell, then fuscous, with the apex whitish; hind wings yellow, margined apically and posteriorly with fuscous; clypeus incurved, bearing long black hair; eyes distinctly converging above, the space between them at vertex a little greater than the length of second joint of flagellum, the latter joint not two-thirds as long as the first joint; pronotum strongly swollen laterally; scutellum bearing long, black, erect hairs; middle segment coarsely striated transversely, not strongly impressed medially, not tuberculate; second ventral with two, small, widely separated, transverse tubercles, which slope toward base of segment. Length, 23–28 mm.

Three specimens. This species reminds one of a *Pepsis*, especially *Pepsis discolor* Tasch.

**Salius (Priocnemis) Iheringii** n. sp.

♀.—Black, including first two, and base of third joints of antennæ; remainder of antennæ fulvous; wings fulvous, reddish medially, black at extreme base; clypeus with large shallow punctures anteriorly, its fore margin subtruncate, not or but slightly incurved; middle segment coarsely striated; second abdominal segment with shallow, sparse punctures basally, the ventral surface not tuberculate, but with two flat raised areas separated by a depression. Length, 22–23 mm.

Rio Grande do Sul and Estado do São Paulo. Three specimens. Close to *S. dumosus* Lep., but larger, the clypeus not or scarcely incurved and second ventral not tuberculate.

**Salius (Priocnemis) flavipennis** Lep.

**Salius (Priocnemis) carinatus** Lep.

Rio Grande do Sul and Estado do São Paulo.

**Salius (Priocnemis) tomentosus** Tasch.

Ypiranga.

**Salius (Priocnemis) dumosus** Lep.

Rio Grande do Sul and Estado do São Paulo.

**Pompilus erubescens** Tasch.

**Pompilus bituberculatus** Spin. (= *vulpes* D. T.).

The *Pompilus bituberculatus* of Guerin belongs to the genus *Salius*. Therefore the changing of the name of Spinola's *Pompilus bituberculatus* by Dalla Torre is unnecessary, and not to be followed.

**Pompilus argenteus** Tasch.

Ypiranga.

**Pompilus areatus** Tasch.

**Pompilus amethystinus** Fabr.

Ypiranga.

**Pompilus Hempelii** n. sp.

♀.—Black; wings pale yellow, with a pale fuscous apical band; head convex in front, impressed; clypeus very short, transverse, subtruncate, its fore margin shining; antennæ inserted close to base of clypeus, tolerably short, not as long as head and thorax, the flagellum tapering but little to apex, the first joint a little longer than second; eyes somewhat converging above; thorax narrow and elongate; pronotum indistinctly subangulate posteriorly; middle segment not impressed above, very indistinctly so posteriorly; tibiæ spinose, but the hind pair feebly so; no tarsal comb; claws armed with a tooth within near base; abdomen with black hairs at apex; cubital vein of hind wings originating beyond apex of submedian cell; first recurrent vein received by second submarginal in about middle; second recurrent vein sinuous, received by third submarginal before middle; the latter cell narrowed about one-half above. Length, 11 mm.

Ypiranga (August 16), A. Hempel. According to Kohl's tables of the Pompilidæ this species falls into his Group 7 of the genus *Pompilus*.

**Ammophila abbreviata** Fabr.

**Sceliphron fistulare** Dhlb.

**Sphex subhyalinus** n. sp.

♀.—Black; head and thorax with black pubescence, no silvery spots; wings hyaline, very faintly tinged with yellow, and with darker apical margin, the nervures forming the submarginal and discoidal cells brownish; inner eye-margins parallel; clypeus very similar to that of *S. fuliginosus;* space between hind ocelli, if anything, very slightly less than that between them and eyes; scutellum flat, not impressed; postscutellum impressed; middle segment almost smooth, subopaque; metatarsus of fore leg bearing at least nine long spines outwardly; petiole fully as long as second joint of hind tarsus; abdomen shining, nude, with the exception of a few long black hairs beneath and apically. Length, 28 mm.

Ypiranga. One specimen. Related to *fuliginosus* and *caliginosus*, but easily distinguished by pale wings, entire scutellum, etc.

**Sphex caliginosus** Er.

**Sphex fuliginosus** Plug.

**Sphex ruficaudus** Tasch.

The single specimen in the collection represents a variety with dark wings (= *S. proximus* Sm.).

**Sphex dubitatus** Cress.

**Sphex ingens** Sm.

**Sphex (Chlorion) hemiprasinus** Sichel.

**Larra americana** Sauss.

**Monedula surinamensis** De G.

**Monedula signata** Linné.

**Monedula magnifica** Perty.

**Monedula punctata** Fabr.

Iguape, December 21.

**Monedula arcuata** Burm.

**Tachytes scalaris** Tasch.

**Trypoxylon fuscipenne** Fabr.

São Paulo.

**Trypoxylon ornatum** Sm.

São Paulo.

**Cerceris basalis** Sm.

**Montezumia sepulchralis** Sauss.

## SOME UNTENABLE NAMES IN ORNITHOLOGY.

BY HARRY C. OBERHOLSER.

The following notes, gathered during the course of recent systematic investigations, are here published in advance of other papers whose appearance is necessarily for some time delayed They relate chiefly to generic terms, although a few changes in specific names are introduced. The lists of recognized species are as complete as available means have permitted.

The writer is under obligation to Dr. C. W. Richmond for various courtesies, as well as to Dr. Walter Faxon, Mr. Samuel Henshaw and Mr. Witmer Stone for assistance in verification of references.

### MICRURIA Grant.

This generic name, as used by Mr. Ogilvie-Grant,[1] is preoccupied in Coleoptera by *Micruria* Reitter.[2] Since by reason of the very long tarsi, tail of 12 feathers, and the absence of any spotted condition of plumage, this appears to be a well-defined group, it may bear the name *Endomychura*, from ἐνδόμυχος, occultus, and οὐρά, cauda; the type being *Brachyrhamphus hypoleucus* Xantus.

The two species are

*Endomychura hypoleuca* (Xantus).
*Endomychura craveri* (Salvadori).

### EUHYAS Sharpe.

*Euhyas* Sharpe[3] is untenable because of *Euhyas* Fitzinger,[4] proposed for a genus of reptiles. In its stead may be employed *Zapterus*, from ζά, valde, and πτερόν, ala. The type and only species is *Charadrius leucurus* Lichtenstein, which will now stand as

*Zapterus leucurus* (Lichtenstein).

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[1] *Cat. Birds Brit. Mus.*, xxvi, 1898, p. 594.
[2] *Verh. Ver. Brünn.*, xiii, 1875, p. 58, pl. 1, figs. 13-21.
[3] *Cat. Birds Brit. Mus.*, xxiv, 1896, p. 736.
[4] *Syst. Rept.*, 1843, p. 31.

### DEFILIPPIA Salvadori.

The generic term *Defilippia* Salvadori[1] is preoccupied in Diptera by *Defilippia* Lioy.[2] The proper name of the genus is *Hemiparra* Salvadori,[3] for although no description is given, *Chettusia crassirostris* DeFilippi is mentioned as the type, which, of course, is sufficient to fix the name.

The two species should be called

*Hemiparra crassirostris* (DeFilippi).

*Hemiparra leucoptera* (Reichenow).

### PHYLLOPEZUS Sharpe.

The name *Phyllopezus* Sharpe[4] must give way on account of *Phyllopezus* Peters,[5] a genus of reptiles. It may be replaced by *Actophilus*, from *ἀκτή*, litus, and *φιλέω*, amo; the type being *Parra africana* Gmelin.

The two species are

*Actophilus africanus* (Gmelin).

*Actophilus albinuchus* (Is. Geoffroy).

### ORTHOCNEMUS Milne-Edwards.

*Orthocnemus* Milne-Edwards[6] is antedated in Coleoptera by *Orthocnemus* Jekel;[7] and may be called *Idiornis* (*ἴδιος*, distinctus, *ὄρνις*, avis), with *Orthocnemus gallicus* Milne-Edwards as the type.

The described forms are

*Idiornis gallicus* (Milne-Edwards).

*Idiornis cursor* (Milne-Edwards).

*Idiornis major* (Milne-Edwards).

*Idiornis minor* (Milne-Edwards).

### TAPINOPUS Milne-Edwards.

The term *Tapinopus* Milne-Edwards[8] is preoccupied by *Tapinopus* Saussure[9], for a genus of Orthoptera. It may be replaced by

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[1] *Atti. Soc. Ital.*, viii, 1865, p. 373.
[2] *Act. Venet Inst.*, 3 Ser., ix, 1864, p. 733.
[3] *Atti. Soc. Ital.*, viii, 1865, p. 270.
[4] In Shelley's *Birds of Africa*, i, 1896, p. 187.
[5] *Monatsb. K. Akad. Wiss. Berlin*, 1877, p 415.
[6] *C. R. 2nd Congrès Ornith. Internat. Budapest*, ii, 1892, p. 74.
[7] In *Fabr. Ent.*, i, 1857, p. 131.
[8] *C. R. 2nd Congrès Ornith. Internat. Budapest*, ii, 1892, p. 79.
[9] *Mel. Orth.*, vi, 1878, p. 758.

*Diatropornis*, from *διάτροπος*, differens, and *ὄρνις*, avis; the type and only species being *Tapinopus ellioti* Milne-Edwards. This will now stand as

*Diatropornis ellioti* (Milne-Edwards).

**PERISTERA** Swainson.

The Columbine genus *Peristera* Swainson[1] is untenable because of *Peristera* Rafinesque[2] in Mollusca; and may be called *Claravis*, from clara (clarus) and avis, the type being *Columba cinerea* Temminck. The name of this species, however, should be *pretiosa* Ferrari-Perez;[3] for *Columba cinerea* Temminck and Knip[4] is preoccupied by *Columba cinerea* Scopoli.[5]

The species will then stand as follows:

*Claravis pretiosa* (Ferrari-Perez).

*Claravis geoffroyi* (Temminck and Knip).

*Claravis mondetoura* (Bonaparte).

**HARPE** Bonaparte.

*Harpe* Bonaparte[6] is preoccupied in ichthyology by *Harpe* Lacépède.[7] *Harpa* Sharpe,[8] for the same group, is also untenable on account of *Harpa* Lamarck,[9] a genus of Mollusca. As no other name is available, there may be proposed *Nesierax*, from *νῆσος*, insula, and *ἱέραξ*, accipiter, with *Falco novæ-zealandiæ* Gmelin as type.

The species are

*Nesierax novæ-zealandiæ* (Gmelin).

*Nesierax australis* (Hombron and Jacquinot).

**PACHYNUS** Reichenow.

Not only is *Pachynus* Reichenow[10] preoccupied in Hemiptera by *Pachynus* Stål, 1866, and thus untenable under any circumstances, but it is not the earliest available name for the genus. *Graydi-*

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[1] *Zool. Journ.*, iii, 1827, p. 360.
[2] *Anal. Nat.*, 1815, p. 145.
[3] *Proc. U. S. Nat. Mus.*, ix, 1886, p. 175.
[4] *Pig. I. fam. seconde*, 1808–1811, p. 126, pl. 58.
[5] *Del. Flor et Faun. Insubr.*, ii, 1786, p. 94, n. 93.
[6] *Compt. Rend.*, xli, 1855, p. 652.
[7] *Hist. Nat. Poiss.*, iv, 1802, 426.
[8] *Cat. Birds Brit. Mus.*, i, 1874, p. 372.
[9] *Mém. Soc. Hist. Nat.*, 1799, p. 71.
[10] *Journ. f. Orn.*, 1881, p. 352.

*dascalus* Bonaparte[1] has nearly thirty years' priority, and there seems to be no valid reason for its rejection.

The type and only species should therefore stand as

*Graydidascalus brachyurus* (Temminck and Kuhl).

**HEMILOPHUS** Swainson.

The name *Hemilophus* Swainson[2] is preoccupied in Coleoptera by *Hemilophus* Serville.[3] The next name seems to be *Mulleripicus* Bonaparte,[4] type *Picus pulverulentus* Temminck.

The only recognized species is

*Mulleripicus pulverulentus* (Temminck).

**DENDROBATES** Swainson.

Dr. C. W. Richmond has already pointed out[5] that *Dendrobates* Swainson[6] is untenable by reason of a batrachian genus, *Dendrobates* Wagler,[7] but proposed that *Eleopicus* Bonaparte[8] be used in its place. The proper name, however, would appear to be *Veniliornis* Bonaparte, since in the list of genera (*l. c.*) this is numbered 21, while under it are ranged as subgenera *Venilia* and *Eleopicus*, all the species contained in both being now included in the genus *Dendrobates*. This name *Veniliornis* has been generally ignored, but there seems to be no doubt of the propriety of accepting it for the group in question, rather than either of its subgenera —one of the two alternatives being necessary. No type is indicated, neither is there a subgenus *Veniliornis;* but the first species mentioned, *Picus sanguineus* Lichtenstein, may be taken as the typical one.

With regard to specific names in this group, there are two of those accepted in the eighteenth volume of the British Museum *Catalogue of Birds* that require to be changed; while some doubt attaches to a third. The correct name of the bird known as *peruvianus* Taczanowski is *Callonotus major* Berlepsch and Taczan.,[9]

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[1] *Rev. et Mag. de Zool.*, 1854, p. 147.
[2] *Classif. Birds,* ii, 1837, p. 309.
[3] *Ann. Soc. Ent. France*, Ser. 1, iv, 1835, p. 49.
[4] *Consp. Av., Volucr. Zygod.*, 1854, p. 7.
[5] *Proc. U. S. Nat. Mus.*, xvi, 1893, p. 519.
[6] *Fauna Bor.-Amer.*, ii, 1832, p. 301.
[7] *Nat. Syst. Amphib.*, 1830, p. 202.
[8] *Consp. Av , Volucr. Zygod.*, 1854, p. 10.
[9] *P. Z. S.*, 1883, p. 570.

which antedates the former by three years. There seems to be no reason why the name *passerinus* Linnæus[1] should not be employed for the species now called *tephrodops*, as the former is of undoubted application, and of much earlier date. *Picus affinis* Swainson,[2] now *Dendrobates affinis*, is possibly rendered untenable by *Picus affinis* Raffles,[3] but as it has been impossible at present to obtain the exact date of this part of Swainson's *Zoological Illustrations*, no change in this name is here made.

The species of this genus are as follows:

*Veniliornis fumigatus* (Lafresnaye and d'Orbigny).
*Veniliornis caboti* (Malherbe).
*Veniliornis oleaginus* (Lichtenstein).
*Veniliornis sanguinolentus* (Sclater).
*Veniliornis callonotus* (Waterhouse).
*Veniliornis callonotus major* (Berlepsch and Taczanowski).
*Veniliornis sanguineus* (Lichtenstein).
*Veniliornis kirtlandi* (Malherbe).
*Veniliornis nigriceps* (Lafresnaye and d'Orbigny).
*Veniliornis murinus* (Malherbe).
*Veniliornis dignus* (Sclater and Salvin).
*Veniliornis valdizani* (Berlepsch and Stolzmann).
*Veniliornis passerinus* (Linnæus).
*Veniliornis tænionotus* (Reichenbach).
*Veniliornis frontalis* (Cabanis).
*Veniliornis agilis* (Cabanis).
*Veniliornis olivinus* (Malherbe).
*Veniliornis fidelis* (Hargitt).
*Veniliornis spilogaster* (Wagler).
*Veniliornis maculifrons* (Spix).
*Veniliornis cassini* (Malherbe).
*Veniliornis ruficeps* (Spix).
*Veniliornis affinis* (Swainson).
*Veniliornis hæmatostigma* (Malherbe).
*Veniliornis kirkii* (Malherbe).
*Veniliornis cecilii* (Malherbe).

[1] *Syst. Nat.*, ed. 12, i, 1766, p. 174.
[2] *Zool. Ill.*, Ser. 1, ii, 1821–22, pl. 78, desc. ♂.
[3] *Trans. Linn. Soc. Lond.*, xii, 1822, p. 288.

### HARPACTES Swainson.

The generic term *Harpactes* Swainson[1] cannot be used because of *Harpactes* Templeton,[2] a genus of Arachnida, as already noted by Dr. C. W. Richmond,[3] and previously by Cabanis.[4] The next name, *Hapalurus* Reichenbach,[5] is preoccupied by *Hapalura* Cabanis,[6] which is a synonym of *Culicivora;* and *Duvaucelius* Bonaparte,[7] besides an uncertainty regarding the identity of the type species, is untenable on account of *Duvaucelia* Desvoidy.[8] This gives a clear title to *Pyrotrogon* Bonaparte,[9] of which the type is *Trogon ardens* Temminck.

The species are

*Pyrotrogon diardii* (Temminck).
*Pyrotrogon kasumba* (Raffles).
*Pyrotrogon fasciatus* (Pennant).
*Pyrotrogon ardens* (Temminck).
*Pyrotrogon whiteheadi* (Sharpe).
*Pyrotrogon erythrocephalus* (Gould)
*Pyrotrogon erythrocephalus flagrans* (Müller).
*Pyrotrogon duvaucelii* (Temminck).
*Pyrotrogon orrhophæus* (Cabanis).
*Pyrotrogon viduus* (Grant).
*Pyrotrogon oreskios* (Temminck).
*Pyrotrogon dulitensis* (Grant).

### AMAZILIA Reichenbach.

The name *Amazilia* Reichenbach[10] is not the earliest one for the genus of humming-birds to which it has been applied, as the following discussion will show. Lesson, in 1832,[11] made use of the term "Les Amazilis" as a popular heading for one of his groups, including under this the species *Ornismya amazili* Less.; indicating by the manner of its use that he did not intend *Amazilis* as a generic

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1 *Classif. Birds*, ii, 1837, p. 337.
2 *Zool. Journ.*, v, 1834, p. 401.
3 *Proc. U. S. Nat. Mus.*, xvii, 1894, p. 602, footnote.
4 *Mus. Hein.*, iv, pt. 1, 1863, p. 154.
5 *Av. Syst. Nat.*, 1850, pl. 88.
6 *Archiv f. Naturg.*, 1847, p. 252.
7 *Consp. Av.*, *Volucr. Zygod.*, 1854, p. 14.
8 Diptera, 1830.
9 *Consp Av.*, *Volucr. Zygod.*, 1854, p. 14.
10 *Av. Syst. Nat.*, 1849, pl. 39.
11 *Ind. Gén. Troch.*, p. xxvii.

term. Gray, however,[1] evidently considers it as such, as witness some notes sent by Mr. Witmer Stone, who kindly verified the original reference: "On page 107, in footnote to *Genus Polytmus*, he [Gray] says that it includes a number of genera of various authors, among which he gives '*Les Amizilis* Less. (1829),' apparently quoting the above and misspelling it. On page 108, in the list of species of *Polytmus* he gives under P. [olytmus]. amazili (Less.), 'Type of Amizilis Less. (1829);' referring to the same again and turning it into a Latin name." The following year Gray again makes use of the term *Amizilis* "Lesson,"[2] this time as a generic heading, under which are placed the species *A. latirostris* (Sw.) and *Or. amizili* Less. There thus appears to be no reason for the non-acceptance of Gray's *Amizilis*—the type of which may properly be considered to be *Orthorhynchus amazili* Lesson—whether we allow the genus to date from 1840 or 1841, since in either case it is several years anterior to *Amazilia* Reichenbach.

The species for which Mr. Salvin uses the name *pristina* Gould, should be called *amazili* Lesson,[3] this being its earliest name. The species commonly known as *viridiventris* Reichenbach is a parallel case, its proper name being *viridigastra* Bourcier.[4] The forms, *erythronota, feliciæ* and *aliciæ* are distinguished from *tobaci* by characters too slight and inconstant to entitle them to more than subspecific rank.

The species are

*Amizilis amazili* (Lesson).
*Amizilis leucophæa* (Reichenbach).
*Amizilis alticola* (Gould).
*Amizilis dumerili* (Lesson).
*Amizilis cinnamomea* (Lesson).
*Amizilis cinnamomea saturata* (Nelson).
*Amizilis graysoni* (Lawrence).
*Amizilis beryllina* (Lichtenstein).
*Amizilis devilii* (Bourcier).
*Amizilis castaneiventris* (Gould).
*Amizilis cyanura* (Gould).

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[1] *Gen. Birds*, 1840, pp. 107, 108.
[2] *List Gen. Birds*, 1841, p. 19.
[3] *Voy. Coq.*, pl. 31, fig. 3.
[4] *Rev. Zool.*, 1843, p. 103.

*Amizilis ocai* (Gould).
*Amizilis sumichrasti* (Salvin).
*Amizilis yucatanensis* (Cabot).
*Amizilis cerviniventris* (Gould).
*Amizilis cerviniventris chalconota* (Oberholser).
*Amizilis lawrencii* (Elliot).
*Amizilis fuscicaudata* (Fraser).
*Amizilis fuscicaudata jucunda* (Heine).
*Amizilis viridigastra* (Bourcier).
*Amizilis iodura* (Reichenbach).
*Amizilis lucida* (Elliot).
*Amizilis cupreicauda* (Salvin and Godman).
*Amizilis edward* (Delattre and Bourcier).
*Amizilis niveiventris* (Gould).
*Amizilis warszewiezi* (Cabanis).
*Amizilis saucerottii* (Bourcier and Delattre).
*Amizilis alfaroana* (Underwood).
*Amizilis sophiæ* (Bourcier and Mulsant).
*Amizilis tobaci* (Gmelin).
*Amizilis tobaci erythronota* (Lesson).
*Amizilis tobaci feliciæ* (Lesson).
*Amizilis tobaci aliciæ* (Richmond).
*Amizilis elegans* (Gould).
*Amizilis cyanifrons* (Bourcier).

### HETEROPELMA Bonaparte.

*Heteropelma* Bonaparte[1] is preoccupied in Hymenoptera by *Heteropelma* Wesmaël.[2] It may be called *Scotothorus*, from σκότος, obscuritas, and θορεῖν, cursare; the type being *Muscicapa turdina* Maximilian.

The name of the bird usually known as *Heteropelma virescens* (Max.) should be changed to *unicolor* Bonaparte,[3] since *Muscicapa virescens* Maximilian[4] is untenable by reason of *Muscicapa virescens* Temminck,[5] which is a synonym of *Phyllomyias brevirostris* (Spix).

[1] *Consp. Av.*, *Volucr. Anisod.*, 1854, p. 4.
[2] *Bruxell. Acad. Bull.*, xvi, 1849, pp. 2, 115.
[3] *Consp. Av.*, *Volucr. Anisod.*, 1854, p. 4.
[4] *Beitr.*, iii, 1831, p. 802.
[5] *Pl. Col.*, livr. 46, May, 1824, pl. 275, fig. 3.

The species are as follows:

*Scotothorus turdinus* (Maximilian).

*Scotothorus wallacii* (Sclater and Salvin).

*Scotothorus amazonus* (Sclater).

*Scotothorus stenorhynchus* (Sclater and Salvin).

*Scotothorus veræ-pacis* (Sclater).

*Scotothorus unicolor* (Bonaparte).

*Scotothorus flavicapillus* (Sclater).

*Scotothorus chrysocephalus* (Pelzeln).

*Scotothorus igniceps* (Sclater).

*Scotothorus rosenbergi* (Hartert).

**METOPIA** Swainson.

The term *Metopia* Swainson[1] must be displaced on account of *Metopia* Meigen,[2] a genus of Diptera. The proper name is *Antilophia* Reichenbach.[3]

The type and only species will therefore stand as

*Antilophia galeata* (Lichtenstein).

**GYMNOCEPHALUS** Geoffroy St.-Hilaire.

The genus *Gymnocephalus* Geoffroy St.-Hilaire[4] must give way to *Gymnocephalus* Bloch and Schneider.[5] In its stead may be employed *Perissocephalus*, from περισσός, mirabilis, and κεφαλή, caput. The type and sole species is *Corvus calvus* Gmelin, which should now be called

*Perissocephalus calvus* (Gmelin).

**HETEROCNEMIS** Sclater.

*Heterocnemis* Sclater[6] is preoccupied by *Heterocnemis* Albers[7] for a genus of Coleoptera. Since the only other name for this group of birds, *Holocnemis* Strickland,[8] is untenable because of *Holocnemis* Schilling,[9] in Coleoptera, as pointed out by Dr. Sclater (*l. c.*), it is proposed to substitute *Sclateria*, in honor of Dr. P. L.

[1] *Fauna Bor.-Amer.*, i, 1832, p. 491.
[2] *Illig. Mag.*, ii, 1803, p. 280.
[3] *Av. Syst. Nat.*, 1850, t. lxiii.
[4] *Ann. du Mus.*, xiii, 1809, p. 237.
[5] *Syst. Ichthyol.*, 1801, p. 346.
[6] *P. Z. S.*, 1855, p. 146.
[7] *Entom. Zeitung Stettin*, 1852, p. 46.
[8] *Ann. and Mag. Nat. Hist.*, xiii, 1844, p. 415.
[9] *Beitr. Ent. Faun.*, 1829.

Sclater, and in recognition of his extensive contributions to Neotropical ornithology.

The type is *Sitta nævia* Gmelin; and the list of species is as follows:

*Sclateria nœvia* (Gmelin).
*Sclateria leucostigma* (Pelzeln).
*Sclateria saturata* (Salvin).
*Sclateria argentata* (Des Murs).
*Sclateria hypoleuca* (Ridgway).

### HOMORUS Reichenbach.

The generic name *Homorus* Reichenbach[1] is rendered untenable by *Homorus* Albers,[2] a genus of Mollusca. The only other name for this group is *Pseudoseisura* Reichenbach,[3] of which the type is *Anabates gutteralis* d'Orbigny and Lafresnaye.

The species are

*Pseudoseisura lophotes* (Reichenbach).
*Pseudoseisura gutteralis* (d'Orbigny and Lafresnaye).
*Pseudoseisura cristata* (Spix).
*Pseudoseisura galatheæ* (Leverkühn).

### LIMNOPHYES Sclater.

The genus *Limnophyes* Sclater[4] is preoccupied in Diptera by *Limnophyes* Eaton,[5] and may be called *Thryolegus*, from θρύον, juncus, and λέγω, lego. The type and only species is *Limnornis curvirostris* Gould, which will therefore stand as

*Thryolegus curvirostris* (Gould).

### OXYURUS Swainson.

The usual reference to this name is *Zoological Journal*, iii, 1827, p. 354, though here is nothing but a nomen nudum, no species being mentioned. The correct citation seems to be *Classification of Birds*, ii, 1838, p. 313. *Oxyurus* is, however, untenable in ornithology, by reason of *Oxyurus* Rafinesque[6] for a genus of fishes. No other name being available, it may be known as *Aphrastura*,

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[1] *Handb. Spec. Orn.*, 1853, p. 172.
[2] *Die Heliceen*, 1850, p. 196.
[3] *Handb. Spec. Orn.*, 1853, p. 172.
[4] *P. Z. S.*, 1889, p. 34.
[5] *Ent. Mo. Mag.*, xii, 1875, p. 60.
[6] *Caratt. Anim. Sicil.*, 1810, p. 19.

from ἄφραστος, mirabilis, and οὐρά, cauda, the type being *Motacilla spinicauda* Gmelin.

The species are

*Aphrastura spinicauda* (Gmelin).

*Aphrastura masafueræ* (Philippi and Landbeck).

### EROESSA Hartlaub.

*Eroessa* Hartlaub[1] is preoccupied in Lepidoptera by *Eroessa* Doubleday.[2] Another name for the group, *Dauria* Pollen,[3] is also unavailable on account of *Dauria* Dejean, 1834, for a genus of Coleoptera. *Neomixis* Sharpe[4] must therefore be employed, the type being *Neomixis striatigula* Sharpe.

The species will thus stand as

*Neomixis tenella* (Hartlaub).

*Neomixis viridis* (Sharpe).

*Neomixis striatigula* Sharpe.

### ELLISIA Hartlaub.

The genus *Ellisia* Hartlaub[5] must give way to *Ellisia* Forbes and Goodsir,[6] for a group of Polypi. As *Thamnornis* Milne-Edwards, type *chloropetoides*, appears to be sufficiently distinct for generic separation, a new name is necessary for the species of *Ellisia* proper; and *Nesillas*, from νῆσος, insula, and ἰλλάς, turdus, is proposed, the type being *Ellisia typica* Hartlaub.

The recognized forms are

*Nesillas typica* (Hartlaub).

*Nesillas typica ellisia* (Schlegel).

*Nesillas typica lantzi* (Grandidier).

*Nesillas typica longicaudata* (Newton).

*Nesillas brevicaudata* (Milne-Edwards and Oustalet).

### PHLEXIS Hartlaub.

The generic term *Phlexis* Hartlaub[7] is preoccupied in Coleoptera by *Phlexys* Erichson,[8] emended by Agassiz to *Phlexis*.[9] It may be

[1] *P. Z. S.*, 1866, p. 218.
[2] *Gen. Diurn. Lep.*, 1847, p. 56.
[3] *Rech. Faune Madag.*, *Mam. et Ois.*, 1868, p. 92.
[4] *P. Z. S.*, 1881, p. 195.
[5] *Journ. f. Orn.*, 1860, p. 92.
[6] *Rep. Brit. Ass.* for 1839 (1840), p. 81.
[7] *Ibis*, 1866, p. 139.
[8] In *Wagn. Reis. Algier*, 1841.
[9] *Nom. Zool.*, 1842–46, p. 124.

replaced by *Cryptillas*, from κρυπτός, occultus, and ἰλλάς, turdus; the type and sole species being *Bradypterus victorini* Sundevall. This will now stand as

*Cryptillas victorini* (Sundevall).

### AMYTIS Lesson.

*Amytis* Lesson[1] is untenable by reason of *Amytis* Savigny,[2] proposed for a genus of Vermes. In its stead may be used *Diaphorillas*, from διάφορος, differens, and ἰλλάς, turdus; the typical species being *Malurus textilis* Quoy and Gaimard.

The list of species is as follows:

*Diaphorillas textilis* (Quoy and Gaimard).
*Diaphorillas striata* (Gould).
*Diaphorillas macroura* (Gould).
*Diaphorillas goyderi* (Gould).

### HEMIXUS Hodgson.

In the sixth volume of the British Museum *Catalogue of Birds*, pp. 120, 121, Dr. Sharpe treats at length the generic name *Ixos* Temminck,[3] arriving finally at the conclusion that it is a synonym of *Pycnonotus*, and that it must date from 1840. That this disposition of the name is not the proper one may at once be seen by reference to the original description in the text accompanying the *Planches Coloriées*. Dr. Sharpe states that Temminck gives no characters for the genus, but the following quotation will show that this is not correct: "Je donne à ce groupe d'oiseaux un nom systématique, pour que les espèces qui en font partie puissent être séparées génériquement des *Merles* (*Turdus*), desquels on peut les séparer assez convenablement, par la brièveté du bec en proportion de la tête, par des ailes plus courtes, et par une plus grande abondance de duvet sur le croupion, caractère très marqué dans quelques unes." The only species given is *Ixos virescens* Temminck, which must therefore be considered the type; and as this bird is not a *Pycnonotus*, but a *Hemixus*, the generic name *Ixos*, 1825, must supplant *Hemixus* Hodgson.[4]

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[1] *Traité d'Orn.*, 1831, p. 453.
[2] *Syst. Annél.*, 1826, p. 46.
[3] *Pl. Col.*, ii, livr. 64, Dec., 1825, pl. 382, fig. 1.
[4] Gray's *Zool. Miscell.*, 1844, p. 83.

The recognized forms are as follows:

*Ixos flavala* (Hodgson).
*Ixos hildebrandi* (Hume).
*Ixos davisoni* (Hume).
*Ixos castanonotus* (Swinhoe).
*Ixos connectens* (Sharpe).
*Ixos cinereus* (Blyth).
*Ixos malaccensis* (Blyth).
*Ixos virescens* (Temminck).
*Ixos canipennis* (Seebohm).
*Ixos sumatranus* (Salvadori).

### CASSINIA Hartlaub.

*Cassinia* Hartlaub[1] is preoccupied in Mollusca by *Cassinia* Rafinesque,[2] and as no other name is available, may be called *Stizorhina*, from στίζω, distinguo, and ῥίς, nasus, the type being *Muscicapa fraseri* Strickland.

The species are
*Stizorhina fraseri* (Strickland).
*Stizorhina finschi* (Sharpe).
*Stizorhina semipartita* (Rüppell).
*Stizorhina zenkeri* (Reichenow).

### PHILENTOMA Eyton.

The generic name *Philentoma* Eyton[3] is not the earliest one for the group to which it is applied, as *Drymophila* Temminck[4] is distinctly stated to have for its type *Drymophila velata* Temminck (*l. c.*), which is now a *Philentoma*. At first sight *Drymophila* Temminck appears to be preoccupied by *Drymophila* Swainson, 1824,[5] but the latter is a nomen nudum, no species being mentioned; and it was not properly characterized until the next year,[6] later by a few months than *Drymophila* Temminck, which thus becomes available for *Philentoma*.

[1] *Rev. et Mag. de Zool.*, 1860, p. 82.
[2] *Anal. Nat.*, 1815. p. 145.
[3] *Ann. and Mag. Nat. Hist.*, xvi, 1845, p. 229
[4] *Pl. Col.*, livr. 56, March, 1825, pl. 334.
[5] *Zool. Journ.*, i, Oct., 1824, p. 302.
[6] *Zool. Journ.*, ii, July, 1825, p. 149.

The species, therefore, should stand as
*Drymophila velata* (Temminck).
*Drymophila pyrrhoptera* (Temminck).
*Drymophila dubia* (Hartert).

### SYMMORPHUS Gould.

The genus *Symmorphus* Gould[1] is preoccupied in Hymenoptera by *Symmorphus* Wesmaël,[2] and may be replaced by *Diaphoropterus* (διάφορος, differens, and πτερόν, ala), its type being *Symmorphus leucopygus* Gould.

*Muscicapa nævia* Gmelin,[3] which is *Symmorphus nævius*, is untenable because of *Muscicapa nævia* Boddaert,[4] a *Myiobius*. The correct name is *montrosieri* (*Lalage montrosieri* Verreaux and Des Murs).[5]

The species of this genus are
*Diaphoropterus leucopygus* (Gould).
*Diaphoropterus montrosieri* (Verreaux and Des Murs).
*Diaphoropterus affinis* (Tristram).

### XEROPHILA Gould.

*Xerophila* Gould[6] must be displaced on account of *Xerophila* Held,[7] a genus of Mollusca. In its place may be employed *Aphelocephala*, from ἀφελής, simplex, and κεφαλή, caput, with *Xerophila leucopsis* Gould as type.

The species are as follows:
*Aphelocephala leucopsis* (Gould).
*Aphelocephala pectoralis* (Gould).
*Aphelocephala nigricincta* (North).

### EUTHYRHYNCHUS Schlegel.

The name *Euthyrhynchus* Schlegel[8] is preoccupied in Hemiptera by *Euthyrhynchus* Dallas.[9] As *Melipotes gymnops* is distinct generically, the only name for the group embraced in *Euthyrhynchus*

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1 *P. Z. S.*, 1837, p. 145.
2 *Mon. Odyn. Belg.*, 1833.
3 *Syst. Nat.*, i, 1788, p. 944.
4 *Tab. Pl. Enl.*, 1783 p. 34.
5 *Rev. et Mag. de Zool.*, 1860, p. 431.
6 *P. Z. S.*, 1840, p. 175.
7 *Isis*, 1837, p. 913.
8 *Ned. Tijdschr. Dierk.*, iv, 1873, p. 39
9 *Brit. Mus. List Hemipt.*, pt. 1, 1851, p. 104.

proper is *Timeliopsis* Salvadori,[1] of which the type is *Timeliopsis trachycoma* Salvadori (= *E. griseigula* Schlegel).

The species will therefore stand as

*Timeliopsis griseigula* (Schlegel).

*Timeliopsis griseigula flavigula* (Schlegel).

*Timeliopsis fulvigula* (Schlegel).

*Timeliopsis meyeri* (Salvadori).

*Timeliopsis fulviventris* (Ramsey).

### STICTOPTERA Reichenbach.

The generic term *Stictoptera* Reichenbach[2] is untenable by reason of *Stictoptera* Guenée,[3] for a group of Lepidoptera, and may be replaced by *Stizoptera*, from στίζω, noto, and πτερόν, ala, the type being *Fringilla bichenovii* Vigors and Horsfield.

The species are

*Stizoptera bichenovii* (Vigoüs and Horsfield).

*Stizoptera annulosa* (Gould).

### CHERA Gray.

The genus *Chera* Gray[4] must give place to *Chera* Hübner,[5] employed in Lepidoptera; and it may be called *Diatropura*, from διάτροπος, differens, and οὐρά, cauda. The type and only species is *Emberiza procne* Boddaert, which will now stand as

*Diatropura procne* (Boddaert).

### EUCORYSTES Sclater.

*Eucorystes* Sclater[6] is preoccupied in Crustacea by *Eucorystes* Bell.[7] In its stead may be used *Zarhynchus*, from ζά, valde, and ῥύγχος, rostrum; the type and sole representative being *Cacicus wagleri* Gray, which should now be called

*Zarhynchus wagleri* (Gray).

### CALORNIS Gray.

The term *Calornis* Gray[8] is debarred by *Calornis* Billberg,[9] for a genus of Lepidoptera. The only available name for this group of

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[1] *Ann. Mus. Civ. Gen.*, Ser. 1, vii, 1875, p. 963.
[2] *Singvögel*, 1862, p. 31.
[3] *Spéc. gén. d. Lep.*, vii, 1852, p. 51.
[4] *Gen. Birds*, ii, March, 1849, p. 355.
[5] *Verz. Schmett.*, 1816, p. 211.
[6] *Ibis*, 1883, p. 147.
[7] *Monogr. Malacostr. Crust. Gr. Brit.*, ii, 1862, p. 17.
[8] *List Gen. Birds*, 1841, p. 53.
[9] *Enum. Ins.*, 1820, p. 77.

birds is *Lamprocorax* Bonaparte,[1] the type of which is *Lamprotornis fulvipennis* Jacquinot and Pucheran (= *Lamprocorax grandis* Salvadori).

The list of species is as follows:

*Lamprocorax metallicus* (Temminck).

*Lamprocorax metallicus inornatus* (Salvadori).

*Lamprocorax metallicus fuscovirescens* (Salvadori).

*Lamprocorax gularis* (Gray).

*Lamprocorax purpureiceps* (Salvadori).

*Lamprocorax minor* (Bonaparte).

*Lamprocorax chalybeus* (Horsfield).

*Lamprocorax chalybeus tytleri* (Hume).

*Lamprocorax chalybeus altirostris* (Salvadori).

*Lamprocorax chalybeus panayensis* (Scopoli).

*Lamprocorax chalybeus neglectus* (Walden).

*Lamprocorax enganensis* (Salvadori).

*Lamprocorax sulaensis* (Sharpe).

*Lamprocorax sanghirensis* (Salvadori).

*Lamprocorax obscurus* (Bonaparte).

*Lamprocorax grandis* (Salvadori).

*Lamprocorax dichrous* (Tristram).

*Lamprocorax corvinus* (Kittlitz).

*Lamprocorax maximus* (Tristram).

**DILOPHUS Vieillot.**

*Dilophus* Vieillot[2] is untenable because of *Dilophus* Meigen,[3] for a genus of Diptera. As no other name is available it may be called *Perissornis* (περισσός, mirabilis, ὄρνις, avis), the type and sole species being *Gracula carunculata* Gmelin, which will now stand as

*Perissornis carunculatus* (Gmelin).

**CUPHOPTERUS Hartlaub.**

The genus *Cuphopterus* Hartlaub[4] is preoccupied in Hymenoptera by *Cuphopterus* Morawitz,[5] and as there are no synonyms, it may be called *Horizorhinus* from ὁρίζω, limito, and ῥίς, nasus. The type and only species is *Cuphopterus dohrni* Hartlaub, which should now be known as

*Horizorhinus dohrni* (Hartlaub).

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[1] *Compt. Rend.*, xxxvii, 1853, p. 830.

[2] *Analyse*, 1816, p. 34.

[3] *Klassif. und Beschr. Europ. Zweifl. Insekt.*, Bd. i, Abt. 1, 1804, p. 114, pl. 6, f. 25–32.

[4] *P. Z. S.*, June 12, 1866, p. 326.

[5] *Bull. Acad. Imp. Sci. St. Pétersb.*, January 20, 1866, p. 252.

April 4.

The President, Samuel G. Dixon, M.D., in the Chair.

Twenty persons present.

A paper entitled "Thermotropic Movements of the Leaves of Rhododendron maximum L.," by John W. Harshberger, was presented for publication.

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April 11.

The President, Samuel G. Dixon, M.D., in the Chair.

Thirty persons present.

A paper entitled "Dynamic Evolution or Form as a Result of Motion," by the Rev. William F. C. Morsell, was presented for publication, the author giving the substance of the communication verbally with lantern illustrations.

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April 18.

The President, Samuel G. Dixon, M.D., in the Chair.

Thirty-four persons present.

The deaths of James McAlpine Sommerville, M.D., and William A. Blackwood, M.D., members, were announced.

Mr. Witmer Stone made a communication on the Josiah Hoopes collection of birds recently added to the ornithological cabinet of the Academy. (No abstract.)

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April 25.

The President, Samuel G. Dixon, M.D., in the Chair.

Thirty-eight persons present.

A paper entitled "Certain Aboriginal Remains of the Alabama River," by Clarence B. Moore, was presented by title for publication.

Dr. Henry Skinner made a communication on the relation of insects to disease. (No abstract.)

James Wallace, M. D., was elected a member.

April 27.

The President, Samuel G. Dixon, M.D., in the Chair.

Fifty-five persons present.

This meeting, adjourned from the 25th inst., was held for the consideration of a revised code of By-Laws reported by the Council of the Academy, in conformity with a resolution of instruction adopted February 21, 1899.

The following was ordered to be printed:

## THERMOTROPIC MOVEMENT OF THE LEAVES OF RHODODENDRON MAXIMUM L.

BY JOHN W. HARSHBERGER, PH.D.

It is apparent from a number of recently published papers on the reactions of protoplasm and, in particular, of various sensitive plants to stimuli, that it will be necessary to reconstruct our views to a considerable extent upon the subject of vegetable irritability. The movement of the chlorophyll granules in the cells of leaves, exposed to too bright sunlight; the movement of tendrils in response to shocks, heat or the application of chemical substances, show us that protoplasm reacts in essentially the same manner, whatever plant is chosen for experimentation.

The writer is not aware that any observations have ever been recorded on the movement of the leaves of *Rhododendron maximum*, yet the movements of this plant are quite definite. If observations upon this ericaceous shrub be made during cold weather (the recent zero weather affording fine opportunities for such study), it will be found that the leaves are all bent down closely against the stem, and are rolled inward tightly in a convolute manner, one edge slightly overlapping the other, so that the upper epidermis is alone presented to the action of the weather (fig. 1). To assume this position, the petiole takes a sharp bend downward through an angle of about seventy degrees. The lower side of the petiole is puckered into transverse folds, when the inrolled and hanging position of the leaves is assumed. The acute apex as shown in one of the lower leaves (fig. 1) is slightly incurved. The U-shaped bend of the petiole is more marked in the lower leaves than in the upper. The leaves assume an extremely deep green color, of a brownish hue, and appear as if frozen. Two objects seem to be served by the hanging position of the leaves accompanied by the folding of the lower surface of the blade, which is provided with stomata, or transpiration openings. Firstly, the protection of the lower surface of the leaf, thus ensuring the conservation of the internal water of the plant. When the soil is hard frozen and the days are bright and crisply cold, with a breeze stirring, the plant with broadly expanded leaves would transpire itself to death. Kihlman[1] has clearly shown the action of a dry wind in frosty weather on vegetation to be destructive in the extreme. Secondly, the folding of the leaves and downward curvature facilitates the rapid shedding of snow and ice, which in the mountains where this plant grows cover the evergreen trees and bushes to a considerable extent. During the recent zero weather, even in the most protected places where exposed to the bright sunlight, the drooping condition of the leaves was constantly maintained. In the shade of one of the University buildings, the infolding was even more accentuated than in the sun, as one would naturally expect, and in the mountains of Pennsylvania, in the shadow of the leafless trees and evergreen hemlocks, the cold rigor of the plant was very noticeable at a hundred yards' distance, viewed from the windows of a rapidly moving train.

If a branch of a plant with its leaves in the hanging position be carried into a warm room at about the temperature of 75°–80° F., in response to this thermal stimulus the leaves will begin to unfold and assume the diaheliotropic, or dorsiventral, position. The following observations made upon the reactions to heat and cold stimuli show that the movements are made quite rapidly:

*Branch 1.*—Intervals of time given in minutes.

1.30 min.—Visible response to heat stimulus.

2.00 min.—Unfolding of leaf began.

3.00 min.—Leaf almost wholly unfolded and petiole erected through an angle of about 40°.

4.00 min.—Upper leaves become dorsiventral.

5.00 min.—Blade of leaves fully expanded, but the petiole not yet entirely straight.

*Branch 2.*—This branch was held over a radiator. It had been cut for twenty-four hours and placed out of doors in the cold. The record is as follows:

$\frac{3}{4}$–1 min.—Response to stimulus.

1.30 min.—Somewhat jerky upward movement of the petiole apparent.

[1] Kihlman, A. O.: Pflanzenbiologische Studien aus Russisch-Lappland, Acta Soc. pro Fauna et Flora fennica (1890).

Schimper, A. F. W.: Pflanzen-geographie auf physiologischer Grundlage (1898), p. 183.

3.00 min.—Leaves assume a nearly horizontal position and the blade unfurled.
4.00 min.—Movement of one of the petioles still evident.
5.00 min.—Leaves assume the normal position.

The main leader showed much quicker response than the laterals. In removing this branch to the cold after it had assumed the normal position in the heated room, it was found that the response under the freezing temperature was not so rapid or marked as when the shoot was moved from out of doors into a heated atmosphere. A slight response to the cold was evident in three minutes, when the petiole began to curve slightly and the blade to roll. At the end of five minutes, the larger leaves were well turned down and rolled. At the end of ten minutes, the large leaves of one of the shoots experimented upon had assumed the cold position.

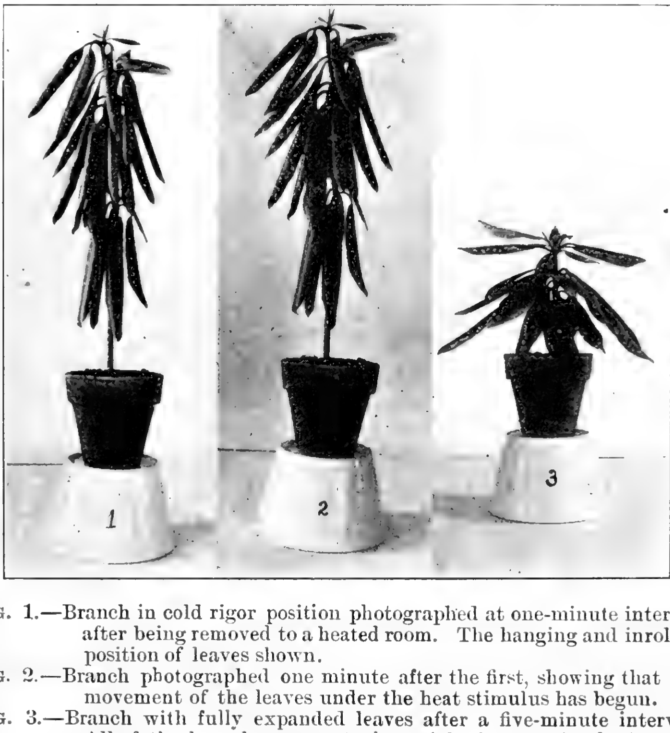


Fig. 1.—Branch in cold rigor position photographed at one-minute interval after being removed to a heated room. The hanging and inrolled position of leaves shown.
Fig. 2.—Branch photographed one minute after the first, showing that the movement of the leaves under the heat stimulus has begun.
Fig. 3.—Branch with fully expanded leaves after a five-minute interval. All of the branches were stuck upright in pots filled with soil, and thus photographed.

*Branch 3.*—

1 min.—Response to thermal action.

3 min.—Nearly fully expanded.

5 min.—Fully expanded.

*Branch 4.*—

1 min.—Response to heat stimulus.

2 min.—Snow which had been enclosed by the inrolled leaf dropped out. In fig. 2, the leaves here are yet more fully expanded and the petiole has turned slightly upward, as a critical comparison of figs. 1 and 2 will demonstrate.

4 min.—Leaves nearly fully expanded.

5 min.—Leaves fairly expanded, but the petiole has not responded so quickly, as in the other experimental branches.

Fig. 3 illustrates a branch after it has assumed its normal dorsiventral position.

A cross-section of the leaf shows the following arrangement of cells. There is a thick cuticle developed on the upper surface. Beneath this there are two rows of epidermal cells; the upper row has a thick external wall of cellulose. Beneath the epidermis, there are several well-defined layers of palisade cells, and then follow the loose parenchyma cells, more or less compacted together, succeeded by the lower epidermis provided with stomata and multicellular hairs, so disposed that they form a flat surface of interlocked branches as a protection against too rapid loss of internal water. A striking feature of most of the cells, especially in the upper epidermis, palisade tissue and loose parenchyma tissue, is the intercellular communications, which are visible under ordinary treatment and powers as depressions in the cell-wall. These are of importance as part of the mechanism of movement.

Research has shown that the movement in the leaves of *Mimosa pudica* L., *M. sensitiva* L., *Oxalis bupleurifolia* A. St. Hil., and other sensitives, is brought about by the extrusion of water from the pulvini into the contiguous stems and petioles, resulting in the contraction of the pulvini. When the absorbing tissue of the pulvini have again taken up water, and become tense and firm, they will react again to new stimuli. The study of the cell structure of the leaf of *Rhododendron maximum* L. leads the writer to believe that the transference of liquid from cell to cell, resulting in the alternate rigidity of the upper and lower portions of the petiole, has a very considerable bearing upon the resulting movements. The movements are due to the gradual passage of sap through the contractile protoplasmic sac of each cell into the intercellular spaces, or they in all probability are due to the movement of the liquid from cell to cell by means of the protoplasmic bridges, so that one part of the leaf becomes highly turgescent and the other part more or less flaccid. Cold weather, therefore, sets the liquids in motion toward the upper side of the petiole and leaf. The result of this motion of sap would be the downward flexure of the leaf-stalk and the inward rolling of the leaf. When any branch with hanging leaves is brought into a heated room the liquid is again conveyed to the cells lying near the lower surface and the blade and petiole right themselves. That there is some movement of cell-sap is evident on watching the change of color of the leaves after they are brought indoors. In the cold they are of a blackish green color, but on full expansion they assume a brighter green, which becomes lighter as the temperature of the surrounding air rises.

Turgidity is then the main factor in the mechanism of these movements; its mechanical importance is further strikingly illustrated by the great rigidity of the turgid members, and by the great force, equivalent in parts of some plants to twenty times the atmospheric pressure, which they develop in opposition to external resistance, as when the roots of trees cause the splitting of walls or pavements. Although one essential factor in turgidity is the purely physical osmotic activity of substances in the cell-sap, it must not be forgotten that it also depends upon the resistance offered by the protoplasm to filtration under pressure; so that the maintenance of turgidity is after all a vital act. The maintenance of turgidity appears, in fact, to depend upon a certain state of molecular aggregation of the protoplasm lining the cell-wall, in which it offers resistance to the escape of the cell sap; whereas in the flaccid condition the state of molecular aggregation of the protoplasm is such that it readily permits the escape of cell-sap, under the elastic pressure of the cell-wall, either into the intercellular spaces or through the protoplasmic bridges into adjoining cells, which thus become more turgid.

That evergreen plants, such as *Rhododendron maximum*, have an immense advantage in the struggle for existence goes without saying. The fact that a plant can transpire, can metabolize food, can respire and conduct the elaborated material during the cold of winter is of very considerable biological significance. Other trees and shrubs are practically dormant during the cold of the winter months. They must develop and vegetate during the warmer months of the year, while *Rhododendron maximum* is ready, as our experiments go to prove, to avail itself of all the passing atmospheric and meteorological conditions, whether of winter or summer, which are favorable to its growth.

May 2.

The President, Samuel G. Dixon, M.D., in the Chair.

Eighty-three persons present.

An adjourned meeting, the special business being the continued consideration of the revised code of By-Laws.

May 9.

The President, Samuel G. Dixon, M.D., in the Chair.

Sixty persons present.

A paper entitled "The Voles collected by Dr. W. L. Abbott in Central Asia," by Gerrit S. Miller, Jr., was presented for publication.

The death of Henry Whelen, a member, was announced.

The consideration of the revised code of By-Laws was concluded.

May 16.

Mr. Arthur Erwin Brown in the Chair.

Sixteen persons present.

Papers under the following titles were presented for publication:

"Neuropterous Insects collected by Dr. A. Donaldson Smith in Northeastern Africa," by Philip P. Calvert.

"Parallelism in Structure between Certain Genera of Odonata from the Old and the New World," by Philip P. Calvert.

"West Indian Eulimidæ," by E. G. Vanatta.

The death of Franz Ritter von Hauer, a correspondent, was announced.

May 23.

The President, Samuel G. Dixon, M D., in the Chair.

Twenty-five persons present.

Papers under the following titles were presented for publication:

"A New Australian Eulima," by Henry A. Pilsbry.

"Descriptions of Two New Gray Foxes," by Gerrit S. Miller, Jr.

"Some Notes on Coccidæ," by T. D. A. Cockerell.

The deaths of Alexander Biddle, a member, and of Mariano Barcena and Sylvanus Hanley, correspondents, were announced.

*Relations of the Land Molluscan Fauna of South America.*—Mr. H. A. Pilsbry spoke of the extrinsic relations of the land molluscan fauna of South America, recounting and commenting upon the various theories advanced to account for the relations existing between the South American, African and Australo-Zealandic faunas. The evidence of former Austral land connecting South America with Australasia derived from a study of the *Bulimulidæ*, the *Macroögona*, etc., was detailed The speaker gave his reasons for preferring the hypothesis of a former extension of Antarctic land to that of a South Pacific continent, as advocated by Prof. Hutton[1] and some others. He claimed that the present fauna of southern Polynesia was not consistent with Hutton's supposition that these islands had been submerged and thus their fauna destroyed on the sinking of the supposed Pacific continent entirely below the sea, the present "islands being merely outgrowths on its submerged back." Some Polynesian groups, such as *Partula*, belong to very primitive and therefore ancient groups, unknown in any other area, and indicating great antiquity for the Polynesian archipelagoes[2] Neither is the present fauna of Polynesia consistent with the hypothesis that these islands are unsubmerged remnants of a Pacific continent.

The enigmatic relations of the fresh-water fishes, snails, and the terrestrial *Streptaxidæ* of tropical South America with the African fauna were discussed.

The speaker considered the neotropical region of Wallace to be composite, the Antillean and southern Mexican area representing a tract independent from North and South America in Mesozoic and perhaps earlier time, on which the faunal problems had been independently worked out.

Various questions bearing on the communication were discussed by Dr. Calvert, Prof. Cockerell and Dr. Sharp.

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[1] See Proc. Linn. Soc. New South Wales, 1896, p. 36, for an able paper advocating Prof. Hutton's views.

[2] *Partula*, like the allied *Achatinella* of the Hawaiian group, has a bottle-shaped kidney with direct, not reflexed, ureter, as in *Limnæa*. These forms have no relations with the *Bulimulidæ* and *Achatinidæ*, with which conchologists associate them, but lie at the base of the terrestrial pulmonate tree.

May 30.

Mr. Charles Morris in the Chair.

Fourteen persons present.

The death of Charles Brongniart, a correspondent, was announced.

William T. Shoemaker, M.D., was elected a member.

The following were ordered to be printed:

## NEUROPTEROUS INSECTS COLLECTED BY DR. A. DONALDSON SMITH IN NORTHEASTERN AFRICA.

BY PHILIP P. CALVERT, PH.D.

Dr. A. Donaldson Smith, of Philadelphia, in his expedition through Somaliland and Gallaland to Lake Rudolph, collected some Neuroptera which he presented to the Academy of Natural Sciences of Philadelphia. These, some twenty-seven specimens, embrace thirteen species of Odonata, three of Planipennia, and one Termite; among them are two new species and one new genus of Odonata. This fact, together with the very slight information hitherto existing on the fauna of the region, justifies the publication of the present paper.

Dr. Smith has published a narrative[1] of his journey, accompanied by excellent maps, and since his Neuroptera are individually labelled and dated, it is possible, by reference to his book, to determine exactly the geographical positions and the elevations of the localities whence his specimens came. The care thus taken to record precise information deserves special mention, since not all recent travellers, in Africa or elsewhere, have been so painstaking.

Dr. Smith left Berbera, on the Gulf of Aden, July 10, 1894; reached Lake Rudolph in July, 1895; thence turned southeastwardly to the Tana river and Lamu on the Indian Ocean, at which latter he arrived about October 26, 1895. His Neuroptera were collected at the following places:

Berbera, on the Gulf of Aden, *Onychogomphus* sp., *Hemianax ephippiger*, *Crocothemis erythræa*, *Orthetrum brachiale* and *O. Sabina*, July 4 and 5, 1894;

Lafarok (map) or Lafarug (text, p. 16), about thirty miles to the southwest of Berbera, *Crocothemis erythræa*, July 13, 1894;

The Haud, a plateau with an elevation of 3,000 feet and more,

[1] Through Unknown African Countries. By A. Donaldson Smith. Edward Arnold, London and New York, 1897.

lying between 8° and 10° N. and 43° and 46° E., *Palpares* sp. No. 2, July 24, 1894.

"Lammo, Aug. 12, 1894," on *Palpares* sp. No. 1, is, I suppose, Tug Lummo, of page 28, Tug Lomo of the map, sheet 1. "Tug" is the Somali name for the sandy bed of a stream (p. 16). Dr. Smith crossed Tug Lammo in approximately 42° 41′ 40″ E., 7° 45′ N.

Stony brook, a tributary of the Erer river, mentioned by Dr. Smith on p. 32, lies in 42° 7′ E., 7° 35′ N. Its elevation at two points visited August 16 and 18 is respectively 3,350 and 2,650 feet (see map). *Trithemis ardens* and *Pseudomacromia Donaldsoni*, August 17, 1894.

"Smith river, Sept. 11, 1894," attached to a *Palpopleura Portia*, I cannot find mentioned in the text or on the map. The latter shows Dr. Smith to have been at Roko, 41° 52′ E., 7° 33′ N., 3,870 feet elevation, on that date.

Sheikh Husein (p. 43), 7° 43′ 32″ N., 40° 44′ 30″ E., elevation 5,020 feet, *Enallagma* sp., *Pantala flavescens*, *Hemistigmoides deceptor*, *Sympetrum Fonscolombii*, late September and early October, 1894.

Walenso, a peak, 8,420 feet high, of the Gillette mountains, 40° 47′ E., 7° 35′ 33″ N., *Orthetrum contractum*, dated October 26, 1894, although by the map Dr. Smith was nearest this peak on October 15, while on October 26 he was fifty miles farther south.

Boran country, *Palpares* sp., No. 3, is merely dated April 8, 1895, at which time Dr. Smith was in the Boran country, near Higo, 4,480 feet elevation, 38° 30′ E., 4° 27′ N., and on that day had the severe fight with the natives which he describes on pages 195 *et seq.*

No Neuroptera of later date are included in the collection.

The previous literature on the Odonata of this region is a paper by Mr. Kirby,[2] recording six species (three identical with some of the present collection) from Dobar in the Goolis mountains and Bichen in Somaliland, while the writer has listed[3] seven species from the Tana river.

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[2] On some Dragon flies obtained by Mr. and Mrs. Lort Phillips in Somaliland. Proc. Zoöl. Soc. London, 1896, pp. 521–523.

[3] Notes on the Odonata from East Africa, collected by the Chanler Expedition. Proc. U. S. Nat. Mus., xviii, pp. 143–145, 1895 (1896).

## ODONATA.

1. **Enallagma ? sp.**

One male from Sheikh Husein, September 29, 1894, has lost the last seven abdominal segments, so that a positive identification is at present impossible, but the remaining parts seem to indicate a relationship to such species as *glaucum* Burm. (*gabonense* Selys). The following descriptive notes are added to permit of future identification.

Frons, genæ, nasus, lips and rear of head pale green; rhinarium pale brown, vertex black from eye to eye, the site of the usual postocular spots is green confluent with the same color of the rear of the head.

Prothorax green on either side, and a middorsal black band half as wide as the prothorax itself.

Thorax pale green, a middorsal and a humeral stripe black, the latter half as wide as the pale antehumeral stripe, the former twice as wide as the pale antehumeral stripe; a short, narrow, black stripe at the upper end of the second lateral suture.

Femora pale green with an external (superior) black stripe. Tibiæ and tarsi yellowish, the former with an external (anterior) black line in their proximal halves.

Abdomen pale bluish-green, an uninterrupted middorsal black stripe on 1–3, widened and then suddenly narrowed before the apex of 2, narrowed at the base of 3.

Wings with the inferior sector of the triangle arising at least as far in front of the submedian cross-vein as the latter is long, quadrilateral with its upper side one-third as long as the lower side on the front wings, one-half on the hind wings, three antenodal cells, eleven postnodals on the front wings, ten on the hind wings, nodal sector arising near the fifth postnodal, ultranodal sector at the eighth. Pterostigma surmounting less than one cell; on the front wings black, with the lower and outer sides nearly equal; on the hind wings smaller, ochre, with the outer side distinctly longer than the lower.

Length of head, thorax and first three abdominal segments 12.5 mm., hind wing 19 mm.

The difference in the pterostigmata of the front and hind wings suggests *Ischnura*, but I notice something similar, although less marked, in a male of *glaucum* Burm. (*gabonense* Selys).

An apparently teneral female from Sheikh Husein, October 16, 1894, is probably of the same species as the above-described male; the last four and a half segments are wanting, and the specimen is otherwise in poor condition. The pale green of the male is replaced by pale luteous throughout. The black on the prothorax is but faintly indicated. The black humeral stripe is but a line, the middorsal stripe is narrower, so that it is hardly wider than the pale antehumeral, and it is bisected lengthwise by the middorsal carina being luteous. The two legs which remain (a first and a second) are pale yellowish. The left front wing has twelve postnodals, the ultranodal sector rises at the ninth postnodal on all wings except the left hind. The pterostigma is very pale luteous on all wings, slightly smaller on the hind than on the front.

Length of head, thorax and first five abdominal segments 23 mm., hind wing 19 mm.

**2. Onychogomphus** sp.

One female, Berbera, July 5, 1894.

The females, at least of such East African species of *Onychogomphus* as *Genei*, *Hageni*, *pumilio*, *Costæ*, *obliteratus* and *lacustris*, are difficult to identify from the descriptions in the absence of any specimens of this group. It seems possible that some of the differences indicated as specific may be due to age and to imperfect knowledge owing to the relatively few individuals examined. This being the case, I think it likely that this female from Berbera may be one of the species already described, in spite of the fact that it differs more or less from the descriptions. I prefer, therefore, not to give it any specific name, but to add notes which may facilitate its future identification.

Face and lips very pale yellowish, perhaps somewhat greenish in life, unmarked with black. Upper surface of frons pale yellow with a narrow basal brown line at the base of the vertex, and a group of 10–12 black denticles on either side at its front margin. Vertex yellowish, ocelli and the area between them and the antennæ (except the first joint) blackish. Occiput luteous, its hind margin armed with 16 black denticles.

Prothorax luteous. Thorax pale greenish-yellow, dorsum almost immaculate except for the trace of a pale brown antehumeral stripe; the humeral and the second lateral suture each with a complete brown stripe and a short brown stripe on the site of the first lateral suture from the metastigma downward, where it joins that of the first lateral suture.

Legs pale green, femora with a superior pale brown stripe, first and second tibiæ with one (anterior) brown line, third tibiæ with two (anterior and posterior) tarsi brownish. Thes pines on all parts of the legs blackish.

Abdomen greenish yellow, a middorsal brown line on the basal third of 3–6, the articulations and the supplementary transverse carina (or suture) of 2–7 blackish, an inferior brown spot on either side of 3–6 in front of the supplementary carina and more or less confluent with it, an inferior apical brown stripe on either side of 2–7 which reaches forward to the supplementary carina on 2–4, a double middorsal apical brown spot on 5–7, a brown stripe on either side of 8 meeting its fellow of the opposite side both at base and at apex, narrow transverse basal and apical brown stripes on 9.

Eighth and ninth abdominal segments not at all dilated. Vulvar lamina brown, its emargination subquadrate. Appendages as long as 9, twice as long as 10, straight, slender, tapering, luteous, apical sixth brown. Eleventh segment ("anal tubercle") a little longer than 10, when viewed from above luteous.

Wings: reticulation mostly black or dark brown, except the yellow costa. Front wings with 12 (right), 13 (left) antenodals, 8 postnodals. Hind wings with 10 antenodals, 8 postnodals. First and fifth antenodals thicker. No basal subcostal cross-veins. Pterostigma pale yellow enclosed by thickened veins, surmounting 4–5 cells on the different wings. Membranule small, white.

Abdomen 32 mm., its appendages 1.5 mm., hind wing 27, pterostigma 3.5.

This female seems to have too much black on the abdomen to be *Genei*, *Costæ*, or *Hageni*, or perhaps even *lacustris*, and in this and other respects seems to resemble *obliteratus*, but this last has the pterostigma black. *Pumilio* is smaller and is differently proportioned in some of its parts. In addition to the older literature, Mr. McLachlan's paper in the *Entomologists' Monthly Magazine* for July, 1897, is to be consulted.

3. **Hemianax ephippiger** Burm.

One female, Berbera, July 4, 1894.

4. **Pantala flavescens** Fabr.

One female, Sheikh Husein, October 9, 1894.

5. **Palpopleura Portia** Drury.

One male, "Smith river, Sept. 11, 1894, F. G." [= Fred. Gillette ?] is nearest *Portia*, but the dark brown coloring on the front wings does not reach the hind margin at any point, instead of occupying the entire width of the wing in its basal fourth, as in Drury's figure.

6. **Trithemis ardens** Gerstæcker.

Gerst., Mitt. Naturh. Mus. Hamburg, ix, p. 5, 1891.

One male, Stony brook, August 17, 1894.

In this individual there are, on the front wings, four posttriangular cells, then three rows to beyond the level of the nodus.

This species was originally described from Mbusini. I possess also a male from Abyssinia, given me at the Königliche Museum für Naturkunde, which I compared with the type of *T. Marnois* Brauer (*Verhd. zool. bot. Gesel. Wien*, xviii, p. 735, 1868, no description; see also de Borre, *Repertoire Alphabetique*, etc., p. 26) "aus Setith.," and found the two to be identical. Dr. Karsch (*Berl. Ent. Zeit.*, xxviii, p. 24, 1893) has held *ardens* to be the same as *sanguinolenta* Burm., but they are quite distinct, as may be seen by comparing my description (*Trans. Am. Ent. Soc.*, xxv, p. 90, 1898) of Burmeister's types with Gerstæcker's description; it may be added that the supplementary sector next below the subnodal is so strongly convex posteriorly that two rows of cells exist between it and the subnodal sector in *ardens*, instead of one row as in *sanguinolenta*.

Mr. Kirby suggests (*Ann. Mag. Nat. Hist.*, 7, ii, p. 233, 1898) that "*T. ardens* Gerstæcker is, perhaps, a form of this species [*i.e.*, *T. lacustris* Kirby] with blacker legs." A comparison of the original descriptions accompanying the two names shows the following differences:

| | **Lacustris** Kirby.[4] | **Ardens** Gerst. |
|---|---|---|
| 1. Length of body | 28 mm. | 34–37 mm. |
| 2. Alar expanse | 48 mm. | 56 (about) mm. |
| Antenodals— | | |
| 3. Front wings | 9 | 13 |
| 4. Hind wings | 6 | 9 |
| Yellowish color at base of wings extends— | | |
| 5. On front wings | one-third of the length of the wing | to the triangle or one row of cells beyond [*i.e.*, about one fourth of the wing length]. |
| 6. On hind wings | nearly to the nodus | $\frac{2}{3}$ to $\frac{3}{4}$ of the distance to the nodus. |
| 7. Pterostigma | very pale yellow | blackish. |

The above-quoted males are more like *ardens* than *lacustris*, although somewhat smaller and with slightly fewer antenodals than the former. Gerstæcker's description being briefer than Mr. Kirby's, it is not possible to determine whether the following features, in which these two males from Stony brook and from Abyssinia differ from *lacustris*, also exist in the typical *ardens*: front wings with internal triangle three-celled (instead of two), hind wings with 8–12 postnodals, three or four posttriangular cells, then two rows for two cells, then three rows increasing. It may be noted that Mr. Kirby (1898, *l. c.*) cites *lacustris* from Pretoria and Zoutpansberg in the Transvaal, from Wadelai and from Abyssinia.

7. **Crocothemis erythræa** Brullé.

Synonym. *Orthetrum Lorti* Kirby, Proc. Zoöl. Soc. Lond., 1896, p. 522; Ann. Mag. Nat. Hist. (7), ii, p. 233, 1898.

Three males, four females, Berbera, July 4 and 5, 1894. One male, Lafarok, July 13, 1894.

All eight individuals have the sectors of the triangle of the hind wings slightly separated at their origins, the maximum distance between them being about .2 mm.

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[4] Trans. Zoöl. Soc. London, xii, p. 329. 1889.

One of the three males from Berbera has the triangle of the hind wings crossed by one vein, and five rows of cells between the principal and nodal sectors at the level of the inner end of the pterostigma; these are two of the characters given as distinguishing *C. divisa* Baumann (*Ent. Nach.*, xxiv, p. 342, 1898), a West African species, from *erythræa.* On the other hand, the body is no more slender and the amount of yellow coloring at the base of the hind wings no less than in the other two Berbera males, which have the triangle of the hind wings free, and one of which has five rows, the other four rows of cells between principal and nodal sectors at the level of the inner end of the pterostigma. It seems very doubtful, therefore, that *divisa* is a distinct species.

It may here also be remarked that, on the page quoted from Baumann's paper, it is stated that "*ferrugaria* Ramb., Calv.," is the female of *erythræa.* I pointed out the differences between the two in *Proc. U. S. Nat. Mus.*, xviii, p. 127, 1896, and subsequently showed *ferrugaria* to be a synonym of *sanguinolenta* Burm. (*Trans. Am. Ent. Soc.*, xxv, p. 91, 1898).

**8. Pseudomacromia Donaldsoni** n. sp. (Pl. X, fig. 5.)

One male, Stony brook, August 17, 1894.

♂.—Dull bluish black except in those parts noted below. Vertex and most of the frons metallic violet, the lateral and inferior margins of the latter pale brown. Nasus blackish brown, darker in the middle. Rhinarium pale olive. Labrum shining black. Labium yellow, median lobe and inner halves of the lateral lobes black. Occiput black above, orange edged with black behind. Rear of the eyes black and yellow. Mesepisternum and metapleuron with some very indistinct, yellowish spots and stripes. Posterior half of metasternum black with a pair of bright yellow spots close to the median line. Coxæ and trochanters obscure brownish. Sides of first three abdominal segments pale brown, evidently much faded. It seems quite likely that in life there was a longitudinal yellow or brown streak on each side of the dorsum of 3–7, now almost completely faded.

Eyes meeting for a distance a little less than the antero-posterior middorsal dimension of the occiput. Tip of the vertex barely concave in outline when viewed from in front. Face clothed with black hairs, most numerous on frons and vertex. Frons without carina, but the meeting of the two colors violet and brown nearly coincides with a more or less angular crest, best marked on the anterior surface. Hind lobe of the prothorax much smaller than the middle lobe, its hind margin entire.

Spines on all the femora directed toward the knee, 6 on the first, 9–12 on the second, 20–18 on the third; the spines on the third femora are shorter than the intervals separating them and noticeably shorter than the spines on the first or second femora; all these spines are of the antero-inferior (or outer) row, the postero-inferior row being composed of more numerous, slender hairs. Third tibiæ with 12 antero-inferior (outer), 15 postero-inferior (inner) spines, longer than the intervals separating them. Claws of all the tarsi with the tooth distinctly shorter than the tip of the nail itself.

Abdomen, viewed from above, widest at 2 and at 6, slightly narrower at 3 and at 10. Genitalia of 2 quite prominent, especially the hamule which is entire, sickle-shaped, resembling, but more robust than, that of *Macrothemis*. Anterior lamina but little less prominent; viewed in profile, convex and polished in front, nearly plane behind; seen from behind its apical fifth is very distinctly bifid so as to show two tapering, rounded tips. Genital lobe at least half shorter than the hamule, oblong, apex rounded.

Superior appendages as long as 9, of the usual Libelluline form, with an inferior row of 8–10 denticles. Inferior appendage about one-seventh shorter, triangular, reaching beyond the denticles of the superiors.

Wings slightly smoky, milky at base to the arculus on the front wings, to the triangle on the hind wings. Pterostigma dark brown. Membranule pale brown, white at extreme base. Reticulation throughout blackish; nodal sector distinctly waved; two rows of cells between the subnodal sector and the next supplementary sector below; one submedian cross-vein; arculus between the first and second antenodals.

Front wings: 14 (right), 13 (left) antenodals, the last not continuous; 9 (right), 10 (left) postnodals, the first three not continuous; discoidal triangle with one cross-vein, internal triangle of three cells, three posttriangular rows to beyond the level of the nodus increasing to 4–5 marginal cells.

Hind wings: 9 antenodals, 11 (right), 9 (left) postnodals, triangles free, its basal side a little nearer than the arculus, 3 post-triangular cells, then 2 rows for 2 to 3 cells, then three rows increasing to 13–14 marginal cells.

Total length 43 mm., abdomen 29, sup. app. 2, third femur 6, hind wing 35, pterostigma 3.

This species is very similar to *P. torrida* Kirby (*Trans. Zool. Soc. Lond.*, xii, p. 340, pl. lii, f. 7, 1889), which, however, is larger, having the total length of the body 58 mm., the wing expanse 100 mm., the pterostigma 5 mm., no milky color at the wing bases (at least none is mentioned in the description or shown in the figure), and the membranule white, while in spite of its larger size *torrida* has fewer antenodals and postnodals than *Donaldsoni.*

**9. Orthetrum contractum** Rambur.

*Libellula c.* Ramb., Névr., p. 60, 1842. *O. c.* Calvert, Trans. Am. Ent. Soc., xxv, p. 96, 1898, for full references.

One male, Walenso, October 26, 1894.

Pterostigma 3 mm. long. The brownish yellow alongside of the membranule of the hind wings extends outward for a width of two cells. Anterior lamina not as prominent as internal hamular branch. Sectors of the triangle of the hind wings arising from the same point.

Variety ?

One male, Walenso, October 26, 1894. Differs from the type-form in having but one row of cells throughout the entire area between the subnodal sector and the supplementary sector next below. In three males from Kilimanjaro, by Dr. Abbott,[5] which I still have before me, this area consists of one row of cells throughout in six out of the twelve wings, while in the other six wings, one or more of which belong to each of the three individuals, there are one or two double cells inserted near the middle. This variety is therefore hardly worthy of a distinctive name.

**10. Orthetrum brachiale** Beauvois.

*Libellula b.*, Beauv., Ins. Recueil. Afr. Amer., p. 171, Neur., pl. 2, fig. 3, 1805. *O. b.* Calvert, Trans. Amer. Ent. Soc., xxv, p. 97, 1898 (with bibliography and synonymy).

One male, Berbera, July 4, 1894; no pruinose coloring.

[5] Described by me in Proc. U. S. Nat. Mus., xviii, p. 130, as *O. brachiale* Beauvois, although I have since shown this name to be incorrectly applied here.

Falls here by my key, *l. c.*, 1898, p. 95. I note, however, on the side of the thorax, in addition to the stripes described for *brachiale* (= *contractum* Ramb.) on p. 130, *Proc. U. S. Nat. Mus.*, xviii, a blackish stripe running through the spiracle (metastigma), and a similar one on the metepimeron parallel to and behind the second lateral suture and confluent, at its lower end, with the blackish color along the latero-ventral metathoracic carina; neither of these stripes reaches to the base of the wings. There are therefore six dark stripes on either side of the thorax, counting the antehumeral as one. A similar number and arrangement of stripes exists in a male from West Africa, given me by Mr. McLachlan, but which from the black color of the antenodals and other cross-veins should be *contractum;* this male is not at all pruinose, and its colors are in excellent preservation.

**11. Orthetrum Sabina** Drury.

Lib. S. Drury, Ill. Exot. Ins., i, pl. 48, f. 4, 1773.

One male (the last five abdominal segments missing) and one female, Berbera, July 4, 1894.

The race *africana* Selys (*Ann. Ent. Soc. Belg.*, xxxi, p. 22, 1887) is stated by him and by Mr. McLachlan (*Entom. Mo. Mag.*, 2, viii, p. 154, 1897) to differ from the typical *Sabina* in the following respects:

| | **Sabina** Drury. | **Africana** Selys. |
|---|---|---|
| 1. Labrum | pale brownish yellow | black, barely margined with pale yellow. |
| 2. Sectors of the triangle in the hind wings | widely separated at their origin | arising from the same point. |
| 3. Anterior lamina of the male | with a pencil of stiff hairs on either side | without the hairs of *Sabina* type |
| Habitat | China, Malaysia, Moluccas, New Guinea, Viti Is., India, Syria, Asia Minor, Cyprus, | Cameroon (West Africa). |

Mr. McLachlan draws the conclusion (*l. c.*), "the two forms are not only distinct as species, but will probably eventually be placed in two different genera."

It is consequently of interest to note that the present male from Berbera agrees with *Sabina* in characters Nos. 1 and 2, with *africana* in No. 3. The distance between the origins of the two sectors of the triangle is about .5 mm., therefore the same as in *Sabina;* no trace of the hairs exists on the anterior lamina, whose anterior surface, moreover, is yellow instead of blackish as in the Asiatic males of *Sabina* which I have examined.

The female from Berbera has the labrum pale yellowish, the sectors of the triangle separated at their origin by a distance of .2–.3 mm., therefore less than in *Sabina,* the black line on the frons bordering the vertex and eyes is narrower than in *Sabina,* and the seventh abdominal segment has a large yellow spot on either side, at its middle, similar to the pair on 6.

**12. Sympetrum Fonscolombii** Selys.

One male, Sheikh Husein, September 29, 1894.

**HEMISTIGMOIDES** new genus.

(*1*) Vertex truncated at tip. (*2*) Frons with its upper surface sloping downward and forward from the vertex meeting its anterior surface at an angle of about 115°, the line of junction of these two surfaces being marked by a well-defined carina, (*3*) no lateral or other carinæ. (*4*) Eyes in contact for a distance nearly equal to the middorsal length of the occiput.

(*5*) Hind lobe of the prothorax of equal width with the middle lobe, (*6*) its hind margin with a shallow median concavity and thus being slightly bilobed.

(*7*) Abdomen shorter than the hind wing, thickest at the third segment, thence tapering gradually to the tip, triangular in cross-section; (*8*) segments 2, 3 *and 4* each with a distinct, supplementary, transverse carina.

(*9*) Femora armed with very short (except the last one to three) spines directed toward the knees; (*10*) tibiæ with longer spines, those of the anterior row (thirteen) on the first tibia, of the posterior row on the second (twenty) and third (eighteen) tibiæ being more numerous than those of the posterior (eleven) and anterior (ii, 9–11, iii, 13) rows respectively; this arrangement of the tibial spines may be formulated thus: i *a* 13 *p* 11, ii *a* 9–11 *p* 20, iii *a* 13 *p* 18; (*11*) tarsal nails with the usual inferior tooth acute, much shorter than the tip of the nail itself.

All wings: (*12*) arculus between the first and the second antenodals, (*13*) one submedian cross-vein, (*14*) nodal sector very slightly waved, (*15*) at least some double cells between the subnodal sector and the supplementary sector next below, (*16*) one to three cross-veins between the median vein and the principal sector from the origin of the subnodal sector to the nodus, (*17*) discoidal triangles with one cross-vein.

Front wings: (*18*) last antenodal not continued to the median vein, (*19*) sectors of the arculus arising by a very short common stalk equal in length to the lower division of the arculus (*i. e.*, that part of the arculus from the origin of the stalk to the submedian vein), (*20*) one hypertrigonal, (*21*) triangle with its basal side twice as long as its anterior side, (*22*) internal triangle of three cells, (*23*) four posttriangular cells, then three rows to the level of the last antenodal, thence increasing, (*24*) submedian space reaching to the level of the fourth antenodal.

Hind wings: (*25*) sectors of the arculus arising by a common stalk which is almost as long as the arculus, (*26*) no hypertrigonals, (*27*) apex of the triangle not reaching outward (distad) to the level of the triangle of the front wings (it reaches to the level of the fourth antenodal of the hind wings), (*28*) triangle with its basal side in prolongation of the arculus, (*29*) three posttriangular cells, then two rows to the level of separation of the median and principal sectors, thence increasing, (*30*) sectors of the triangle arising from the same point, (*31*) four subbasal sectors (Kirby) start from the postcostal vein.

(*32*) Genitalia of second abdominal segment of male not prominent, (*33*) hamule bifid at tip only.

The insect for which this genus is established has a great superficial resemblance to the African *Hemistigma*, Kirby, a fact which has suggested the name here proposed. From *Hemistigma*, *Hemistigmoides* differs by the characters above numbered *1*, *2*, *5*, *8*, *15* (except in one wing out of twenty-four wings of *Hemistigma* studied for this purpose), *17* (for the hind wings), *19* and *27*. It may be added here that two males, three females of *Hemistigma affinis* Ramb. have the arculus *at the second* antenodal (compare

No. *12* above), while one male of *affinis* has it slightly nearer the base of the wing than the second antenodal is. Further, although Mr. Kirby states in his original characterization of *Hemistigma* (*Trans. Zool. Soc. Lond.*, xii, p. 295, 1889) that the abdomen is "as long as the hind wings in the male," all three males of *H. affinis* just quoted have the abdomen shorter than the hind wing.

The genus *Bradinopyga* Kirby (*Journ. Linn. Soc. Lond. Zool.*, xxiv, p. 553, 1894), from Ceylon, is compared by its author to *Hemistigma*. *Hemistigmoides* differs from *Bradinopyga* in the characters above numbered *5*, *16*, *17* (for the hind wings), *19*, *20*, *27* and *30*.[6]

In Dr. Karsch's arrangement of the genera of the Libellulinæ (*Berl. Ent. Zeit.*, xxxiii, p. 356, 1890), *Hemistigmoides* would fall in the same section as *Perithemis*. It differs from *Perithemis*, however, by the characters above numbered *16*, *20*, *21*, *24*, *25* and *27*.

**13. Hemistigmoides deceptor** n. sp. (Pl. X, fig. 4.)

One male, Sheikh Husein, September 29, 1894.

♂.—Vertex brown, its tip with a small metallic dark green spot. Upper surface of frons dark metallic blue-green, sides and anterior surface and the clypeus pale green. Labrum yellow, narrowly edged with black at the middle of the front margin. Labium yellow, a median line on the middle lobe and the inner edges of the lateral lobes dark brown. Occiput brown.

Prothorax dull blackish, middle lobe with a median twin spot and a small lateral spot—pale. Thoracic dorsum obscurely mottled with green and brown. Sides pale green with blackish brown stripes on the first (obsolete) and second lateral sutures, confluent below with the mostly dark pectus; this last has a pair of spots and behind them a transverse streak—all green—on the metasternum.

[6] The structure of the prothorax of *Bradinopyga* is not mentioned by Mr. Kirby; his description states that the sectors of the triangle of the hind wings are separated at base, while his figure (*l. c.*, Pl. 41, f. 3) of *B. stigmata* Kirby shows them arising from the same point. Mr. Kirby has kindly informed me on both of these structures, by letter dated March 30, 1899, as follows: "In *Bradinopyga* the sectors of the triangle are *distinctly* separated, but not for more than a comparatively short space, which varies. In the type, the prothorax is not properly visible; but in a second specimen it seems to be shaped something like this: [here a sketch] *i. e.*, quadrilobate, the two central lobes sloping down on the sides, and the hind one *not divided* and considerably smaller."

Abdomen blackish, sides of 1–3 with some pale green, of 4–9 with a small indistinct yellowish-brown streak close to the lateral carinæ. Genitalia of 2 inconspicuous; anterior lamina very slightly developed, its margin entire; hamule bifid at the extreme tip only, the anterior (inner) branch apparently hooked; genital lobe a little more prominent than the hamule, a little longer than wide, its tip regularly rounded.

Terminal abdominal appendages black; superiors about as long as 9 + 10, slender, thickest at four-fifths their length, with some inferior denticles, apex acute; inferior appendage reaching to slightly beyond the thickest part of the superiors.

Legs black, the under surfaces of the first femora, and of the second femora at base, and most of the trochanters pale green.

Wings: venation, including the costa, mostly black, but the antenodals and the cross-veins immediately below yellow. Pterostigma dark brown with a yellow spot on its inner half which does not, however, reach to the inner (proximal) end of the pterostigma. Membranule whitish.

Front wings: 12 antenodals, 7 postnodals, 6 marginal cells in the posttriangular field. Area between costa and median vein from base to pterostigma, the submedian space, apex of the wing from the pterostigma distad, and small areas above the hypertrigonal space and between the subnodal and principal sectors below the nodus—brownish yellow. Subcostal space from base to sixth antenodal (with slight "overflows" into the costal space), a spot at the nodus from slightly beyond the last antenodal to the first postnodal and from the costa to the median vein, and the area between the sectors of the arculus from their origin to the level of the triangle—blackish.

Hind wings: 9 (R) 8 (L) antenodals, 9 (R) 8 (L) postnodals, 10 (R) 12 (L) marginal cells in the posttriangular field. Subcostal (and adjoining part of costal) space to the third antenodal, the submedian space to beyond the cross-vein, the tip of the wing from the distal end of the pterostigma—brownish yellow. A black streak in the subcostal space from the base to the first antenodal.

Total length 33 mm., abdomen 21, front wing 28, its greatest width (at the nodus) 6; hind wing 26, its greatest width (at the fifth antenodal) 8; pterostigma 4, third tibia 4.5, superior appendages 1.75.

## PLANIPENNIA.

**Palpares** sp. No. 1. (Plate X, fig. 1.)

One male, Lammo (Lummo ?), August 12, 1894, is very close to *tristis* Hag., but differs (*a*) in having the subbasal spot on the hind wings, a spot which is lacking in *tristis*, and (*b*) in the form of the subbasal spot on the front wings. In (*a*) it resembles var. *niansanus* Kolbe (*Deut. Ost. Afrika*, iv, Netzflügler, p. 9, 1898), but differs therefrom in the greater extent of the second and third bands (Querbinde) of the hind wings; it is also larger than *niansanus.*

**Palpares** sp. No. 2. (Plate X, fig. 2.)

One female, The Haud, July 24, 1894, resembles Kolbe's figure (*l. c.*, f. 6) of *nyicanus* and McLachlan's description (*Journ. Linn. Soc. Zool.*, ix, p. 240, 1868) of *sparsus.*

**Palpares** sp. No. 3. (Plate X, fig. 3.)

One female [Boran country], April 8, 1895, related to *Stuhlmanni* Kolbe (*l. c.*, p. 12 and f. 1), and resembling *digitatus* Gerstæcker (*Mitth. Ver. Vorpomm.*, xxv, p. 117, 1894) in the markings of the hind wings.

Not having access to any other specimens of Palpares, and being therefore unable to appreciate the amount of individual variation which may occur in this genus, I have thought it preferable to designate these species as above, rather than to attach names to them, probably incorrectly.

The accompanying plate, from photographs which I owe to the kindness of Dr. Henry Skinner, will, it is hoped, enable students more favorably situated to exactly determine these *Palpares.*

## TERMITINA.

**Termes** sp.

One soldier, without label.

## EXPLANATION OF PLATE X.

Fig. 1. *Palpares* sp. No. 1. Actual length of body 53 mm., of hind wing 50 mm.

Fig. 2. *Palpares* sp. No. 2. Actual length of body 45 mm., of hind wing 47 mm.

Fig. 3. *Palpares* sp. No. 3. Actual length of body 49 mm., of hind wing 53 mm.

Fig. 4. *Hemistigmoides deceptor* n. gen. et sp. Actual length of body 33 mm., of hind wing 26 mm.

Fig. 5. *Pseudomacromia Donaldsoni* n. sp. Actual length of body 43 mm., of hind wing 35 mm.

All the figures, reduced in size, from photographs by Dr. Henry Skinner.

## PARALLELISMS IN STRUCTURE BETWEEN CERTAIN GENERA OF ODONATA FROM THE OLD AND THE NEW WORLDS.

BY PHILIP P. CALVERT, PH.D.

The African genus *Pseudomacromia* Kirby has been compared by Dr. Karsch[1] with the neotropical *Macrothemis* Hagen. In the identification of the species of *Pseudomacromia* (*P. Donaldsoni* n. sp.), described in the preceding paper, I have studied the other species of this genus, as well as those of the genera *Zygonyx* Selys and *Schizonyx* Karsch, chiefly with the view of learning to what extent these three Old World groups parallel, in their structure, the New World *Macrothemis* and its allies. As a basis for this comparison I have used a recent paper,[2] in which I have shown that the five American genera *Dythemis*, *Paltothemis*, *Scapanea*, *Brechmorhoga* and *Macrothemis* form a group (of the subfamily Libellulinæ), the chief peculiarity of which is "the modification of the armature of the second and third femora in the males, and of the tarsal nails in both sexes," the details of the modification being characteristic for each genus, *Dythemis* being the least modified, *Macrothemis* the most modified of the five.

The reason for the comparison of *Schizonyx*, *Pseudomacromia* and *Zygonyx* with *Macrothemis*, etc., is that they show similar modification of the femoral armature and of the tarsal nails.

The following species are referred to these three genera respectively:

To *Schizonyx* Karsch, *luctifera* Selys (type of the genus);

To *Pseudomacromia* Kirby, *torrida* Kirby (type of the genus), *Donaldsoni* Calvert, *hova* Rambur, *speciosa* Karsch and *pretiosa* Karsch;[3]

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[1] Entomologische Nachrichten, xvii, p. 73, 1891; Berlin, Ent. Zeits., xxxviii, p 21, 1893.

[2] The Odonate Genus *Macrothemis* and its Allies. Proc. Bost. Soc. Nat. Hist., xxviii, pp. 301–332, 2 pls., July, 1898.

[3] *Speciosa* and *pretiosa*, described from male and female respectively, are perhaps one and the same species, for Mr. McLachlan writes me, under date of March 3, 1899: "I come round to the opinion that these are probably

To *Zygonyx* Selys, *ida* Selys (type of the genus) and *iris* Selys.

In order that the structure of these species may be compared most readily with that of their American analogues, the following tabular form, used on pages 303 and 304 of my *Macrothemis* paper, is also employed here:—

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♂ ♀ of one species, but the spining of the legs is considerably different." A difference in the same parts of the two sexes is found in *Macrothemis*.

*Ps. luxuriosa* Karsch was later stated by him to be a synonym of *Zygonyx ida* Selys (Ent. Nach., xxi, p. 203). *Tyriobapta* Kirby, placed by its author (Trans. Zoöl. Soc. Lond., xii, p. 262) next to *Macrothemis*, has, I believe, nothing to do with the genera here considered.

| CHARACTERS. | *S. luctifera.* ♂ ♀ | *Ps. torrida.* ♂ ♀ | *Ps. Donaldsoni.* ♂ | *Ps. hova.* ♂ | *Ps. speciosa.* ♂ | *Ps. pretiosa.* ♀ | *Z. ida.* ♂ ♀ | *Z. iris.* ♂ |
|---|---|---|---|---|---|---|---|---|
| Antero-inferior row of teeth or spines on | | | | | | | | |
| 1. The second femora. | Short spines, directed toward the knee. | ........... | Spines, directed toward the knee. | Teeth, directed toward the knee. | Teeth, inclined toward the knee. | Very small teeth, apparently inclined toward the knee. | Short teeth, directed toward the knee. | ........... |
| 2. The third femora. | Short spines, directed toward the knee. | ("Femora distinctly serrated beneath.") | Shorter, more numerous spines, directed toward the knee. | More numerous teeth, directed slightly toward the knee. | Very short, uncinate teeth, inclined toward the trochanter. | Only two nearly triangular teeth, close to the base, of no special direction. | Of about the same number (25) as on 2d fem., slightly larger, first 8–9 directed toward knee, then 1–2 not inclined, then 11 or 12 directed toward trochanter, last 1–2 not inclined (♂); in ♀ all directed toward knee, last 2–3 are longer spines. | ........... |
| 3. Tooth of the tarsal nails. | Considerably shorter than tip of nail itself, acute. | Shorter than tip of nail itself. | Much shorter than tip of nail itself, acute. | Stouter, and as long as, or longer than, tip of nail itself, acute. | Stronger than the tip, but scarcely shorter. | Stronger than the tip, but scarcely shorter. | Stouter and as long as, or slightly longer than, tip of nail itself.* | Strong, as long as the tip of nail itself.* |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4. Vertex at tip. | Truncated. | ........... | Barely concave. | Truncated or barely concave. | ........... | ........... | Truncated. | ........ |
| 5. Nodal sector at its middle. | Waved. | Waved. | Waved. | Slightly waved. | Waved. | Waved. | Waved. | ........... |
| 6. Number of rows of cells in the middle of the field, between the subnodal sector and the supplementary sector next below. | One. | Two. | Two. | One. | One. | One.* | One.* | ........... |
| 7. Arculus, position of. | Between first and second antenodals. | As in *S. luctifera.* | As in *S. luctifera.* | As in *S. luctifera.* | ........... | As in *S. luctifera.* | At the second antenodal.* | ........... |
| 8. Submedian cross-veins. | One. | One.* | One. | One. | One.* | One* (front wings). Two* (hind wings). | Two* (front wings). One (hind wings). | ........... |
| 9. Discoidal triangle of front wings. | Free.* | Crossed. | Crossed. | Crossed. | Crossed. | Crossed. | Free * | Crossed. |
| 10. Discoidal triangle of hind wings. | Free. | Free.* | Free. | Free. | Crossed.* | Crossed. | Crossed.* | Crossed. |
| 11. Internal triangle of front wings. | 3-celled.* | 3-celled.* | 3-celled. | 3-celled. | 3-celled. | 3-celled. | 2–3 celled.* | 3-celled. |
| 12. Posttriangular rows, front wings. | Two.* | Three. | Three. | Three. | Three. | Three. | Two. | Three. |
| 13. Posttriangular rows, hind wings. | Two.* | Three. | Two. | 2–3. | ........... | Three. | 1–2. | Three. |
| 14. Sectors of triangle in hind wings have their origins. | At same point. | At same point. | At same point. | At same point. | At same point. | At same point. | Separated. | Separated. |
| 15. Genital hamule of male. | Bifid. | ........... | Not bifid. | Slightly notched at tip. | ........... | ........... | Bifid. | ........... |

The asterisks (*) mark characters known to be variable, as mentioned in the following remarks.

*Remarks on the preceding table* —Characters 14 and 15, which have no corresponding entries in the table in the *Macrothemis* paper quoted, show some differences of these species from the "Common characters of the Genera" *Dythemis*, etc., listed on p. 301, *l.c.* *In all other respects that list of Common Characters is to be understood to apply to the species here tabulated*, although occasional individual variations exist. Thus, I noted that the last antenodal on one front wing of one female *Z. ida* was continued to the median vein; Baron de Selys has a similar note for *Z. iris;* Mr. Kirby mentions the existence of one hypertrigonal (supratriangular) vein in one wing of one male *Pseudomacromia torrida.*

**Schizonyx.**

The data given for *S. luctifera* in the table are based on personal examination at various times of seven males, two females. 9[4] is crossed in one wing of two males, 11 is 1–2-celled in three males, 12 sometimes begins with three cells or is interrupted by three cells, 13 in some begins with three cells. For bibliography of *luctifera* see *Proc. Acad. Nat. Sci. Phila.*, 1898, p. 146. *Schizonyx* differs from *Pseudomacromia* and *Zygonyx* not only in some of the characters tabulated, but also in having a slight enlargement on the posterior margin of the eye, such as is found in the Corduliinæ, and in its pterostigma being shorter on the hind wings than on the front wings.

**Pseudomacromia torrida** Kirby.

The data given in the table and those which follow on variations are derived entirely from Mr. Kirby's descriptions and figure (*Trans. Zool. Soc. Lond.*, xii, p. 262, 299, 340, pl. lii, f. 7). As *Ps. Donaldsoni* so closely resembles *torrida* in other respects, it will probably be found that the few data lacking for *torrida* are as in *Donaldsoni.* As to the variations of *torrida*—8. two cross-veins in one wing out of twenty-four wings; 10. crossed in two wings out of twelve; 11. four-celled in three wings out of twelve.

**Pseudomacromia hova.**

*Libellula hova* Rambur, *Névr.*, p. 92, 1842, doubtfully referred to *Onychothemis* by Mr. Kirby (*Cat. Odon.*, p. 24, 1890), was placed with *Pseudomacromia* by Dr. Karsch (*Berl. Ent. Zeit.*, xxxiii, p. 369, 1890; xxviii, p. 21, 1893).

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[4] These numbers refer to the numbered characters of the table.

I examined Rambur's type, now in the University Museum, Oxford, England, September 3, 1896, and made some notes upon its venation, some of which are incorporated in the above table, while the others follow here:

Front wings with 10 (right), 11 (left) antenodals, the last one not continued to the median vein, 7 postnodals. Hind wings with 7 antenodals, 8 postnodals, inner (basal) side of the triangle a little nearer than the arculus with which, if produced, it would form a small angle; two or three posttriangular rows, rather irregular and not symmetrically developed on right and left wings. Total length of body 47 mm., abdomen 32, front wing 38, pterostigma 3.5.

The data given for *hova* in the table are based on the type male and on a male from Nossi-Bé, Madagascar coast, given me by Baron de Selys-Longchamps.

**Pseudomacromia speciosa** (♂) and **pretiosa** (♀).

The data given for characters 3, 6–13, are drawn from Dr. Karsch's and Mr. McLachlan's descriptions and figure (*Ent. Nach.*, xvii, pp. 73, 74, taf. ii, 1891, 1 ♂, 1 ♀; *Ent. Mo. Mag.* 2, ii, p. 111, 1891, 2 ♂, 1 ♀). For Nos. 1–3, 5 and 6 I am also indebted to a letter from Mr. McLachlan, in which he expresses his opinion, already quoted, that these two nominal species are really one.

Variations of *speciosa:* 8. Of the three males known, one has two submedian cross-veins in both hind wings (McLachlan, *l. c.*). 10. Dr. Karsch mentions that it is free on the left wing of the male he examined.

Variations of *pretiosa:* 6. Mr. McLachlan in his letter writes, "one or two asymmetrical double cellules in the posterior wings." 8. Dr. Karsch mentions two on the left front wing of his type, Mr. McLachlan three on the right hind wing of his specimen.

The species of *Pseudomacromia* fall into two groups as regards the tarsal nails; one (see the table, character No. 3) comprising *torrida* and *Donaldsoni*, the other *hova* and *speciosa* (with *pretiosa* as ♀). *Hova* differs from *speciosa* in character No. 2, and perhaps also in its superior appendages, "munis en dessous et un peu lateralement, à l'endroit de leur epaisseur, d'une pointe très-courte" (Rambur), a point easily seen in the male I possess. *Ps. Donaldsoni* lacks this "point," and its presence is not mentioned for *speciosa*. It may perhaps be questioned whether all five of these species are congeneric, but until a study is made of the male genitalia of *torrida* and of *speciosa*, it will be advisable to retain them as they here stand.

**Zygonyx ida** Selys.

The data for characters 1–7 are based on personal examination of a male and a female from Java, by Herr Fruhstorfer, given me at the Königliche Museum für Naturkunde at Berlin, and a female from Trong, Lower Siam, by Dr. W. L. Abbott, in the U. S. National Museum. For Nos. 8–13, the descriptions of Baron de Selys (*Ann. Soc. Ent. Belg.*, xxxv, CR., p. ccxxviii, 1891, 13 ♂, 5 ♀) and Dr. Karsch (*Berl. Ent. Zeit.*, xxviii, p. 21, 1893, 9 ♂, 4 ♀; *Ent. Nach.*, xxi, p. 203, 1895) are also available.

Variations: 3. Distinctly shorter on the second tarsi only of the Siamese female. 6. Two double cells in one front wing of the male and of one front wing of one female, one double cell in all the wings of the other female. 7. A little nearer in three out of the twelve wings. 8. One in one front wing of one male. 9. Crossed in three females (Selys). 10. Crossed in seven males, five females, free in six males (Selys); in some free, in some asymmetrically or symmetrically crossed (Karsch). 11. The statement in the table is from de Selys, *l.c.*; I find it one-celled in one wing of one male and of one female.

**Zygonyx iris** Selys.

The statements in the table are all drawn from Baron de Selys' description, *l.c.*, p. ccxxxi.

Variations: 3. "Asymétriquement un peu plus courte à l'un des tarses" (Selys).

CONCLUSIONS

Owing to the small number of individuals of these species which it was possible to examine, I have thought it undesirable to calculate the percentages of variations, as was done for *Macrothemis*.

When the exclusively American *Dythemis*, *Paltothemis*, *Brechmorhoga*, *Scapanea*[5] and *Macrothemis* are compared with *Schizonyx*,

[5] I was in error when I stated by implication (Proc. Bost. Soc. Nat. Hist., xxviii, p. 303) that the nodal sector of *Scapanea* is invariably not waved. In some individuals it is waved, as Mr. McLachlan has pointed out to me by letter, but I am not able to say which of these two conditions is the predominant one, owing to inability to examine a long series of specimens.

*Pseudomacromia* and *Zygonyx*, genera confined to the Old World, it is evident that *in spite of the resemblance in many peculiarities, no complete parallelisms in structure exist.* Thus *Macrothemis*, the most specialized of the former group, agrees with *Zygonyx ida* in characters numbered 3, 6, 9, 12 and 13, but differs from *Z. ida* in Nos. 2, 10, 14 and 15; it agrees with *Pseudomacromia speciosa* (*pretiosa* ♀) in Nos. 2, 3, 6 and 14, but differs therefrom in Nos. 9, 10, 12 and 13; it agrees with *Ps. hova* in Nos. 3, 6, 10 and 14, but differs therefrom in Nos. 2, 9 and 12. Similar results follow a comparison of the other genera.

Dr. Karsch[6] has pointed out a further analogy between *Pseudomacromia* and *Macrothemis*: the females have a strong tendency to colored wings, the males to hyaline wings, although in the Libellulinæ, as in other insects, it is usually the reverse.

As regards climatic distribution, both the American and the Old World genera are inhabitants of the tropical and subtropical zones, the northern and the southern boundaries of the latter being formed by the annual isotherms of 20° C. The one exception to this statement appears to be a male from Chile, referred to variety *typographa* of *Macrothemis inequiunguis.*[7]

I believe that we do not yet know enough of the relationships of the Libellulinæ to enable one to form an opinion on this question: Have the peculiar forms of the tarsal nails and of the femoral armatures been independently acquired by these New World and these Old World genera, or are they inheritances from a common ancestor? Of the physiological significance of these structures we know absolutely nothing, and we await the observations of some naturalist on the living insects to supply us with such information.

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[6] Ent. Nach., xvii, p. 73, 1891.

[7] Proc. Bost. Soc. Nat. Hist., xxviii, p. 319.

## WEST AMERICAN EULIMIDÆ.

BY EDWARD G. VANATTA.

**Eulima lowei** n. sp. Pl. XI, figs. 9, 10.

Shell small, smooth, shining, white, one or two median whorls pink tinted from the animal dried within, opaque, spire bending forward, the outline nearly straight in front, convex behind. In the face view the shell appears straight. Apex decollated and small Suture impressed, slightly ascending toward the aperture. Ten whorls remaining, the last four each having an impressed varix near the right side. Whorls of the spire a little convex, body whorl slightly and very obtusely angular at the periphery, rather flattened above and below this angulation, base sloping, slightly convex. Aperture trapezoidal-ovate, outer lip thickened, sharp, reversed sigmoid in profile, inner lip angular at the junction of the columella and parietal wall. Columella heavy, concave; parietal wall with a thin callus, convex.

Alt. 6 85, diam. 2.66, length of aperture 2.09, breadth of aperture 1.33 mm.

Long Beach, California. Mr. H. N. Lowe.

Type in the collection of the Academy of Natural Sciences, No 57,262

A compact species resembling *E. bistorta*, but differs in being bent forward only, not laterally distorted also, in having four varices instead of three and in the stouter, more conic form. It differs from *E. thersites* Cpr. in having more whorls, and being bent forward and not toward the right.

**Eulima bistorta** n. sp. Pl. XI, figs. 7, 8.

Shell small, smooth, shining, opaque, bluish white, apex yellow tinted, spire bending forward and toward the right, the outline nearly straight on the right side, convex on the left, front outline nearly straight, rear outline convex. Apex decollated, small. Suture impressed, slightly ascending toward the aperture. About nine and one-half whorls remaining, of which each of the last three has an impressed varix, thickened behind, on the right side.

Whorls of the spire convex, the body whorl is rather cylindrical and much bent to the right and forward, giving the penultimate whorl a swollen appearance. Aperture irregularly oval, outer lip sharp, thickened, bow shaped in profile, columella and parietal walls forming a concave arch, parietal callus nearly straight, thin.

Alt. 5.9, diam. 2.16, length of aperture 1.9, breadth of apert. 1.2 mm.

Monterey, California, " on a starfish."

Type in the collection of the Academy of Natural Sciences, No. 65,881.

This species differs from *E. thersites* Cpr.,[1] of which I have not seen a specimen, in being narrower, having more whorls, a longer body whorl, and in having varices. It differs from *E. lowei* n. sp. in having three instead of four varices, and in being bent forward and also to the right and in having a more cylindrical body whorl.

**Eulima compacta** Cpr. Pl. XI, figs, 11, 12.

Shell small, stout, smooth, shining, pinkish white, opaque, the outline of the spire straight, conical. Apex decollated, of moderate diameter. Sutures linear, not ascending toward the aperture. About six and one-half whorls remaining, whorls of the spire flat, the body whorl oval. No varices. Aperture ovate, outer lip sharp, not thickened, in profile it is nearly straight to the periphery, then bent backward. Columella rounded, slightly concave, parietal wall a little convex, forming a slight obtuse angle with the columella, parietal callus moderate.

Alt. 6.7, diam. 2.45, length of aperture 2.27, breadth 1.27 mm.

Pt. Abreogos, Lower California (H. Hemphill!).

The specimen figured is in the collection of the Academy of Natural Sciences, No. 57,263.

This species may be easily distinguished by its stout, straight,

[1] Carpenter's diagnosis of this species is (translated) as follows: "Shell small, very short, whitish, arcuate, very much distorted, right margin of the spire nearly straight, left strongly excurved; nuclear whorls decollated, whorls remaining 6, smooth, nearly flat, the suture distinct, base strongly arched, aperture suboval, produced toward the right, peritreme continuous, heavily calloused, lip sinuous.

" Long .21, long spir. .13, lat. .09 [= 5 25, 3.25, 2.25 mm.), div. 40°. Sta. Barbara (Jewett). Preëminent for aberration among the distorted Eulimidæ." Ann. Mag. Nat. Hist., 3d Ser., xv, 1865, p. 396.

conical form, and the simple curvature of the outer lip.[2] The specimen figured, from Lower California, seems to fulfil the requirements of Carpenter's too brief description.

**Eulima randolphi** n. sp. Pl. XI, figs. 13, 14.

Shell smooth, rather slender, shining, bluish white when empty, but when the animal is dried in, the spire is orange colored above, pink in the middle with sometimes a slight yellowish band on the body whorl; opaque; outlines of the spire straight, conical. Apex blunt, rounded, of moderate size, suture impressed; no varices. Seven or eight whorls, the body whorl ovate, whorls of the spire a little convex. Aperture ovate, outer lip sloping to the right, nearly straight, in profile it is moderately arched forward below and sometimes retracted very slightly above. Columella slender, concave below, convex above, forming an angle with the convex parietal wall, parietal callus very thin.

Alt. 6, diam. 2.3, length of aperture 2.1, breadth 1.1, diam. of apex .3 mm.

Unalaska, Alaska, under stones, P. B. Randolph.

The type is in the collection of the Academy of Natural Sciences, No. 73,729.

This is the species mentioned by Mr. Randolph in the *Nautilus* for February, 1899, p. 112, as being very plentiful under stones. It is a rather slender species distinguished from *E. micans* Cpr. by its smaller size, more impressed sutures, straighter profile of the outer lip and the blunter apex. It is distinguished from *E. rutila* by its blunter apex, fewer whorls, stouter form, in being opaque and having the sutures more impressed. It also lacks any trace of varices.

**Eulima micans** "Cpr." Reeve. Pl. XI, figs. 1, 2.

*E. micans* Cpr., Reeve, Conch. Icon., Vol. xv; *Eulima*, pl. iv, sp. 33 (Dec., 1865).

This is the largest California species of *Eulima*. It is generally of a bluish white color below and lead colored above. The apex is often orange tinted, is quite sharp and seldom decollated.

[2] Carpenter has described "*Eulima (? var.) compacta* from San Pedro as similar to young *E. micans* but much less terete, margins of the spire little excurved, apex lost, seven whorls remaining, base and aperture elongated, the lip little sinuated. It measures .25 × .09 inch [= 6.25 × 2.25 mm.], with the spire .15 long [= 3.75 mm.]. The divergence 22°." Proc. Cal. Acad. Nat. Sci., Vol. iii, 1866.

The sutures are linear. Whorls about thirteen or fourteen. The lip is concave above and convex below. There are several very fine impressed lines indicating former lips, irregular in position either on the right or left side or on both. Reeve's figure being small and poor, I have given a camera drawing of a specimen from San Pedro Bay, No. 72,674 of the Academy's collection. Carpenter reports this species from Puget Sound, Vancouver, Cataline Island, 30–40 fms.; Sta. Barbara and San Diego. The specimen figured measures alt. 11.4, diam. 3.2, length of aperture 3.2, breadth 1.9 mm.

**Eulima rutila** Cpr. Pl. XI, figs. 5, 6.

Similar to *E. micans*, but smaller, more slender and with five very fine varices, three on the right and two on the left side. The specimen figured is from San Diego, No. 57,264 of the collection of the Academy of Natural Sciences, and measures alt. 6.41, diam. 1.83, length of aperture 1.91, breadth .83 mm. The Academy has also one tray of this species from Scammon's Lagoon, Lower California.

Carpenter thus describes *Eulima* (? var.) *rutila* Cpr.: "Shell similar to young *E. micans*, but more terete, highly polished, rosy and livid tinted, nuclear whorls as in *E. micans;* following whorls 10, elongate, very slender, base and aperture greatly prolonged; columella more twisted; lip very sinuous, a callus running backward above the suture, lip narrow.

"Long. 26, long spir .19, lat .07 [= 6.5, 4.75, 1.75 mm.], div. 20°.

"Monterey (Cooper) (*Proc. Cal. Acad. Nat. Sci.*, 1866, p. 221)."

## A NEW AUSTRALIAN EULIMA.

BY HENRY A. PILSBRY.

The group *Lambertia*, reckoned by Tryon and Fischer a subgenus of *Eulima*, was instituted by Souverbie for a peculiar pupiform Eulimid with mucronate apex, from New Caledonia. Only one species has been described, so far as I know; but in a sending of shells from Port Stephens, N. S. W., from Dr. J. C. Cox, another form referable to the same group occurred. As the name *Lambertia* had already been used in zoölogy when Souverbie wrote (by Robineau-Desvoidy in Diptera, 1863), I would propose the name *Hypermastus* for the species described below, the new group probably including Souverbie's New Caledonian form also. It is clearly distinct from *Mucronalia*.

**Eulima (Hypermastus) Coxi** n. sp. Pl. XI, figs. 3, 4.

Shell small, pupiform-cylindrical, glossy; translucent white, with an opaque-white band midway between the sutures, spreading downward; spire convexly tapering, slightly so for the greater part of its length, but more suddenly above, leaving the initial whorl projecting like a mucro or teat, which is tilted or oblique. Whorls five (exclusive of the apical mucro), not in the least impressed at the sutures, the suture slightly ascending and then deflexed at the aperture; base tapering. Aperture semioval, acuminate above; peristome bending forward a little below, somewhat inflexed above; columella concave, passing without angle into the parietal margin, which bears a thin callus.

Length 4, greatest diameter 1.43, length of aperture 1.4 mm.; diameter of apical "button" .15 mm.

Port Stephens, New South Wales, Australia, collected by Dr. J. C. Cox. Type is No. 71,306 coll. A. N. S. P.

The general contour differs considerably from that of *Lambertia Montrouzieri* Souv., which is moreover a far larger species. The surface is unbroken by varices, and the white line running midway of the whorls looks deceptively like the suture. Mr. Charles Hedley, the malacologist of the Australian Museum, tells me that he knows of no description of an Australian *Eulima* resembling this one.

I am indebted to Mr. Vanatta for *camera lucida* drawings, which show the form of the shell better than any description.

## SOME NOTES ON COCCIDÆ.

BY T. D. A. COCKERELL.

The following paper is the result of some work done in the Division of Entomology, Department of Agriculture, while on a brief visit in the spring of 1899 I am greatly indebted to Dr. Howard and his staff for the facilities and assistance kindly given me.

### LLAVEIA Sign.

Ann. Soc. Ent. France, 1875, p. 370.

*Ortonia* Sign., Ann. Soc. Ent. France, 1875, p. 367 (not *Ortonia* Wood, 1869; nor *Ortonia* Nich., 1873).

*Protortonia* Twns., Jn. N. Y. Ent. Soc., 1898, p. 169.

These are all one genus, the species of which, when adult, have normally 11-jointed antennæ. I believe it will yet be necessary to sink *Llaveia* as a synonym of *Monophlebus;* especially since Herrera (*La Naturaleza,* 1884) says the ♂ of *Llaveia axin* has eight "cerdas terminales" on the abdomen, which I suppose to be the filiform processes of the ♂ *Monophlebus.*

Mounts made by Mr Pergande from topotypes of *Ortonia mexicanorum* and *primitiva* show 11-segmented antennæ. The locality of *mexicanorum* is Mixcoac, not "Misebac." Dugès described the antennæ of the ♀ *Llaveia axin* as 10-segmented, but Herrera declares there are 11 segments. I have only seen the third stage (9-segmented) and larva. The following table will separate the adults of *Llaveia* :

Size very large; length 15 mm. or over. . . . . . . . . 1

Smaller, length of adult ♀ cleared and mounted 7 mm . . . 3

1\. Pubescence scanty; length 15–18 mm.; antennæ short, segments broader than long, except the last,
*Llaveia bouvari* (Sign ).

Pubescence abundant; length 23–25 mm. . . . . . . . 2

2\. Legs and antennæ reddish; Mexico. . *Llaveia axin* (Llave).
Ecuador; separated by no tangible characters from the last, so far as known; perhaps identical with it.
*Llaveia uhleri* (Sign.).

3. Skin very thickly covered with short hairs; antennæ long, none of the segments, unless the first, twice as broad as long, those after the sixth conspicuously longer than broad; eleventh narrow, cylindrical, 192 $\mu$ long. *Llaveia primitiva* (Twns.).
   Skin with very many round glands, but hairs very minute, sparse, scarcely noticeable; antennæ shorter, the first 8 segments twice as broad as long; 9 and 10 considerably broader than long; 11 oval, . . . *Llaveia mexicanorum* (Ckll.).

The antennæ and legs of *primitiva* and *mexicanorum* are very dark sepia brown, even in the immature stage; this is very different from the clear ferruginous of *axin*. The antennæ of the third stage of *axin* are of the type of *mexicanorum*, but the skin is very hairy as in *primitiva*.

**Margarodes polonicus** (Linn.).
*Porphyrophora polonica* Auct.

The genus *Porphyrophora* Brandt is essentially the same as *Margarodes*, the latter name having priority. There is a good figure of both the ♀ and the "pearl" of *M. polonicus* in Van F. Houttuyn's *Natuurlyke Historie*, 1766, Vol. 10, pl. lxxxiii.

**COCCUS** Linné.
Syst. Nat., Ed. x, 1758, p. 455.

The first species mentioned is *hesperidum* (*Lecanium*). The last is *cacti*. The other species belong to *Chrysomphalus*, *Kermes*, *Pulvinaria*, *Mytilaspis*, *Chionaspis*, *Eulecanium*, *Ceroplastes*, *Porphyrophora* and some Dactylopiine genus. The *Coccus cacti* of *Syst. Nat.*, ed. x, is a Monophlelid, so the *Coccus* of Signoret is not the Linnean genus in any sense. The first to divide *Coccus* L. was Geoffroy, who used *Chermes* for the Lecaniinæ and Diaspinæ (this is not the true *Chermes* Linn., which is *Psylla*), and restricted *Coccus* to the *Coccinæ*. Under *Coccus* he described three species, *C. adonidum*, etc., which is a *Dactylopius*, *C. phalaridis* which is some Dactylopiid, and *C. ulmi*, etc., which is *Gossyparia*. Only one of these is in the *Syst. Nat.*, ed. x, and that is *phalaridis*, which thus becomes the type of the genus. For a description of *C. phalaridis* we may refer to the *Fauna Suecica*, ed. 1761, p. 266. It is said to live at the roots of *Phalaris canariensis*, and to be attended by *Formica rubra*. The description runs: "Animal magnitudine seminis cannabis, exalbidum, solis pedibus parum incarnatis. Antennæ vix corporis $\frac{1}{4}$ partem adtingunt. Rostrum inflexum. Anus retusa, vix villosa.'' This should be easily identified when collected again in Sweden; most likely it is a *Ripersia.* The insect seen by Geoffroy was possibly not the same, as he says it is ''un peu couleur de chair.'' Lichtenstein suggested that *phalaridis* might well be the *Coccus radicum-graminis* Fonsc., for which he proposed the generic name *Fonscolombia.*

*Coccus* Signoret will stand as *Pseudococcus* Westwood (not *Pseudococcus* Sign., which is *Phenacoccus* Ckll.).

**Coccus adonidum** Gmelin.

There is no such thing as *Dactylopius adonidum* Linné. In the early editions of the *Fauna Suecica* Linné had a *Pediculus adonidum,* but finding out that it was not a *Pediculus,* and apparently not knowing what to do with it, he omitted it altogether from the *Syst. Nat.*, ed. x, from which our nomenclature starts. I also fail to find any trace of it in the twelfth edition, but in Gmelin's edition *Coccus adonidum* appears with a description. The description, however, refers to a longitudinal dorsal elevated line, and other characters which belong evidently to some *Orthezia!*

Geoffroy's ''Coccus adonidum corpore roseo, farinaceo, alis setisque niveis,'' is, on the other hand, evidently a *Dactylopius,* but his name is not a binomial.

*Dactylopius adonidum* must therefore disappear from our lists.

**Coccus cacti** Linné.

Syst. Nat., Ed. x, 1758.

Some of the works cited by Linné (*e. g.*, Réaumur) relate to the true cochineal insect; but the whole of the Linnean description pertains to a Monophlœbid! The specimens described were collected in the island of St. Eustache by Daniel Rolander, and sent alive to Upsala in 1756. At the same time Rolander sent a number in alcohol to DeGeer, who (*Mém.*, Vol. vi, p. 449) gave a full account of them, with a figure. The alcoholic specimens were yellow ochre or pale rose; Linné, having seen them alive, says the abdomen is purplish. The antennæ and legs are black; antennæ 11-segmented; mouth parts present. The shape is long oval, like *Llaveia* or *Ortonia.* Linné says nothing about any ovisac, or cottony covering, so it was doubtless absent.

This species seems not to be identical with anything known to modern coccidologists, but it is probably a *Llaveia* or closely related form. It will doubtless be rediscovered when looked for in the type locality.

The cochineal insect can stand as *Pseudococcus cacti* (Burm., *Handb. der Entom.*, 1839, Vol. 2, p. 72). Burmeister's citations of literature belong to the cochineal, and he ignores the *Syst. Nat.*, ed. x. His description of the ♂ agrees with the cochineal, but his ♀, with caudal setæ, is doubtful. The locality is given as Mexico, and it is definitely stated that it is the animal which produces the scarlet pigment.

### SPHÆROCOCCOPSIS n. g.

Type *S. inflatipes* (*Sphærococcus inflatipes* Maskell, Trans. N. Z. Inst., xxv, p. 238).

This is widely separated from *Sphærococcus* by the presence of well-developed legs in the adult ♀; the first four small, the hind pair very large. The margin is beset with spines.

### PHŒNICOCOCCUS n. g.

Type *P. marlatti* n. sp.

Adult ♀. Skin tuberculate, but without conspicuous glands; spiracles small; antennæ reduced to a mere tubercle; otherwise like *Sphærococcus*. The anal ring is hairless in larva and adult.

Larva with four long caudal bristles instead of only two. No lateral or dorsal spines.

**Phœnicococcus marlatti** n. sp.

Adult ♀; broad oval or plum-shaped, wine-red when alive, (fide Marlatt), 1 to $1\frac{1}{4}$ mm. long; occurring packed in great numbers in little cavities about 10 or 12 mm. long by 4 or 5 broad on the midribs of the leaves, communicating with the air by a narrow longitudinal slit.

Skin transparent after boiling, with only a faint brown tinge, its surface beset with numerous hyaline tubercles, which make it seem tessellate, but no spines or hairs, and only a very few scattered glands, except laterad of the spiracles, where there are numerous small round glands grouped more or less in a semicircle. Spiracles formed as in *Sphærococcus*, but small. Antennæ mere minute dark protuberances. Mouth parts well developed. Rostral loop bent suddenly near the base.

Larva elongate, more than twice as long as broad, without lateral or dorsal spines; antennæ 6-segmented, formula 612 (35) 4; 6 long, cylindrical; 1 very large. Segment 6 has two very long hairs at the end. Interval between the antennæ less than the greatest diameter of the first segment. Caudal tubercles little produced; each with two bristles. Femora much swollen, legs otherwise ordinary.

*Hab.*—On date palms (*Phœnix*) imported from Algeria; found by Mr. C. L. Marlatt, who made some study of it years ago. Mr. Marlatt informs me that on the living plants the slight swellings containing the insects are extremely inconspicuous, and very likely to be overlooked even on close examination.

Since the above description was written, *P. marlatti* has been found by the writer in great numbers on the insides of the sheathing bases of the leaves of a date palm just imported from Algeria. Here it is not beneath the epidermis.

### Dactylophine Genera.

After a consideration of the larval characters, I am willing to recognize five genera of Dactylopiini with the legs and antennæ rudimentary or absent. It is interesting that the larvæ of these forms, which are so degenerate in the adult stage, differ more than do the larvæ of ordinary coccids; and, moreover, their differences are just such as separate the adults of the genera which retain their legs and antennæ to the last.

The following table will separate the genera mentioned:

Newly hatched larva elongate, after the manner of *Rhizœcus* and *Pergandiella*, antennæ 6-segmented, . . . . . . . . 1
Newly hatched larva oval or elliptical, . . . . . . . 2

1. Terminal antennal segment of larva oval, little longer than the one before. . . . . . . . . . Pseudolecanium Ckll.
Terminal antennal segment of larva very large, as long as the three before. . . . . . . . . Chætococcus Maskell.

2. Larva with 5-segmented antennæ; anal ring of adult with 4 hairs. . . . . . . . . . . . Cryptococcus Dougl.
Larva with 6-segmented antennæ; anal ring of adult with 6 hairs. . . . . . . . . . . . . Antonina Sign.
Larva with 7-segmented antennæ; anal ring of adult and larva with 17 hairs. . . . . . . . . . Kermicus Newst.

*Sphærococcus tokionis* Ckll., Bull. 4, Tech. Ser., Div. Ent., will stand as *Pseudolecanium tokionis.*

**Fonscolombia radicum-graminis** (Fonsc.).

*Fonscolombia graminis* Licht., Ent. Mo. Mag., 1877, July, pp. 34, 35.

This insect, described by Fonscolombe in 1834, is found in France at the roots of cereals. The ♀ has 6-jointed antennæ, and the ♂ is apterous. Lichtenstein suggests that this may be the *Coccus phalaridis*, but this is at present doubtful. Should it be *phalaridis*, it will belong to *Coccus* L.; but otherwise Lichtenstein's genus *Fonscolombia* is valid, and has priority over *Pseudochermes* and *Apterococcus*, proposed for a congeneric species.

**Fonscolombia fraxini** (Kalt.)

*Ripersia* (*Apterococcus*) *fraxini* (Newst.).

This insect was first described by Kaltenbach in 1874. In 1895 Nitsche proposed for it the subgeneric name *Pseudochermes*. Newstead, when describing the insect as new, used the same specific name as that of Kaltenbach.

**Phenacoccus mespili.**

Signoret in 1875 described this insect for the first time, but called it *Pseudococcus mespili* Geoffroy. The *Chermes mespili serico albo* of Geoffroy, as well as the *Coccus mespili* Gmelin (*Syst. Nat.*, 1788), based upon it, are manifestly referable to *Pulvinaria*. Geoffroy says his insect appears not to differ from his *Chermes carpini serico albo*, which is also a *Pulvinaria*. Signoret also cites Fonscolombe's supposed *Coccus cratægi*, described in 1834, but that is also a *Pulvinaria*. Signoret has suggested that the *Coccus pruni* Burm., 1849, may be *Pseudococcus mespili*. The description of Burmeister is quite inadequate to demonstrate this, and differs in the statement that the insect is greenish gray, *P. mespil* Sign. being reddish. The *Phenacoccus* is therefore nameless, but it is here proposed to use for it the name *mespili*, which will not conflict with Geoffroy's name, the latter pertaining to a different genus.

**Phenacoccus** (?) **farinosus** (Gmel.).

*Coccus farinosus alni*, DeGeer, Mem , Vol. vi, 1776, p. 442, pl. 28, figs. 17–20.

*Coccus farinosus*, Gmelin, Syst. Nat., Ed. xiii, 1788, p. 2220.

This is a Dactylopiine found on the alder; clear, rather reddish, brown, mealy-farinose, eventually covering itself, except the head, with a cottony sac, in the hind part of which the eggs are laid. In the subadult stage it has short lateral tassels, but no long caudal ones. This should be easily recognized when found again in Europe.

**Rhizæcus (?) terrestris** (Newst.).

*Ripersia terrestris* Newst., Ent. Mo. Mag., 1895, p. 213.

This has in common with *Rhizæcus falcifer* the peculiar elongate shape, the 5-segmented antennæ, the elongated mentum, and the prominent caudal tubercles. Newstead figures no eyes, nor mentions them. The terminal segment of the antenna has not the curious falciform spines observed in *R. falcifer* and *eloti*.

**Rhizæcus (?) mammillariæ** (Targ.-Tozz.).

*Dactylopius mammillariæ* (Targ.-Tozz.).
*Westwoodia* sp. n. (?), Targ.-Tozz., Annali di Agricoltura, 1884, pp. 402, 403, figs.

Found at the roots of *Mammillaria.* Targioni-Tozzetti at first called it *Dactylopius mammillariæ*, but later left it without a specific name. He says his material was immature, but the tibia is considerably larger than the tarsus, pointing to a subadult condition at least. The insect differs from *Pergandiella* in any stage by the elongate mentum; in this it agrees with *Rhizæcus*, but it differs from that in having well-developed eyes, and in lacking the falciform spines on the antennæ. The antennæ, though 6-segmented, resemble more those of *R.* (?) *terrestris* than typical *Rhizæcus* or *Pergandiella.* Apparently this insect will form a new genus.

**Oudablis parietariæ** (Licht.).

*Boisduvalia parietariæ* Licht., Bull. Soc. Ent. France, 1881, p. cxv.

This species has been overlooked by later writers. The ♂ is clear red; the ♀ mealy white. It is found on *Parietaria diffusa.*

*Sugarcane Mealy-bugs.*—In the collection of the Division of Entomology at Washington I find mounted specimens of *Dactylopius calceolariæ* and *D. sacchari* from new localities, identified by Mr. T. Pergande. While recording these, I take the opportunity of giving detailed measurements, not hitherto published for these species. It will be seen that although superficially similar and having similar habits, the insects are very distinct in structure.

**Dactylopius calceolariæ** Mask.

On sugarcane, Florida, November 7, 1898 (No. 6,832). New to the U. S.

Shape long oval. Measurements in $\mu$:

Middle leg: coxa, 197; femur + trochanter, 331; tibia, 223; tarsus (very short!), 90; claw, 30.

Antennal segments: (1) 60 long and 86 broad, (2) 68–70 long, (3) 39–43, (4) 30–34, (5) 43, (6) 32–39, (7) 43–47, (8) 96–100.

The specimens were sent to the Div. Entomology by R. E. Rose, from Narcoosee, Fla.

**Dactylopius sacchari** Ckll.

On sugarcane, Bayamon, Porto Rico, January, 1899, (*A. Busck.*).

Females full of embryos. Measurements in $\mu$:

Middle leg: coxa, 133; femur + trochanter, 236; tibia, 146; tarsus, 73; claw, 30.

Antennal segments: (1) 34–43 long and 82 broad, (2) 39–43 long, (3) 26–30, (4) 30–39, (5) 26–30, (6) 34-39, (7) 77–93.

The antennæ have only 7 segments.

## PERGANDIELLA n. g.

A Dactylopiine coccid with a long, parallel-sided body; antennæ 8-segmented, stouter and shorter than in *Dactylopius;* eyes present; anal ring with six large bristles; mentum short; no projecting caudal lobes. Type *P. americana* n. sp. Includes also *P. perrisii* (*Westwoodia perrisii* Sign.) from France. This is identical with *Westwoodia* Sign., *Signoretia* Kraatz, and *Bergrothia* Kraatz; but all these names are preoccupied. I formerly misunderstood its generic characters, and was later led thereby to place it as a synonym of *Dactylopius.* It is appropriately dedicated to Mr. Theo. Pergande, who has all along maintained its validity, and who discovered the type species.

**Pergandiella americana** n. sp.

♀ (Mr. Pergande's mount).—Length $3\frac{2}{3}$, breadth $1\frac{1}{4}$ mm.; eyes distinct; caudal tubercles not produced, each with many small round glands, and a pair of short, stout spines, also about 15 short hairs, and one long one, this last like the bristles of the anal ring, but longer. Skin with small round glands, and scattered hairs, not numerous enough to form a noticeable pubescence; rostral loop reaching to about midway between first and second pairs of legs;

mentum broader than long, breadth 104, length 92 $\mu$; legs very sparsely hairy; hairs on tibia and tarsus very short; claws simple, ordinary. Bristles of anal ring 108 $\mu$ long.

The following measurements of the legs and antennæ are in $\mu$:

Antennal segments: (1) 52, (2) 44–48, (3) 28–32, (4) 20–24, (5) 32, (6) 22–24, (7) 28–32, (8) 76–88. Formula 812 (537) (64).

Middle leg: coxa, 116; femur + trochanter, 240; tibia, 168; tarsus, 84; claw, 22. Diameter of femur, 72; of tibia, 36.

Anterior leg: tibia, 140; tarsus, 80.

Posterior leg: tibia, 200; tarsus, 92.

*Larva.*—Dactylopiine; antennæ 6-segmented, 6 longer than 3 + 4 + 5, as 13 is to $10\frac{1}{2}$; tarsus, excluding claw, longer than tibia, as 11 is to 10; caudal tubercles slightly produced; mentum not very long, length to breadth as $11\frac{1}{2}$ is to 10.

*Hab.*—Washington, D. C., on ash, November 4, 1898 (*Pergande*, Div. Ent., No. 8,200). Differs from *P. perrisii* principally by its smaller size, scarcely pubescent legs, and in being arboreal, whereas *perrisii* was found on grasses. Its color is also different. This interesting insect ought to have been published under Mr. Pergande's name, as he had carefully examined it and noted its peculiarities before I saw it. It is only after urging him to publish it, without result, that I now, with his consent, make it known. I am permitted to supplement my description by the following extract from Mr. Pergande's notes:

" Found in cracks of bark on the trunk of an ash on the Agricultural Department grounds three specimens of a species of *Westwoodia*, one of them still crawling about. The others were infested by a hymenopterous parasite, though both were still living. The active ♀ was very slender, about 4 mm. long, by 1 mm. in diameter, and of a brownish-red color but covered with a mealy excretion which gave it a grayish or moldy appearance. The other two were in addition to the mealy substance covered by a woolly excretion, which was rather sparse anteriorly, but became very dense toward and around the end of the body. . . . . There was also found in one of the cracks a mass of white and woolly excretion containing eggs and young larvæ of this species, all of which were of a pale purplish color. . . . . With the eggs were also found one minute specimen of a bright red species of *Scirus*, and one minute species of Gamasidæ, of a faintly yellowish color. They were feeding on the eggs" (Pergande MS.).

**Gossyparia spuria** (Modeer).

*Coccus ulmi*, Olivier, Encycl. Meth., Vol. vi, 1791, p. 97.

This species was well figured by Réaumur, and is the *Coccus ulmi, corpore fusco, serico albo*, of Geoffroy. Geoffroy's name is not a binomial, so the proper name of the insect is that given by Modeer, which was in general use before Signoret's time.

The *Coccus alni* Modeer, 1778, is a *Lecanium*, and has nothing to do with *Gossyparia*; see Douglas, *Ent. Mo. Mag.*, September, 1886, pp. 80, 81.

**Eriococcus palmeri** n. sp.

♀.—Sac $1\frac{1}{2}$–2 mm. long, of the usual oval shape, of closely woven pure white cottony secretion, with many loose threads on the surfaces producing a kind of pubescence. Caudal aperture quite large.

♀.—Boiled in KHO, does not stain the liquid. Antennæ uniformly 6-segmented, with 3 longer than the subsequent segments together. 2, 1 and 6 subequal in length; 4 and 5 subequal and shortest. Antennæ and legs pale brown. Dermal spines crowded and very large. Femur rather stout; tibia and tarsus long and slender, tarsus somewhat longer than tibia, with two long bristles on its inner side. Claw long, curved. All the digitules filiform, those of the claw extremely slender, those of the tarsus extending a little beyond end of claw. Claw with a minute denticle on the inner side just before the tip. Caudal tubercles long, cylindrical.

The following measurements are in $\mu$:

Dermal spines, 37–47.

Antennal segments: (2) 32, (3) 75, (4) 22, (5) 22, (6) 35.

Middle leg: coxa, 120; femur + trochanter, 180; tibia, 104; tarsus, 112; claw, 40

Hind leg: tibia, 116; tarsus, 120; claw, 36.

*Hab.*—Collected by Dr. Palmer on Carmen Island, off the east coast of Lower California, February, 1891. Found on *Bourreria sonoræ* Wats., and also on *Euphorbia blepharostipula* Millsp. Types in Coll. U. S. Dept. Agric., Div. Ent., No. 4898. This is the smallest American *Eriococcus*, but it is not so small as *E. leptospermi* Maskell.

**Eriococcus ericæ** Sign.

Finding in the collection of the Dept. Agriculture a slide of this species from F. Richter, of Montpellier, I give the measurements (in $\mu$) of the antennæ and legs.

Antennal segments: (1) 30, (2) 36, (3) 36, (4) 21, (5) 18, (6) 28.

Legs: coxa, 86; femur + trochanter, 133; tibia, 73; tarsus, 109; claw, 12.

Longest dermal spines about 43 $\mu$.

**Asterolecanium epidendri** (Bouché).

*Lecanium epidendri* Bouché, Stett. Ent. Zeit., 1844, p. 300 (not *L. epidendri* Bouché, Stett. Ent. Zeit., 1851, p. 112).

The ♀ described by Bouché is evidently our *A. oncidii;* it is said to be probably from the West Indies. Bouché's ♂ is perhaps some other species.

**Asterolecanium rhamni** Kieffer.

Bull. Soc. Ent. France, 1898, pp. 214, 215, figs.

Found on *Rhamnus* in Algeria, forming galls. This supposed Coccid is manifestly a psyllid, and Mr. Schwarz, to whom I showed the description and figures, immediately recognized it as a *Trioza.*

**Asterolecanium variolosum** (Ratzeburg).

*Asterolecanium quercicola* Sign. et Auctt. (not *Lecanium quercicola* Bch.).
*Coccus variolosus* "Ratzeburg MS.," Hagen, Canad. Entom., 1887, p. 60 (no descr.).
*Lecanium quercus* "L." (not of Linné), Altum, Forstzoologie, iii, Insecten, 1881, p. 365.
*Coccus variolosus* Ratzeburg, Tharander Jahrbuch, xx, 1870, p. 187 (not seen; *fide* Judeich and Nitsche).
*Coccus quercicola* "Sign.," Judeich and Nitsche, Lehrbuch der Mitteleur. Forstinsektenkunde, Vol ii, 1895, p. 1252 (good figures).
*Asterodiaspis variolosus* Boas, Dansk Forstzoologi, 1896–98, p. 395, fig.

Bouché described his *quercicola* as elevated, rough and dark brown. Whatever it may have been, it was hardly the *Asterolecanium.* The name proposed by Ratzeburg is very appropriate.

**KERMES** Boitard.

Manuel d'Entomologie, Vol. ii, 1828, pp. 171, 172.

The name *Kermes* had been used in a popular sense from early times, but Boitard is the first author I find using it as a genus in scientific nomenclature. He includes in it *Kermes variegatus, K.*

*ilicis* and *K. reniformis*, as well as species of *Lecanium*, etc. Mr. T. Pergande suggests that *Kermes* is in reality allied to *Eriococcus*. This had not occurred to me, but after going over the characters with this thought in mind, I am inclined to agree with him.

**Kermes ilicis** (L.).

*Coccus ilicis* L., Syst. Nat., Ed. x, 1758, p. 455.

Linné gives no description, but cites Réaumur. The insect described and figured by Réaumur is the globular black species, later named *K. bauhinii*, not the *K. vermilio*. The latter therefore remains valid.

**Kermes quercus** (L.).

*Coccus quercus* L., Syst. Nat., Ed. x, 1758, p. 455.

Linné gives no description, but cites, "Réaum. ins. 4, t. 6, f. 1–4, and alia f. 8, 9, 10.

Réaumur's figures 1–4 represent *Kermes reniformis* of Signoret and authors, which must therefore fall as a synonym of *K. quercus*. The figures 8, 9, 10, are of a large *Pulvinaria*, also found on oak.

*Kermes quercus* Newst. MS. will need a different name. The *Lecanium quercus* "L." of Signoret is not the Linnean insect.

**Pseudokermes armatus** (Ckll.).

*Lecanium armatum* Ckll., Am. Mag. N. Hist., June, 1898, p. 436.

Mr. Pergande made a mount of the second stage from out of the original lot. It is 1 mm. long approximately, and has the legs and antennæ mere stout, conical protuberances, extremely small; skin with numerous figure-of-8 glands; anal plates large, mouth parts well-developed.

**Lecanium coffeæ** Walker.

List Homop. Ins. B. M., 1852, p. 1079.

This is said to have transverse ridges, which suggests *oleæ;* but it is flat and only 2 mm. long, so it must be in the second stage only, and therefore may be *hemisphæricum*. Tradition in Ceylon identifies it with *hemisphæricum*, and I have used the name *coffeæ* for that insect accordingly. Mr. Pergande, however, tells me he saw specimens in the Berlin Museum labelled *coffeæ*, and believed to be authentic, and they were *oleæ*. On the whole, the name *coffeæ* had better be dropped.

**Lecanium ulmi** (Gmelin).

*Coccus ulmi* Gmel., Syst. Nat., p. 2217 (not *Coccus ulmi* L.).

This is the *Lecanium fasciatum* Costa, with transverse brown bands in the manner of *L. perornatum.* It is DeGeer's *Coccus ovatus albus fusco transverse striatus, ulmi,* figured on pl. 28, f. 7. It is also the *Chermes ulmi rotundus* of Geoffroy, and Olivier's *Chermes ulmi.* Olivier says he found it in Holland in May, 1735.

Douglas (*Ent. Mo. Mag.*, September, 1886, p. 79) remarks that in England are found only wholly brown scales of *L. ulmi,* such as were also known to Signoret in France. He queries whether the bands may not be peculiar to the immature stage, but it seems probable that they are retained to the last, as in *L. perornatum.* In that case the English *L. ulmi* will require a new name, being apparently a distinct species; unless, as Douglas suggests, it may be identical with *L. alni* (Modeer).

**Lecanium liriodendri** (Gmel.).

*Coccus liriodendri* Gmelin, Syst. Nat., 1788, p. 2220.

It has long been supposed that this might be identical with our *L. tulipiferæ* Cook, but nobody appears to have been able to consult the description (*Hamburgisches Magazine,* xii, 1753, pp. 3–24) quoted by Gmelin, on which the specific name is based. Fortunately I have been able to obtain the work at the Library of Congress; it proves to be an article by Dr. John Hill, of London, relating to a *Lecanium* he found on the tulip tree in a plantation of American trees at Goodwood; and afterwards, on the same kind of tree, in Burlington Gardens, Chiswick, England. Not being able to make very much out of the article myself, I asked Mr. Pergande to read it, which he did, also without any definite result. It is plain that the insect was a *Lecanium,* and it is perhaps probable that it was *L. tulipiferæ,* but the description is so vague, besides containing some apparently inaccurate statements, that there can be no certainty. It is, however, very desirable that some one should ascertain whether any tulip trees (*Liriodendron*) are still living at the places named, and, if so, whether they are infested by this *Lecanium.*

**Lecanium castilloæ** Ckll.

I have examined a mount of the second stage, prepared by Mr. Pergande from some of the original material collected by Prof.

Townsend on *Castilloa* at Frontera, Mexico. The margin has numerous short rather thick spines, 10 $\mu$ long and 21 $\mu$ apart. Stigmatal spines in threes, two very short, about 17 $\mu$, the other very long, 73 $\mu$. Close to the margin, on each side, are five well-marked round glands, 14 $\mu$ diam., consisting of a small ring within a larger. Antennæ well developed, 7-segmented; the segments measure thus in $\mu$: (1) 26–34, (2) 34, (3) 60–64, (4) 73–77, (5) 34–39, (6) 30–34, (7) 43–51.

Anterior legs with the tibia, 94 $\mu$; tarsus (excl. claw), 81 $\mu$; width of femur, 51 $\mu$.

### PULVINARIA.

The following measurements will assist in the determination of the species; they are all in $\mu$:

*Antennal Segments.*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| *P. cupaniæ* Ckll., on akee, Kingston, Jamaica (*Ckll.*).. | 39 | 39 | 77 | 43 | 39 | 26 | 26 | 43 |
| *P. aurantii* Ckll., on orange Tokio, Japan (*Takahashi*).. | 34-47 | 47–55 | 64–77 | 47-51 | 43–51 | 21–26 | 26 | 47–55 |
| *P. psidii* Mask., on coffee (?), Kailua, Hawaii, 1893 (*Div. Ent.*)... | 39 | 64 | 111–107 | 60–64 | 64 | 39–43 | 34 | 55 |
| *P. ribesiæ* Sign., Lancaster, England (*Newstead*)... | (?) | 47 | 73 | 73 | 55 | 34 | 30 | 47 |
| *P. flavicans* Mask., Murray Bridge, Australia (*Koebele*).. | 39–43 | 43 | 47 | 39–43 | 34-47 | 21–26 | 17–21 | 34–39 |
| *P. "camellicola,"* on *Euonymus*, Macon, Georgia, 1892 (*Bonn.*)...... | (?) | 43–51 | 55-64 | 55 | 30–34 | 30 | 26 | 39–51 |
| *P. bigeloviæ* Ckll., Los Angeles, California (*Div. Ent.*). | (?) | 51 | 60 | 51 | 43 | 39 | 30 | 39 |

*Legs of the same Specimens.*

| | Length of Tibia. | Length of Tarsus (excl. claw). | Breadth of Femur. |
|---|---|---|---|
| *P. cupaniæ* (anterior leg)....... | 172 | 94 | 68 |
| *P. aurantii* (anterior leg)....... | 155 | 86 | 73 |
| *P. psidii* (anterior leg)......... | 258 | 107 | 90 |
| *P. ribesiæ* (anterior leg)........ | 180 | 103 | 69 |
| *P. "camellicola"*............. | 163 | 82 | 73 |
| *P. bigeloviæ* (middle leg)....... | 193 | 124 | 90 |

*P. cupaniæ*, *aurantii* and *psidii* are superficially similar, and are liable to be confused. In *cupaniæ* and *psidii* the marginal spines are about 21 μ long, and more or less fimbriate at the ends; in *aurantii* they are simple, only those next to the spiracular incisions being slightly flattened and inclined to be fimbriate at the ends. On the other hand, by the antennæ *aurantii* and *cupaniæ* are close together, and *psidii* differs greatly by the long 3, as also in the very long tibia.

The marginal spines of *flavicans* are sharp and quite simple; those of *ribesiæ* are also quite simple, very slender, the longer ones 43 μ.

The marginal spines of the "*camellicola*" are simple, very slender, 39–60 μ apart, and 34–47 μ long.

The *bigeloviæ* has the antennæ practically as in "*camellicola*," but the legs will distinguish it.

The species marked "*camellicola*," may possibly be the insect intended by Signoret, but his description does not agree. I have considered it rather a form of my *P. simulans;* vide *Canad. Entom.*, 1895, p. 258.

**Aulacaspis coccois** (Licht.).

*Diaspis coccois* Licht., Bull. Soc. Ent. France, 1882, p. xxxvi.

This is presumably the insect afterwards described by Morgan as *D. tentaculatus*. The exuviæ are distinct and almost central.

**Chrysomphalus aonidum** (Linn.).

*Coccus aonidum* L., Syst. Nat., Ed. x, p. 455.

The description reads: "Habitat in Asiæ arboribus sempervirentibus ut in Camellia, aliisque. Præcedenti [*hesperidum*] minor, sed similis. Testa orbiculata, planiuscula, atro-purpurascens, centro f. vertice tuberculo rotundo rubro quod in senescentibus aperitur." This seems to me to apply excellently to one thing, and one only, viz., *Chrysomphalus ficus* Ashm. Signoret naturally could not recognize the species, because he did not have it. It seems probable that the insect is after all a native of Asia, with *C. dictyospermi;* while the group of *C. perseæ*, etc., is truly neotropical.

**Chrysomphalus rossi** Maskell.

Manila, Philippine Is., on an orchid, quarantined by Mr. A. Craw at San Francisco. The material was very scanty, but was examined by Mr. Marlatt and the writer, and identified as *rossi*. This is the first coccid record from the Philippines.

**Aspidiotus acuminatus** Targ.-Tozz.

This species was omitted from my Check List. It is a species of *Hemibeilesia*, and, so far as I can see, identical with *A. rapax* Comst.

**Aspidiotus euonymi** Targ.-Tozz.

This is also an *Hemiberlesia*, and has been referred to *A. rapax*. It is, however, one of the *A. cydoniæ* group, having four groups of circumgenital glands.

**Aspidiotus saccharicaulis** Zehntner.

This is an *Odonaspis*, and hardly more than a variety of *A. secretus*. The following table will separate the three races of *secretus*:

(1) Two groups of circumgenital glands, not connected above by a line of glands. . . *A. secretus* var. from Ceylon (Green).

(2) Groups of circumgenital glands connected above by a line of glands. . . . . . *A. secretus* Ckll., type from Japan.

(3) Groups of circumgenital glands connected above by a median group which is three deep in the middle.
*A. secretus* race *saccharicaulis* (Zehnt.).

A new locality for *A. secretus* is Honolulu, Hawaii, on bamboo, 1899 (*Geo. Comp*, in coll. Div. Ent. Dept. Agric.).

**Mytilaspis abietis** Sign.

Signoret, in *Bull. Soc. Ent. France*, 1882, p. clxxxiv, admits that his "*Mytilaspis abietis* Schr." is not Schrank's insect, the latter being an *Aspidiotus*. He then proposes that the name *abietis* be retained for the *Mytilaspis* with himself as its author. This must hold, and the name *confusus*, proposed by Horváth, will fall as a synonym.

**Mytilaspis ulmi** (L.).

*Coccus ulmi* Linné, Syst. Nat., Ed. x, 1758, p. 455.
*Mytilaspis pomorum* Bouché et Auctt.

Linné gives no description, but cites, "Réaum. ins. 4, t. 2, 5. f. 5–7, and alia t. 7. f. 1–10." Réaumur's pl. 5, figs. 5–7, represent the *Mytilaspis* of the elm, which is now considered identical with that of the apple; they are, in fact, the very figures which Geoffroy cites for his *Coccus arborum linearis*. Réaumur's pl. 7, figs. 1–10 represent *Gossyparia spuria* (*ulmi*).

**Mytilaspis beckii** (E. Newman).

*Coccus beckii* E. Newman, Entomologist, Feb., 1869, pp. 217, 218.
*Mytilaspis citricola* (Pack.), Comst. et Auctt.

The name *beckii* is based on Beck's figures and notes, which are unmistakable. Newman erroneously supposed the apple *Mytilaspis* to be the same.

**Parlatoria proteus** var. **crotonis** Dougl.

Ent. Mo. Mag., April, 1887, p. 242.

The species found so commonly on crotons, described as *crotonis* (*pergandei* var.) by the present writer, appears to be the same as that of Douglas. I had overlooked the latter's article on the subject.

**Diaspis pentagona** Targ.-Tozz.

Rivista di Bachicoltura, 1886, No. 11; reprinted in Bull. Soc. Ent. Ital., 1887, pp. 184–186.
n. syn. *Diaspis amygdali* Tryon.

The probability of this synonymy had occurred independently to Mr. Marlatt and the present writer; an examination of Italian material of *pentagona* confirms it.

Targioni-Tozzetti's 1886 account is of a very general nature, but will hold the name. In a pamphlet published in Milan in 1890 he gave a scientific description with figures. There is also a description in *Bull. Soc. Ent. Ital.*, xxi, 1890.

## DESCRIPTIONS OF TWO NEW GRAY FOXES.

BY GERRIT S. MILLER, JR.

The United States National Museum contains numerous specimens of small gray foxes from Central America, south of the Isthmus of Tehuantepec. These represent two hitherto undescribed species, one from the arid tropical coast of Yucatan, the other from the humid tropical region of Guatemala and Chiapas. To the kindness of Mr. D. G. Elliot I owe the opportunity to compare these animals with the type of *Urocyon fraterculus*, the property of the Field Columbian Museum. Dr. C Hart Merriam has placed at my disposal the Mexican and Guatemalan gray foxes in the Biological Survey collection I publish this paper here by permission of the Secretary of the Smithsonian Institution.

**Urocyon parvidens** sp. nov.

*Type* ♂ (skin and skull), No. $\frac{11429}{37762}$, United States National Museum, collected at Merida, Yucatan, by A. Schott. Original number 385.

*General characters.*—Most like *Urocyon fraterculus* (Elliot),[1] from San Felipe, Yucatan, but teeth smaller, tail shorter, and color more fulvous.

*Color.*—Fur of body composed of two kinds of hair, one short, dense, and woolly, the other long, stiff and sparse. Except in the whitish areas where they are pale to base, the hairs of the under fur are cinereous through lower third, then creambuff or pinkish buff to tip. The long hairs are whitish at base (conspicuously paler than the bases of the under fur) gradually shading to dark brown near middle; the tip black. Between the black tip and the brown median area is a conspicuous white ring, the base of which is level with the tips of the under fur. The varying combinations of the buff of the under fur and the white rings and black tips of the longer hairs give the dorsal surface its color. On the head the under fur, here darkened to tawny ochraceous, and the white rings

[1] *Urocyon cinereo-argentatus fraterculus* Elliot, Field Columbian Museum Publication 11, Zoölogical Series, i, No. 3, p. 80, May, 1896.

are most conspicuous. From ears to base of tail the black and white predominate, producing a clear gray, blackening irregularly along median line and very faintly tinged with buff. On the sides the buff becomes more conspicuous and slightly darker, and on the sides of the belly both white and black practically disappear. Chin, upper side of muzzle and posterior half of upper lip dusky. Cheeks, sides of muzzle, throat and median line to base of tail buffy white. Inner sides of thighs and area between them white. Bases of ears, area behind ears, on sides of neck and across chest ochraceous buff. Distal half of ears duller than base. Inner surface buffy white. Outer sides of front legs and posterior surface of hind legs ochraceous buff. Anterior surface of hind leg and dorsal surface of pes buffy white. Soles and palms ochraceous buff. Tail gray with a black dorsal stripe and tip and ill-defined ventral buffy area.

*Skull.*—The skull is exactly similar to that of *Urocyon fraterculus.* It therefore needs no comparison with that of any of the members of the *cinereoargenteus* group.

Measurements of skull of type:[2] greatest length, 102; basal length, 94.4; basilar length, 92; palatal length (median), 47; nasals (median), 30; zygomatic breadth, 53; interorbital breadth, 20.4; breadth across postorbital processes, 30.4; greatest breadth of brain case, 40.6; mastoid breadth, 36.4; greatest depth of brain case, 33.6; space between audital bullæ, 5.6; upper toothrow (exclusive of incisors), 41; mandible, 74; mandibular toothrow (exclusive of incisors), 46.

*Teeth.*—The teeth of *Urocyon parvidens* are uniformly much smaller than in *U. fraterculus,* but the differences are most conspicuous in the first molar and the second, third and fourth premolars. The greatest diameter of the crown of the first molar in three specimens of *U. parvidens* is respectively, 8.8, 8.8 and 8.6. In the type of *U. fraterculus* it is 10.6. The greatest diameter of the crown of the carnassial in three skulls of *U. parvidens* is 9.2,

[2] The skull of the type of *U. fraterculus* measures: greatest length, 101; basal length, 93; basilar length, 91; palatal length (median), 48; nasals (median), 31; zygomatic breadth, 53.6; interorbital breadth, 19.6; breadth across postorbital processes, 30; greatest breadth of brain case, 40; mastoid breadth, 37.4; greatest depth of braincase, 31; space between audital bullæ, 6; upper toothrow (exclusive of incisors), 44; mandible, 74; mandibular tooth row (exclusive of incisors), 48.6.

9.4 and 9.2. In the type of *U. fraterculus* it is 11. The second and third premolars in *U. fraterculus* are long and crowded, while in *U. parvidens* they are narrow and widely spaced. The height is about the same in each. The length of each of these teeth including cingulum equals or exceeds the height in *U. fraterculus*, but is much less than the height in *U. parvidens.* In this respect *U. parvidens* resembles the members of the *cinereoargenteus* group. In the mandibular teeth the differences are of the same kind, but somewhat less defined. Length of first lower molar 9.2 in *U. parvidens*, 10.6 in *U. fraterculus.*

*Measurements.*—Type:[3] Total length, 720; tail vertebræ, 240; hind foot, 95; ear from meatus, 51; ear from crown, 46. Average of four specimens including the type: Total length, 722; tail vertebræ, 222; hind foot, 93; ear from meatus, 50; ear from crown, 46 (all from dry specimens).

*Specimens examined.*—Four, all from the type locality.

*General remarks.*—*Urocyon fraterculus* and *U. parvidens* form a group readily distinguishable from the relatives of *U. cinereoargenteus* by their slender feet and relatively larger and more inflated audital bullæ. The bullæ in these small skulls are much larger than in members of the *cinereoargenteus* group of approximately the same size, and fully equal to those of the largest forms. They are more abruptly elevated above level of basioccipital (when skull is held upside down) and the outer anterior face slopes away much more abruptly. They are placed more closely together than in the members of the *cinereoargenteus* group. In a specimen of *U. littoralis*, only 193 in greatest length, the space between the bullæ is 8.4, and in the other forms this relative spacing is maintained.

**Urocyon guatemalæ** sp. nov.

*Type* adult ♂ (skin and skull), No. 76,723, United States National Museum (Biological Survey Collection), collected at Nenton, Guatemala, December 16, 1895, by E. W. Nelson and E. A. Goldman. Original number 8,801.

*General characters.*—Most like *Urocyon littoralis* Baird from the Santa Barbara Islands, California, but color darker and richer. Carnassial tooth more robust than in *U. littoralis.* Audital bullæ

[3] The type of *U. fraterculus* measures: total length, 750; tail vertebræ, 290; hind foot, 95 (from skin).

slightly more inflated than in the other members of the *cinereo-argenteus* group.

*Color.*—Type specimen in unworn winter coat. Quality of fur and arrangement of color bands as in *U. parvidens* and the other members of the genus. Dorsal surface clear gray formed by the nearly equal mixture of the black tips and white subterminal rings of the coarse hairs. Under fur pale creambuff, appearing at surface only when hair is disarranged. Top of head tinged with tawny. On the sides the black tips are less conspicuous than on the back, and the buff of the under fur appears distinctly at the surface. Belly ochraceous buff except along median line and between hind legs, where it is dull white. Base of ear and area behind ear tawny ochraceous; this area extending back to front leg, but much suffused with gray except on and close to ear. Distal half of ear thickly sprinkled with dusky hairs which considerably dull the ochraceous. Inner surface of ear whitish. Muzzle, upper lip and chin dark brown. Cheek between eye and lip, and region beneath the ochraceous area under ear dull white, continuous with white of throat. Dorsum of manus and pes a coarse dark grizzle of black, white and tawny. Inner side of hind leg white; outer and posterior side dull ochraceous. Palms and soles dull ochraceous. The gray of the sides of the belly extends down the front of the fore leg to join the gray of the foot. Outer surface of foreleg dull ochraceous. Tail gray heavily shaded with black. A broad, black dorsal stripe and conspicuous black tip. Under side of tail dull ochraceous. Specimens in worn pelage are less gray than the type, and the tawny areas are brighter and more extensive.

*Skull*—The skull of *Urocyon guatemalæ* closely resembles that of *U. littoralis*, but averages slightly larger. It is much smaller, however, than that of the ordinary gray fox of Mexico north of the Isthmus of Tehuantepec. Zygomata slightly less flaring than in *U. littoralis*. Audital bullæ slightly larger and closer together than in *U. littoralis*, their longitudinal diameter greater relatively to their transverse diameter. The whole surface of the bulla is more evenly rounded than in other members of the *cinereoargenteus* group; in this respect showing an approach to *U. fraterculus* and *U. parvidens*. Compared with that of *U. parvidens* the skull of

*Urocyon guatemalæ* is considerably larger, while the audital bullæ are actually as well as relatively smaller.

*Measurements of skull of type.*—Greatest length, 111; basal length, 101; basilar length, 98; palatal length (median), 51.4; nasals (median), 33; zygomatic breadth, 60; interorbital breadth, 21.4; breadth across postorbital processes, 33; greatest breadth of brain case, 44; mastoid breadth, 40; greatest depth of brain case, 33; space between audital bullæ, 8; upper tooth row (exclusive of incisors), 46; mandible, 81; mandibular tooth row (exclusive of incisors), 51.

*Teeth.*—The teeth closely resemble those of *Urocyon littoralis*, but are more robust. This is particularly noticeable in the first molar and the carnassial, the crown of the latter is nearly a millimetre shorter and broader than in *U. littoralis.* All the teeth are larger than in *U. parvidens*, though they are of essentially the same form.

*Measurements.*—Type: total length, 830; tail vertebræ, 327; hind foot, 128. Average of four specimens from near type locality (including type): total length, 827; tail vertebræ, 328; hind foot, 120. A specimen from Tumbala, Chiapas: total length, 786; tail vertebræ, 300; hind foot, 111.

*Specimens examined.*—Ten, from the following localities: Guatemala—Nenton, 3; Jacaltenango, 1; exact locality unknown, 5; Chiapas—Tumbala, 1.

*General remarks.*—Mexico north of the Isthmus of Tehuantepec is inhabited by gray foxes of large size and pale color, which resemble *Urocyon cinereoargenteus scottii* Mearns. These animals are replaced south of the Isthmus by *U. fraterculus* and *U. parvidens* in the arid tropical region of Yucatan, and by *U. guatemalæ* in the humid tropical region of Guatemala.

## THE VOLES COLLECTED BY DR. W. L. ABBOTT IN CENTRAL ASIA.

BY GERRIT S. MILLER, JR.

During three recent expeditions in Central Asia, Dr. W. L. Abbott collected fifty-four voles representing the following ten species. These specimens form part of the large collection of Asiatic mammals which he has presented to the United States National Museum. I publish this paper here by permission of the Secretary of the Smithsonian Institution.

### Genus **MICROTUS** Schrank.

1798. *Microtus* Schrank, Fauna Boica, i, p. 72. Type by elimination *Microtus terrestris* Schrank = *Mus arvalis* Pallas.

All of the voles collected by Dr. Abbott are members of the genus *Microtus*.

### Subgenus **PHAIOMYS** Blyth.

1863. *Phaiomys* Blyth, Journ. Asiat. Soc. Bengal, xxxii, p. 89. Type *Phaiomys leucurus* Blyth = *Arvicola blythi* Blanford.

The subgenus *Phaiomys* is represented in Dr. Abbott's collection by one species only.

**Microtus blythi** Blanford.

1863. *Phaiomys leucurus* Blyth, Journ. Asiat. Soc. Bengal, xxxii, p. 89. (Not *Arvicola leucurus* Gerbe, 1862.)
1875. *Arvicola blythi* Blanford, Journ. Asiat. Soc. Bengal, xliv, pt. ii, p. 107.
1891. *Microtus blythi* Blanford, Fauna of British India, Mammalia, p. 432.

*Type locality.*—Between Spiti and Pankong lake, eastern Kashmir.

*Specimens collected by Dr. Abbott.*—Thirty-four (twenty skins, fourteen in formalin). The specimens were all taken in Ladak, where Dr. Abbott found the species the most abundant vole, common on all grassy plains bordering lakes and streams between the altitudes of 14,000 feet and 16,000 feet. The following are the exact localities represented:

Tsokr Chumo (lake), 15,000 feet.
Rupchen, Rupshu, 15,000 feet.
Ooti, Rupshu, 15,500 feet.
Rupshu, 16,000 feet.
Hanle district, 16,000 feet.
Banks of Hanle river, 15,000 feet.
Chibra, Hanle river, 14,000 feet.
West side of Pognor lake, 16,000 feet.
Above Tsomoriri lake, 16,000 feet.
Karzok, Tsomoriri, altitude not stated.

*Color.*—The series of skins shows no considerable variation in color. In summer pelage the back is light woodbrown, strongly tinged with yellowish, and very faintly darkened by an even sprinkling of long blackish hairs, which in many specimens are more noticeable on neck and region behind shoulders than elsewhere. Sides clear buff; belly like sides, but paler and irregularly clouded by the appearance on the surface of the dark underfur. Tail pale buff, slightly paler below. Feet dirty white. The autumn coat, which is beginning to appear in specimens taken late in August and early in September, is slightly less yellow. Half-grown young are duller and browner than the adults. These immature specimens show a more strongly contrasted (though actually duller) buffy lateral area.

*Feet.*—Both palms and soles are 5-tuberculate. On the soles a rudimentary sixth tubercle is distinguishable in two quarter-grown individuals preserved in formalin.

*Mammæ.*—On the label of an adult female taken above Tsomoriri, July 31, 1897, Dr. Abbott records the number of mammæ as four pectoral and four inguinal. I find a like number in each of two females preserved in formalin.

*Skull.*—The series of fifteen perfect adult skulls shows the slight range of individual variation usually met with in species of *Microtus*. The most variable characters appear to be the form of the interparietal, the extent of the constriction near the middle of the nasals, the extent of the forward projection of the upper incisors, and the size of the audital bullæ. The development of the audital bullæ appears to be less in the females, since I find it possible to select the majority of the female skulls in the series by reference to this character alone.

Average measurements of five fully adult skulls: greatest length, 29 (28.4–30); basal length, 27.9 (27.6–28.8); basilar length, 26.7 (26–27.4); zygomatic breadth, 18.5 (18–19); mastoid breadth, 15.2 (15–15.6); interorbital constriction, 4; nasals, 7.7 (7.4–8); diastema, 9.3 (9–9.6); palatal length, 15.7 (15–16); occipital depth (in median line), 8.1 (7.6–8.6); fronto-palatal depth (at middle of molar series), 9.1 (9–9.4); mandible, 18.5 (18–19); maxillary toothrow (alveoli), 7; mandibular toothrow (alveoli), 7.

*Teeth.*—The enamel pattern is remarkably constant. The last loop of the posterior upper tooth is occasionally somewhat more abruptly curved than usual on the outer side so that the last salient angle is cut off as a rudimentary closed triangle. The variation necessary to bring about this result is, however, very trifling. In the front lower molar the exact form of the anterior loop varies slightly, but in none of the twenty specimens is a fourth triangle isolated.

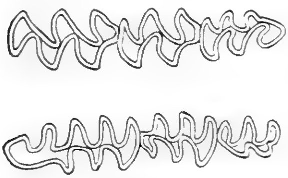

FIG. 1. Enamel pattern of *Microtus blythi.* (× 6.)

*Remarks.*—This species is very closely related to *Microtus strauchi* Büchner. A specimen of the latter from northern Thibet agrees with *M. blythi* in all particulars except its conspicuously shorter tail.

*Measurements.*—The measurements of nineteen specimens of *Microtus blythi* are given in the following table:

*Measurements of Microtus blythi.*

(In millimetres.)

| Locality. | Number. | Sex. | Head and Body.[1] | Tail Vertebræ.[1] | Hind Foot (with claws). | Hind Foot (without claws). | Ear from Meatus. | Width of Ear. |
|---|---|---|---|---|---|---|---|---|
| Tsokr Chumo, Ladak...... | 84,032 | ♂ | 123.8 | 34.9 | 22 | 20 | 11 | 12 |
| Tsokr Chumo, Ladak...... | 84,035 | ♂ | 120.7 | 31.8 | 23 | 20.4 | 12 | 12 |
| Tsokr Chumo, Ladak...... | 84,036 | ♂ | 117.5 | 31.8 | 23 | 20 | 10 | 10 |
| Rupchen, Rupshu, Ladak.. | 84,042 | ♂ | .... | .... | 23 | 21 | 12 | 10.4 |
| Chibra, Hanle river, Ladak. | 84,045 | ♂ | 117.5 | 38 | 22 | 19.6 | 11.4 | 11 |
| West side of Pognor lake, Ladak.................. | 84,048 | ♂ | 117.5 | 35 | 22 | 19.8 | 11 | 11 |
| Ooti, Rupshu, Ladak...... | 84,052 | ♂ | 130 | 31.8 | 21 | 19 | 11.4 | 11 |
| Tsokr Chumo, Ladak...... | 84,031 | ♀ | 117.5 | 31.8 | 22 | 20 | 11 | 10.6 |
| Tsokr Chumo, Ladak...... | 84,033 | ♀ | 121 | 31.8 | 21 | 18.8 | 12.6 | 12 |
| Tsokr Chumo, Ladak...... | 84,034 | ♀ | 114 | 31.8 | 21.8 | 19 | 11.4 | 11 |
| Tsokr Chumo, Ladak...... | 84,037 | ♀ | 117 | 38 | 23 | 20 4 | 12 | 12 |
| Rupshu, Ladak........... | 84,040 | ♀ | 117 | 31.8 | 20 | 18 | 11 | 10 |
| Rupchen, Rupshu, Ladak.. | 84,041 | ♀ | 102 | 31.8 | 22 | 20 | 10 | 10 |
| Hanle district, Ladak...... | 84,046 | ♀ | 117 | 31.8 | 21 | 18.4 | 10.4 | 10 |
| Hanle district, Ladak ..... | 84,047 | ♀ | 121 | 31.8 | 20.4 | 18.8 | 11 | 11 |
| West side of Pognor lake, Ladak................. | 84,049 | ♀ | 129 | 29 | 20.4 | 18 | 11 | 10 |
| Ooti, Rupshu, Ladak...... | 84,051 | ♀ | .... | .... | 22 | 19 | 10 | 11 |
| Above Tsomoriri lake, Ladak.................... | 84,055 | ♀ | 114 | 35 | 21 | 18.6 | 11 | 10.6 |
| Banks of the Hanle river, Ladak................. | 84,044 | .. | 121 | 31.8 | 20 | 18 | 10 | 10 |

**Subgenus MICROTUS** Schrank.

1798. *Microtus* Schrank, Fauna Boica, i, p. 72. Type by elimination *Microtus terrestris* Schrank = *Mus arvalis* Pallas.

Dr. Abbott collected two species of the subgenus *Microtus*, one in eastern Turkestan, the other in the Pamir. Neither has hitherto been described.

**Microtus ravidulus** sp. nov.

*Type* adult ♀ (skin and skull), No. 62,159, United States National Museum, collected at Okchi, valley of the Aksai (altitude, 7000 feet), eastern Turkestan, November 7, 1893, by Dr. W. L. Abbott.

[1] Collector's measurement.

*General characters.*—In general appearance much like *Microtus arvalis* from Braunschweig, Germany, but tail shorter, fur longer and coarser, color paler, and skull longer and narrower. Enamel pattern as in *M. arvalis.* Mammæ, 8; plantar tubercles, 6; hip glands conspicuous.

*Fur and Color.*—The fur is harsh and coarse, that on middle of back about 12 mm. in length. It is everywhere dark slaty plumbeous at base.

Ground color of dorsal surface buff, faintly tinged with wood-brown and coarsely 'lined' with blackish brown. Sides clear pale buff. Ventral surface creambuff much darkened, especially anteriorly, by the plumbeous bases of the hairs. Tail indistinctly bicolor, soiled whitish below, brownish above. Feet dirty white.

*Feet.*—Palms with five tubercles, soles with six; all well developed. Soles densely hairy behind tubercles.

*Mammæ.*—Mammæ eight, four pectoral and four inguinal, as usual in the subgenus *Microtus.*

*Skull.*—The skull of *Microtus ravidulus,* though of the same type as that of *M. arvalis* from Germany, is readily distinguishable by its slightly greater length, and by the narrowness and great depth of the braincase. The form of the braincase is much like that of *M.* (*Pedomys*) *austerus.* Interorbital constriction narrow, the constricted region unusually long. Zygomatic arches not widely flaring, the outer borders nearly parallel (not strongly convergent anteriorly as in *M. arvalis*) in the region opposite post-orbital processes. Rostrum heavier than in *M. arvalis,* but not conspicuously different in form. Audital bullæ slightly larger than in *M. arvalis.* Mandible similar to that of *M. arvalis,* but larger and with more slender angular process.

Average measurements of three adult skulls: greatest length, 26.3 mm. (26–26.6); basal length, 25.1 (25–25.4); basilar length, 23.4 (23–23.6); zygomatic breadth, 14.4 (14–14.6); mastoid breadth, 11.6 (11.4–12); interorbital constriction, 3; nasals, 7; diastema, 8; palatal length, 14; occipital depth, 8; fronto-palatal depth (at middle of molar series), 8.1 (8–8.4); mandible, 16.1 (16–16.4); maxillary tooth row (alveoli), 6; mandibular tooth row (alveoli), 6.

*Teeth.*—The teeth of *Microtus ravidulus* are relatively slightly

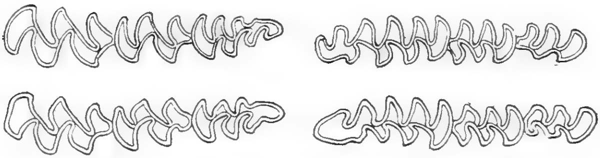

FIG. 2. Enamel pattern of *Microtus ravidulus* (upper figures) and *M. pamirensis* (lower figures). (× 6.)

larger than in *M. arvalis*, but the enamel pattern in the two species is identical.

*Specimens examined.*—Five, all from the type locality.

*Remarks.*—Although a member of another subgenus, *Microtus ravidulus* bears a strong superficial resemblance to *M. blythi.* The colors of the two species are almost precisely the same, but *M. ravidulus*, aside from its subgeneric characters, can be distinguished by the dark dorsal surface of the tail, coarser fur, and more conspicuous dark ' lining ' of back.

The four skins show no important variations in color.

*Microtus ravidulus* is closely related to *M. tianschanicus* Büchner from the Juldus Valley. In size, color and cranial characters the two species apparently agree perfectly; but the five specimens of *M. ravidulus* have the front lower molar of *M. arvalis* instead of the very peculiar tooth described and figured by Büchner as occurring without exception in the seven specimens of *M. tianschanicus* collected by Przewalski. In only one of the latter is there a faint trace of a fourth outer salient angle; and this tooth is specially figured as abnormal. Although both animals occur on the south side of the great Tianschan mountain chain, they are some four hundred miles apart, and probably completely insulated by the Chalyk and Beschan mountains, which would undoubtedly act as barriers to austral species.

Dr. Abbott tells me that this vole was abundant in the grain fields of the comparatively low, fertile valley about Okchi. It occurred together with a species of *Cricetulus*, and one or both of the animals laid up abundant underground stores, each containing about a pint of barley heads. Strangely enough, this habit was not known to the owners of the fields.

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[2] Wissensch. Resultate der von N. M. Przewalski nach Central-Asien untern. Reisen, Zoolog. Theil, Bd. i, Säugethiere, p. 107, 1889.

*Measurements.*—The measurements of four adult specimens of *Microtus ravidulus* are given in the following table:

*Measurements of Microtus ravidulus.*

| Locality. | Number. | Sex. | Head and Body.[3] | Tail Vertebræ.[3] | Hind Foot (with claws). | Hind Foot (without claws). | Ear from Meatus. | Width of Ear. |
|---|---|---|---|---|---|---|---|---|
| Okchi, valley of the Aksai, eastern Turkestan........ | 62,157 | ♂ | 105 | 29 | 18.4 | 16.8 | 11 | 11.4 |
| Okchi, valley of the Aksai, eastern Turkestan........ | 62,158 | ♀ | 121 | 32 | 18 | 16 | 10 | 11 |
| Okchi, valley of the Aksai, eastern Turkestan........ | 62,159[4] | ♀ | 121 | 38 | 18 | 16.4 | 11 | 12 |
| Okchi, valley of the Aksai, eastern Turkestan........ | 62,160 | ♀ | 121 | 32 | 18 | 16.6 | 12 | 13 |

**Microtus pamirensis** sp. nov.

*Type* adult ♂ (skin and skull), No. 62,161, United States National Museum, collected at Tagdumbash, Pamir (altitude 12,000 feet), June 18, 1894, by Dr. W. L. Abbott.

*General characters.*—Size medium; tail short; ears moderate, scarcely overtopping fur; color uniform pale brown above, whitish below; skull heavily built and angular; upper incisors conspicuously protruding; two anterior triangles in first lower molar open; posterior loop of back upper molar nearly straight.

*Fur and color.*—The fur is full and soft, that on middle of back about 12 mm. in length. It is everywhere slategray at base.

Color of dorsal surface light broccolibrown, very uniform and only inconspicuously sprinkled with darker hairs. Ventral surface grayish white, strongly clouded anteriorly by the dark bases of the hairs. Feet whitish. Tail whitish with a very inconspicuous dusky dorsal stripe.

*Feet.*—The soles and palms were slit open by the collector, so that it is impossible to determine the number and position of the tubercles. Claws as in typical members of the subgenus *Microtus*.

*Skull.*—The skull of *Microtus pamirensis* is unlike that of any other true *Microtus* with which I am acquainted. In superficial

[3] Collector's measurement. [4] Type.

appearance it strongly suggests an approach to *Phaiomys*. This is due chiefly to the protruding upper incisors and the short, strongly cuneate nasals. The whole skull is angular and heavily built, much broader than that of *M. arvalis*, from Germany, though of about the same length. Nasals shorter than in *M. arvalis*, and much broader anteriorly. Zygomatic arches strongly flaring anteriorly, nearly parallel in region opposite postorbital processes. Interparietal rectangular, the anteroposterior breadth about half the lateral breadth. Braincase squarish in outline, broader than in *M. arvalis*, but of about the same depth. Interorbital constriction relatively less narrow than in *M. arvalis*, but constricted region of about the same length. Palate normal, the lateral pits well developed, though shallower than in *M. arvalis*. Audital bullæ about the same size as in *M. arvalis*, but flatter. Incisive foramen considerably broader anteriorly than posteriorly.

Measurements of type skull: greatest length, 25; basal length, 14.6; basilar length, 14; zygomatic breadth, 16; mastoid breadth, 12.4; interorbital constriction, 3.8; length of nasals, 7; anterior breadth across nasals, 3.6; posterior breadth across nasals, 1; diastema, 8.8; palatal length, 14.4; occipital depth, 8; frontopalatal depth (at middle of molar series), 8; mandible, 17; maxillary toothrow (alveoli), 6.8; mandibular toothrow (alveoli), 6.6.

*Teeth.*—Attention has already been called to the strongly projecting upper incisors. The molars are heavier than in *M. arvalis*. In general appearance the enamel pattern is less compact than in *M. arvalis*, while the details in the two species differ considerably. The posterior upper molar contains an anterior transverse loop, a small outer closed triangle, a larger one on the inner side, and a long terminal longitudinal loop provided with a well-developed salient angle on each side anteriorly. Behind each of these salient angles is a rounded reëntrant angle. As the inner of these salient angles and its corresponding reëntrant angle are the more strongly developed as well as the more posterior in position the terminal loop is bowed very slightly inward. It is, however, essentially straight as compared with the corresponding region in *M. arvalis*. Middle upper molar tetramerodont. The front lower molar contains the same elements as in *M. arvalis*, but the two anterior triangles open freely into the terminal loop. This character may prove to be individual, though I am inclined to believe that it is normal. The enamel pattern of the remaining teeth is like that of *M. arvalis.*

*Specimens examined.*—Dr. Abbott collected only one specimen of this species.

*Remarks.*—*Microtus pamirensis* differs too widely from any described form to require detailed comparison.

*Measurements.*—Head and body, 105; tail vertebræ, 34; pencil, 4; hind foot with claws, 18; hind foot without claws, 16; ear from meatus, 12; width of ear, 13.8.

### Subgenus HYPERACRIUS Miller.

1896. *Hyperacrius* Miller, North American Fauna, No. 12, p. 54. July 23, 1896. Type *Arvicola fertilis* True.

During his first and second visits to Kashmir, Dr. Abbott collected the five specimens that subsequently formed the basis of the descriptions of *Microtus fertilis* and of the subgenus *Hyperacrius.* During his last expedition he obtained another specimen which differs so considerably from those previously collected that it must be regarded as the representative of an undescribed species. The three species of *Hyperacrius* now known may be recognized by the following characters:

### Key to Species of Hyperacrius.

Hind foot (with claws) 19; upper tooth row 7.
*M. aitchisoni* Miller.[5]

Hind foot (with claws) 16–18; upper tooth row 6.

Ear from meatus 10–11. . . . . . . . . *M. fertilis* (True).

Ear from meatus 7.8. . . . . . . . . *M. brachelix* sp. nov.

**Microtus fertilis** (True).

1894. *Arvicola fertilis* True, Proc. U. S. National Museum, xvii, p. 10. May 8, 1894.

1896. *Microtus fertilis* Miller, North American Fauna, No. 12, p. 55. July 23, 1896.

*Type locality.*—Pir Panjal range, Kashmir. Altitude, 8,500 feet.

*Specimens collected.*—Dr. Abbott has taken no specimens of this species in addition to the original series of five skins procured during his first and second visits to Kashmir. These were taken at the following localities:

Pir Panjal range, 8,500 feet.

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[5] Proc. Biolog. Soc. Washington, xi, p. 141. May 13, 1897. From Gulmerg, Kashmir. Type in British Museum.

Kaj Nag mountains, 8,000 feet.

Krishnagunga valley, 7,000 feet.

Central Kashmir, 12,000 feet.

This species occurs in the mountain parks well below timber line. From the information given me by Dr. Abbott I should suppose that its faunal position is lower boreal. In the middle boreal and upper boreal it is replaced by members of the subgenera *Phaiomys* and *Alticola*.

*Color.*—The five skins show no marked variation in color. In all, the entire dorsal surface is a fine grizzle of dull woodbrown and sealbrown, the result of which is a general tint not far from sepia. Such variation as occurs is due to slight differences in the balance between the component colors. On the sides and belly the sealbrown disappears, and the woodbrown changes to a yellowish clay color, varying slightly in intensity and in the amount of clouding due to the dark bases of the hairs. Tail obscurely bicolor, sepia above, dirty whitish beneath. Feet dusky sepia, varying considerably in depth; occasionally almost blackish.

*Skull.*—Three skulls show little variation beyond that due to differences in age. The skull of the type is the oldest and most angular. It measures: greatest length, 24.6 ; basal length 24; basilar length, 23 ; zygomatic breadth, 16 ; mastoid breadth, 12.4; interorbital constriction, 3.8; length of nasals, 8 ; anterior breadth across nasals, 3.2 ; posterior breadth across nasals, 0.5; diastema, 9; palatal length, 14; occipital depth, 7; frontopalatal depth (at middle of molar series), 7; mandible, 16; maxillary toothrow (alveoli), 6.4; mandibular toothrow (alveoli), 6.2.

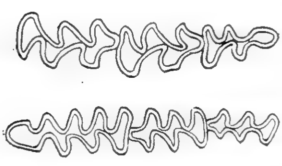

FIG. 3. Enamel pattern of *Microtus fertilis*. (× 6.)

*Measurements.*—For measurements, see table, p. 291.

**Microtus brachelix** sp. nov.

*Type* young adult ♀ (skin and skull), No. 63,445, United States National Museum, collected at Nagmarg, Kashmir (altitude, 9,000 feet), November 15, 1895, by Dr. W. L. Abbott.

*General characters.*—Precisely similar to *Microtus fertilis* (True), but with much smaller ears.

*Fur and color.*—In length and quality of fur as well as in color the types of *Microtus fertilis* and *M. brachelix* resemble each other so exactly that it would be difficult to find two skins more perfectly alike.

*Ears.*—The ears are small, much overtopped by the surrounding fur, while in *M. fertilis* they are about equal to the fur in length. The reduction in height is especially noticeable along the upper edge of the anterior border, which is reduced to the merest rim.

*Skull and teeth.*—In cranial and dental characters *Microtus brachelix* agrees perfectly with *M. fertilis.*

*Remarks.*—I should hesitate to separate *Microtus brachelix* from *M. fertilis* on the single character of the size of the ears, did not the five specimens of the latter show perfect uniformity among themselves. Even in a half-grown specimen of *M. fertilis* the ears are much larger than in the type of *M. brachelix.*

*Measurements.*—The measurements of the type of *Microtus brachelix* and of five specimens of *M. fertilis* are given in the following table:

*Measurements of Microtus fertilis and M. brachelix.*
(In millimetres.)

| NAME. | LOCALITY. | Number. | Sex. | Head and Body.[6] | Tail Vertebræ.[6] | Hind Foot (with claws). | Hind Foot (without claws). | Ear from Meatus. | Width of Ear. |
|---|---|---|---|---|---|---|---|---|---|
| *Microtus fertilis*........ | Pir Panjal mountains, Kashmir.......... | 20,148 | ♂ | 86 | 35 | 16 | 14 | 10 | 10 |
| *Microtus fertilis*........ | Krishnagunga valley, Kashmir.......... | 21,690 | ♂ | 105 | 25 | 17 | 15 | 9.8 | 9 |
| *Microtus fertilis*........ | Kaj Nag mountains, Kashmir.......... | 59,293 | ♂ | 108 | .. | 16.6 | 14.6 | 10 | 9.6 |
| *Microtus fertilis*........ | Central Kashmir.... | 20,146 | ♀ | 114 | 21 | 17 | 15 | 10 | 9 |
| *Microtus fertilis*........ | Pir Panjal mountains, Kashmir.......... | 20,147[7] | ♀ | 114 | 27 | 17 | 15.6 | 11 | 11 |
| *Microtus brachelix*...... | Nagmarg, Kashmir.............. | 63,445[7] | ♀ | 95 | 35 | 18 | 16 | 7.8 | 9. |

### Subgenus ALTICOLA Blanford.

1884. *Alticola* Blanford, Journ. Asiat. Soc. Bengal, l, pt. ii, p. 84. Type *Arvicola stoliczkanus* Blanford.

Seven species of the compact and well-defined subgenus *Alticola*

[6] Collector's measurement. [7] Type.

have thus far been described, two of them based on material obtained by Dr. Abbott during his first visit to Baltistan and Kashmir. While in Ladak during 1893 and 1897 Dr. Abbott secured two additional species, both of which appear to be undescribed. The species now known, with their type localities, are as follows:

1. MICROTUS ROYLEI (Gray). (Kashmir.)

1842. *Arvicola roylei* Gray, Ann. and Mag. Nat. Hist., x, p. 265. December, 1842.
1891. *Microtus roylei* Blanford, Fauna of British India, Mammalia, p. 430.

2. MICROTUS STOLICZKANUS Blanford. Ladak, near headwaters of the Yarkand river.

1875. *Arvicola stoliczkanus* Blanford, Journ. Asiat. Soc. Bengal, xliv, pt. ii, p. 107.
1891. *Microtus stoliczkanus* Blanford, Fauna of British India, Mammalia, p. 430.

3. MICROTUS STRACHEYI (Thomas). Kumaun.

1880. *Arvicola stracheyi* Thomas, Ann. and Mag. Nat. Hist., 5th ser. vi, p. 322. October, 1880.
1891. *Microtus stracheyi* Blanford, Fauna of British India, Mammalia, p. 431.

4. MICROTUS BLANFORDI (Scully). Gilgit.

1880. *Arvicola blanfordi* Scully, Ann. and Mag. Nat. Hist., 5th ser., vi, p. 399. November, 1880.
1891. *Microtus blanfordi* Blanford, Fauna of British India, Mammalia, p. 432.

5. MICROTUS WYNNEI Blanford. Murree.

1880. *Arvicola wynnei* Blanford, Journ. Asiat. Soc. Bengal, xlix, pt. ii, p. 244.
1891. *Microtus wynnei* Blanford, Fauna of British India, Mammalia, p. 431.

6. MICROTUS MONTOSUS (True). Central Kashmir.

1894. *Arvicola montosa* True, Proc. U. S. National Museum, xvii, p. 11. May 8, 1894.

7. MICROTUS ALBICAUDA (True). Braldu valley, Baltistan.

1894. *Arvicola albicauda* True, Proc. U. S. National Museum, xvii, p. 12. May 8, 1894.
1896. *Microtus albicauda* Miller, North American Fauna, No. 12, p. 54. July 23, 1896.

8. MICROTUS CRICETULUS sp. nov. Banks of the Tso Kyun, Ladak.

9. MICROTUS ACROPHILUS sp. nov. (Ladak side of Kara Korum Pass.)

These nine species may be distinguished by the following characters:

KEY TO SPECIES OF ALTICOLA.[8]

Under parts dark.
  m 3 with 4 salient angles. . . . . . . . . *Microtus wynnei.*
  m 3 with 6 salient angles.
    Hind foot, 22 mm. . . . . . . . . . . *Microtus roylei.*
    Hind foot, 20 mm. . . . . . . *Microtus montosa.*
Under parts whitish.
  Back bright ferruginous brown . . . *Microtus stoliczkanus.*
  Back gray or pale fawn.
    Tail vertebræ over 45 mm. . . . . . *Microtus blanfordi.*
    Tail vertebræ under 40 mm.
      m 3 with 6 salient angles.
        m 1 with 10 salient angles. . . . *Microtus stracheyi.*
        m 1 with 8 salient angles. . . . *Microtus albicauda.*
      m 3 with 5 salient angles.
        Teeth heavy; posterior loop of m 3 forming much less than half of crown. . . . . *Microtus acrophilus.*
        Teeth light; posterior loop of m 3 forming at least half of crown. . . . . . . . . *Microtus cricetulus.*

**Microtus montosus** (True).

1894. *Arvicola montosa* True, Proc. U. S. National Museum, xvii, p. 11. May 8, 1894.

*Type locality.*—Central Kashmir. Altitude, 11,000 feet.

*Specimens collected.*—Dr. Abbott obtained only one specimen of this species, the type, a half-grown male.

*Remarks.*—*Microtus montosus* is very doubtfully distinct from *M. roylei*, also from Kashmir. The type and only known specimen is young—scarcely more than half-grown—so that its true characters cannot be determined with certainty; but I am unable to see that it differs from *M. roylei*, as described by Blanford, in any way not to be accounted for by its immaturity.

[8] In part compiled from Blanford's papers on the group.

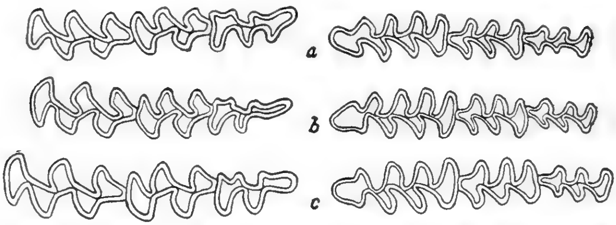

FIG. 4. Enamel pattern of *Microtus albicauda* (a), *M. cricetulus* (b), and *M. acrophilus* (c). (× 6.)

**Microtus albicauda** (True).

1894. *Arvicola albicauda* True, Proc. U. S. National Museum, xvii, p. 12. May 8, 1894.

1896. *Microtus albicauda* Miller, North American Fauna, No. 12, p. 54. July 23, 1896.

*Type locality.*—Braldu valley, Baltistan.

*Specimens collected.* — Dr. Abbott took only one specimen of *Microtus albicauda.*

*Skull.*—The skull of the type measures: greatest length, 26.4; basal length, 24.4; basilar length, 23; zygomatic breadth, 15; mastoid breadth, 13.4; interorbital constriction, 4.4; length of nasals, 7.8; anterior breadth across nasals, 3.8; posterior breadth across nasals, 1.8; diastema, 7.8; palatal length, 12.6; occipital depth, 7.6; fronto-palatal depth (at middle of molar series), 7; mandible, 16; maxillary tooth row (alveoli), 6.6; mandibular tooth row (alveoli), 6.4.

*Remarks.*—*Microtus albicauda* is apparently most closely related to *M. stracheyi* and *M. cricetulus.* With both of these it agrees in color and in general size. From the former it is separable by its simpler $\overline{\text{m 1}}$, from the latter by its more complex $\overline{\text{m 3}}$, longer tail and more lightly built skull. From *M. blanfordi* it is distinguishable at a glance by its shorter, more closely haired, entirely white tail.

*Measurements.*—For measurements of *Microtus albicauda* see table, p. 298.

**Microtus cricetulus** sp. nov.

*Type* adult ♂ (skin and skull), No. 84,043, United States National Museum, collected on the banks of the Tso Kyun, Ladak (altitude, 16,000 feet), August 11, 1897, by Dr. W. L Abbott.

*General characters.*—Similar to *Microtus albicauda* (True), but with more heavily built skull and much shorter tail.

*Fur and color.*—Fur full and soft, that on middle of back 10 mm. to 13 mm. in length.

Dorsal surface pale smokegray, strongly tinged with woodbrown and faintly darkened by a sprinkling of blackish hairs. Ventral surface of body and back of feet pure white, irregularly clouded by the plumbeous bases of the hairs. A narrow lateral line extending down hind legs to ankles, crossing buttocks, and including whole of tail, pale creambuff. Front legs white.

*Ears.*—The ears are well developed, slightly overtopping the fur. They show no peculiarities in form.

*Feet.*—Palms with five tubercles, soles with six; all well developed. Soles densely furred behind tubercles.

*Skull.*—The skull of *Microtus cricetulus* is in all respects that of a typical *Alticola.* The brain case is rounded in outline when viewed from above, the interorbital region is broad, with a distinct median furrow, and the nasals are very large. Postorbital processes small but distinct. Viewed from the side, the skull is strongly cuneate in outline, owing to the nearly flat dorsal profile, deep brain case, prominent audital bullæ, and slender rostrum. It differs from the skull of *M. albicauda,* its nearest ally, in slightly larger size, a little more highly arched brain case, and in the larger size and more anterior position of the rostral protuberances. The nasal branches of the premaxillaries are narrower than in *M. albicauda.* They terminate on a line with the posterior extremity of the nasals, while in *M. albicauda* they extend considerably behind the nasals.

Measurements of type skull: greatest length, 28; basal length, 26.6; basilar length, 25; zygomatic breadth, 16; mastoid breadth, 13.4; interorbital constriction, 4; length of nasals, 9; anterior breadth across nasals, 4; posterior breadth across nasals, 2; diastema, 9; palatal length, 13.4; occipital depth, 8; fronto-palatal depth (at middle of molar series), 7; mandible, 17; maxillary tooth row (alveoli), 6; mandibular tooth row (alveoli), 6.

*Teeth.*—Both upper and lower incisors are very pale yellow on their anterior faces, contrasting strongly with the deep orange incisors of *M. albicauda.* Molars noticeably heavier than in *M. albicauda,* but enamel pattern, with a single exception, exactly the same. In *M. albicauda* the inner base of the posterior loop of the back upper molar is produced into a conspicuous salient angle. In

*M. cricetulus* this angle is completely absent, no trace of it appearing in any of the four specimens. The character, however, may prove to be inconstant when large series of specimens are available for comparison.

*Specimens examined.*—Four, from the following localities in Ladak:

Banks of the Tso Kyun, Rupshu, 16,000 feet.

Above Kiangchu Maidar, Rupshu.

Rupshu, 16,000 feet.

*Measurements.*—For measurements of *Microtus cricetulus* see table, p. 298.

**Microtus acrophilus** sp. nov.

*Type* adult ♀ (skin and skull) No. 62,162, United States National Museum, collected on the Ladak side of the Kara Korum Pass (altitude 17,000 feet) July 25, 1893, by Dr. W. L. Abbott.

*General characters.*—Closely related to *Microtus stoliczkanus* Blanford, but with shorter tail and much paler color.

*Fur and color.*—Fur full and soft, about 15 mm. long on middle of back. Basal two-thirds of hairs slaty plumbeous, slightly paler than in *Microtus albicauda* and *M. cricetulus.* On the dorsal surface the plumbeous basal area is followed by a broad band of pinkish buff which gives the general tone to the pelage. Throughout the dorsal surface the fur is sprinkled with longer dark brown hairs, but these are nowhere conspicuous. The buff is brightest on the head and lumbar region, paler and grayer across shoulders, along sides and on rump. Belly snowy white, much clouded by the plumbeous under fur. Feet and tail dirty white.

*Ears.*—The ears are of about the same size as in *M. cricetulus,* but owing to the longer surrounding fur they appear much shorter and less conspicuous.

*Feet.*—Palms 5-tuberculate; soles 6-tuberculate. All tubercles very large. Soles densely hairy behind tubercles.

*Mammæ.*—Mammæ eight, four pectoral and four inguinal.

*Skull.*—The skull of *Microtus acrophilus* is similar in general form to that of *M. albicauda* and *M. cricetulus,* but is slightly larger than either, and much more massively built. Zygomatic arches shorter, and rostrum broader and deeper than in *M. albi-*

*cauda* or *M. cricetulus*. Nasal branches of premaxillaries narrow, scarcely reaching posterior edge of nasals. Mandible larger than in *M. cricetulus*, but with much more slender angular process.

Measurements of type skull: greatest length, 28; basal length, 27; basilar length, 25.4; zygomatic breadth, 16.4; mastoid breadth, 13; interorbital constriction, 5; length of nasals, 8.8; anterior breadth across nasals, 3.8; posterior breadth across nasals, 2; diastema, 8.8; palatal length, 14; occipital depth, 8.4; fronto-palatal depth (at middle of molar series), 7.4; mandible, 18; maxillary toothrow (alveoli), 7; mandibular toothrow (alveoli), 6.8.

*Teeth.*—Incisors pale yellow as in *M. cricetulus*. Molars much heavier than in *M. cricetulus*, but enamel pattern exactly similar.[9] The salient angles are, however, less acute, and the terminal loop of the posterior upper molar forms less than half of the length of the tooth crown instead of slightly more than half as in *M. albicauda* and *M. cricetulus*.

*Specimens examined.*—Dr. Abbott took only one specimen of *Microtus acrophilus*. On the label he writes: "Vast numbers inhabit the cliff of conglomerate at sides of the nullah, issuing forth at evening. Country absolutely destitute of vegetation."

*Remarks.*—This species is closely related to *Microtus stoliczkanus*, but is readily distinguishable by its short tail and very pallid color.

*Measurements.*—The measurements of the type of *Microtus acrophilus* are given in the accompanying table:

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[9] The front lower molar in each jaw is imperfect anteriorly.

*Table of Measurements of Specimens of Alticola.*

| NAME. | LOCALITY. | Number. | Sex. | Head and Body.[11] | Tail Vertebræ.[11] | Hind Foot (with claws). | Hind Foot (without claws). | Ear from Meatus. | Width of Ear. |
|---|---|---|---|---|---|---|---|---|---|
| *Microtus montosus*....... | Central Kashmir... | 20,145[10] | ♂ | 92 | 32 | 20 | 18 | 11 | 11.5 |
| *Microtus albicauda* ..... | Braldu valley, Baltistan........... | 20,393[10] | ♀ | 108 | 32[12] | 19.8 | 18 | 14 | 13 |
| *Microtus cricetulus*....... | Rupshu, Ladak.... | 84,038 | ♂ | 111 | 22 | 19 | 17.6 | 14.6 | 14 |
| *Microtus cricetulus*....... | Rupshu, Ladak.... | 84,039 | ♀ | 121 | 22 | 19.8 | 18 | 14 | 14 |
| *Microtus cricetulus*....... | Banks of Tso Kyun, Ladak .......... | 84,043[10] | ♂ | 127 | 22[13] | 20 | 18.6 | 14 | 14 |
| *Microtus cricetulus*....... | Above Kiangchu Maidar, Ladak .. | 84,050 | ♀ | 111 | 22 | 19.6 | 17.6 | 14.4 | 14 |
| *Microtus acrophilus*....... | Ladak side of Kara Korum pass ..... | 62,162[10] | ♀ | 121 | 18.6[14] | 20 | 19 | 14.6 | 14 |

## EXPLANATION OF PLATES XI AND XII.

(All figures × $1\frac{1}{2}$.)

Fig. 1. *Microtus* (*Phaiomys*) *blythi* Blanford.
(No. 84,036, U. S. National Museum.)

Fig. 2. *Microtus* (*Microtus*) *ravidulus* sp. nov.—Type.
(No. 62,159, U. S. National Museum.)

Fig. 3. *Microtus* (*Microtus*) *pamirensis* sp. nov.—Type.
(No. 62,161, U. S. National Museum.)

Fig. 4. *Microtus* (*Hyperacrius*) *fertilis* (True)—Type.
(No. 35,510, U. S. National Museum.)

Fig. 5. *Microtus* (*Alticola*) *albicauda* (True)—Type.
(No. 63,816, U. S. National Museum.)

Fig. 6. *Microtus* (*Alticola*) *cricetulus* sp. nov.—Type.
(No. 84,043, U. S. National Museum.)

Fig. 7. *Microtus* (*Alticola*) *acrophilus* sp. nov.—Type.
(No. 62,162, U. S. National Museum.)

[10] Type. [11] Collector's measurement. [12] Pencil 12. [13] Pencil 12. [14] Pencil 10.

JUNE 6.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Twenty-eight persons present.

The deaths of H. G. Griffith, M.D., and Frank Thomson, members, were announced.

Papers under the following titles were presented for publication:

"A New Species of Coccyzus from St. Andrews, with Remarks on the Birds of the Island," by Witmer Stone.

"A Collection of Birds from the Vicinity of Bogota, with a Review of the South American Species of Speotyto and Troglodytes," by Witmer Stone.

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JUNE 13.

The President, SAMUEL G. DIXON, M.D., in the Chair

Thirteen persons present.

Papers under the following titles were presented for publication:

"Notes on a Few Northwest American Land Snails," by Henry A. Pilsbry.

"Leurognathus marmorata, a New Genus and Species of Salamander of the Family Desmognathidæ," by J. Percy Moore.

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JUNE 20.

MR. CHARLES MORRIS in the Chair.

Eight persons present.

A paper entitled "The Marine Fishes of Peru," by James Francis Abbott, was presented for publication.

June 27.

Mr. Charles Morris in the Chair.

Eight persons present.

A paper entitled "Morphological and Systematic Notes on South American Achatinidæ," by Henry A. Pilsbry and Edward G. Vanatta, was presented for publication.

Mr. Isaac H. Clothier was elected a member.

The following were ordered to be printed:

## A NEW SPECIES OF COCCYZUS FROM ST. ANDREWS.

BY WITMER STONE.

The first collection of birds from the isolated island of St. Andrews in the Caribbean Sea seems to have been made in the winter of 1886–7, by Mr. Robert Henderson, who was collecting for Mr. Charles B. Cory.

Nineteen species were obtained, of which five were described as new by Mr. Cory.[1]

On May 1, 1887, Dr. William L. Abbott stopped at the island and collected a few specimens representing six species.

Two of these were not obtained by Mr. Henderson, namely, *Lampornis violicauda* and a *Coccyzus* allied to *C. minor*, but apparently distinct, for which I would propose the name *Coccyzus abbotti*.

This bird differs from *C. minor* especially in its much longer bill, and this character, curiously enough, is likewise conspicuous in *Mimus magnirostris* and *Icterus lawrencei*, two other peculiar species separated by Mr. Cory.

**Coccyzus abbotti** n. sp.

Type No. 25,177, Acad. Nat. Sci. Phila., St. Andrews, May 1, 1877, W. L. Abbott.

Similar to *C. minor*, but with much larger and longer bill, abdomen and flanks paler, sides of the neck less gray and more suffused with buff.

| | WING. | CULMEN. |
|---|---|---|
| *C. minor*, | 5.30 ins. | 1.08 ins. |
| *C. abbotti*, | 5.20 | 1.28 |

[1] Auk, 1887, p. 177.

## ON A COLLECTION OF BIRDS FROM THE VICINITY OF BOGOTA, WITH A REVIEW OF THE SOUTH AMERICAN SPECIES OF SPEOTYTO AND TROGLODYTES.

BY WITMER STONE.

Through the generosity of Dr. Samuel G. Dixon, President of the Academy, the institution has come into possession of a collection of birds made in 1888–89, by the late Dr. J. W. Detwiller in the vicinity of Bogota, Colombia. So many specimens have been obtained from this region that a list of the species adds but few to those already recorded in Bogota collections. The fact, however, that these specimens, with but few exceptions, are marked with definite localities renders them of greater importance as throwing some light upon the distribution of the species.

The principal points at which specimens were obtained are Honda, on the Magdalena river, seventy miles northwest of Bogota; Ambalema, farther up the Magdalena, about forty miles from Bogota; Ibague, ninety miles west, on the slopes of the central Cordilleras, and on the Nevada del Tolima, about twenty miles west of Ibague. A few were also collected at Villa Vicencia east of the eastern Cordilleras in the Territory of San Martin, sixty miles southeast of Bogota, and on the headwaters of the Meta, a branch of the Orinoco.

The list follows. Unless otherwise stated only one specimen was secured, and where no locality is mentioned the labels have been lost.

**Merganetta columbiana** (DeMurs).

No exact data.

**Belonopterus cayennensis** (Gmel.).

Plain of Tolima.

**Ortalis caracco** (Wagl.).

Magdalena river, February 5, 1888.

**Zenaida ruficauda** (Gray).

Plain of Tolima.

**Speotyto cunicularia tolimæ** sub. sp. nov.

Five specimens secured May 27, 1889, on the Plain of Tolima, where they were breeding and had eggs at this date.

Type No. 35,239, Coll. Acad. Nat. Sci. Phila., ♀. March 27, 1889.

Smaller and darker than any of the other forms of *Speotyto* with less white above, approaching nearest to *S. brachyptera* Richm., from Margarita Island, Venezuela. General ground color above dark Prout's brown to almost sepia, spots on margins of remiges mainly buff, on coverts and scapulars white. Forehead and throat pure white. Five narrow buff bands on the tail and narrow buff tips to the feathers. The bars on the abdomen are somewhat broken and irregular, and are dark brown edged narrowly with cinnamon. Length of wing, 6 ins.

There seem to be at least five races of Burrowing Owls in South America as follows:

1. **S. cunicularia** (Molina).

(Type locality, Chile).

Distributed over the southern part of the continent from Chile and Uruguay southward. It differs from all the more northern forms in its larger size, and in the large amount of white on the outer tail feathers. In these the ground color is white with rather narrow brown cross bars. *S. patagonica* Peale and *S. urucurea* Lesson, I take to be synonyms of this form.

All the more northern birds that I have seen are smaller and darker, with the ground color of the outer tail feathers brown, marked with white spots on the sides. These spots are sometimes nearly confluent into bands, but the white never surpasses the brown in extent as in *S. cunicularia*.

2. **S. c. grallaria** (Spix).

(Type loc., Para, Brazil).

Apparently agrees with the characters just given—thus differing from *cunicularia*. I have been unable to examine specimens of the Brazilian bird and am forced to rely upon descriptions, so that I am unable to show in what respects this differs from the following. From its geograpical range it is almost certainly distinct.

3. **S. c. nanodes** Berl. and Stolzm. P. Z. S., 1892, p. 388.

(Type loc., Lima, Peru.)

This is the bird identified by Peale and Cassin as *grallaria,* and they have been followed provisionally by Ridgway. On geographical grounds it is extremely doubtful that this is identical with the Brazilian form, and I think the authors have done well to separate it.

The U. S. Exploring Expedition specimens are much bleached, but otherwise agree with Berlepsch's description.

4. **S. c. tolimæ** Stone.

(Type loc., Tolima, Colombia.)

Smaller and darker than the last, as above described. In *nanodes* the white on the outer tail feathers generally extends across as distinct bands and the brown bands are of nearly uniform width throughout. In *tolimæ,* however, the brown bands are wider in the middle, and confluent along the shaft, separating the white into rounded spots.

On the middle tail feathers, the buff cross bands are extremely narrow in *tolimæ* (.10–.12 in.), and do not reach the outer margins of the feathers, while in *nanodes* they are broad (.20–.25 in.), and extend to the margin.

5. **S. brachyptera** Richm.

(Type loc., Margarita Isl., Venezuela.)

An island form allied to the last.

**Megascops brasilianus** (Gmel.).

Honda, March 27, 1889.

**Rupornis magnirostris** (Gmel.).

Honda and Ibague.

**Falco sparverius æquatorialis** Mearns.

Two specimens. Plains of Tolima.

**Brotogerys jugularis** (Müll.)

**Pionus menstruus** (L.).

Ambalema.

**Psittacula conspicillata** Lafr.

Villa Vicencia, Llanos San Martin, and Ambalema.

**Diplopterus nævius** (L.).

Ibague.

**Momotus æquatorialis** (Gould).

Ibague (Rio Combeima).

**Momotus subrufescens** Scl.

Ambalema and Honda.

**Urospatha martii** (Spix).

Honda, March 17, 1889.

**Aulacorhamphus castaneorhynchus** Gould.

Rio Combeima, above Ibague.

**Galbula ruficauda** Cuv.

Honda and Ambalema. Nine specimens.

**Chelidoptera tenebrosa** Vieill.

Villa Vicencia, Llanos San Martin.

This capture extends the westward range of this bird materially, and indicates how closely the Venezuelan fauna of the Orinoco valley approaches Bogota, which lies in the highlands just over the eastern Cordilleras.

**Bucco ruficollis** (Wagl.).

**Picumnis olivaceus** Lafr.

Ibague. Two specimens.

**Melanerpes cruentatus** (Bodd.)

Villa Vicencia, Llanos San Martin.

**Trogon collaris** Vieill.

Nevada del Tolima, Rio Cambeima. Two specimens.

**Pharomacharus pavoninus** (Spix).

Nevada del Tolima. Two specimens.

**Hemiprocne zonaris** (Shaw).

Island on Magdalena river, near Ambalema, April 12, 1889.

**Nyctidromus albicollis** (Gm.).

Honda, March 29, 1889.

**Rhamphomicron heteropogon** (Briss.).

**Eriocnemis smaragdinipectus** Gould.

**Cyanophaia goudoti** (Bourc.).

Ibague.

**Metallura tyrianthina** (Bodd.).

**Lesbia victoriæ** (Bourc. and Muls.).

**Petasphora iolata** Gould.

**Aglæactis cupreipennis** (Bourc. and Muls.).

**Thalurania columbica** (Bourc.).

Ibague.

**Damophila juliæ** (Bourc.).

Ibague.

**Rupicola peruviana** (Lath.).

Nevada del Tolima.

**Manacus manacus abditivus** Bangs.

Honda.

**Todirostrum cinereum** (L.).

**Ochthœca fumicolor** Scl.

**Leptopogon superciliaris** Cab.

**Milvulus tyrannus** (L.).

Honda, March 17, 1889.

**Legatus albicollis** (Vieill.).

Ambalema, April 6, 1889.

**Sayornis nigricans** (Swains.).

Ibague.

**Pyrocephalus rubineus** (Bodd.).

Ambalema. Six specimens. April 12–16, 1889.

**Thamnophilus multistriatus** (Lafr.).

A typical male specimen from Antioquia. Also a female without locality which resembles it exactly in size of bill and general proportions, but is uniform rufous above, lighter beneath, with a lighter collar on the hind neck, obscurely streaked with black; sides of face similarly streaked, throat whitish. It looks very much as if this was the female of this species, though it is said to be barred below in the British Museum Catalogue.

**Dendroplex picirostris** Lafr.

Ambalema, April 12, 1889.

**Synallaxis subpudica** Sclater.

Ambalema, April 12, 1889.

**Scytalophus griseicollis** (Lafr.).

**Icterus giraudi** Cass.

Ibague.

**Hypopyrrhus pyrohypogaster** De Tarr.

Nevada del Tolima. Two specimens.

**Ostinops salmonii** Scl.

Rio Combeima, Nevada del Tolima.

**Ostinops decumanus** (Pall.).

Honda (Rio Guali) and Rio Combeima, Nevada del Tolima.

**Embernagra conirostris.**

Ambalema, April 8, 1889.

**Phrygilus unicolor geospizopsis** (Bp.).

**Sporophila minuta** (L.).

Honda, March 29, 1889.

**Sycalis flaveola** (L.).

**Eutheia bicolor** (L.).

Ibague. Two specimens.

**Rhamphocelus icteronotus** Bp.

Ibague.

**Rhamphocelus jacapa** (L.).

Villa Vicencia, Llanos San Martin, April 9, 1888.

**Rhamphocelus dimidiatus** Lath.

Ambalema and Ibague, April 8–16, 1889.

**Calospiza cyaneicollis granadensis** Berl.

Ibague. Two specimens.

**Calospiza vitriolina** (Cab.).

Ibague.

**Calospiza labradorides** (Boiss.).

Ibague.

**Calospiza aurulenta** Lafr.

Ibague.

**Calospiza gyroloides** (Lafr.).

Ibague.

**Dubusia tæniata** (Boiss.).

**Buarremon pallidinucha** (Boiss.).

**Arremon spectabilis** Scl.

Honda, March 21, 1889.

**Piranga rubra** (L.).

Honda, March 21, 1889.

**Conirostrum rufum** Lafr.

**Heleodytes nuchalis** (Cab.).

Two specimens, without locality, have the sandy tint on the nape, and thus differ from *H. pardus* Scl., the Colombian form, indicating that the latter may be, as suggested (Brit. Mus. Cat., vi, p. 204) only an individual variation of *nuchalis*.[1]

**Troglodytes striatulus** Lafr.

Honda, two specimens.

**Troglodytes columbæ** sp. nov.

Type 35,354, Coll. Acad. Nat. Sci. Vicinity of Bogota.

It is with some hesitation that I add another to the long list of names proposed for South American Wrens, but this is so different from any described form that there seems no alternative.

This bird is nearest to *T. striatulus*, but is darker and more olive brown above, without a trace of the rufous tints so characteristic of South American species of *Troglodytes*. *T. striatulus* is practically without rufous tints, but the feathers of the rump or upper tail coverts as well as the tail are lighter and incline to rufous or yellowish brown. There is no trace of this, however, in *T. columbæ*, both rump and tail being dark olive brown. The black bands on the tail are rather more irregular than in *striatulus* and those on the back are a little more pronounced. The under surface is quite as different from *T. striatulus* as are the upper parts; it is uniform ochraceous or vinaceous from the chin to the vent without a trace of white, and no trace of fulvous on the flanks which are uniform in ground color with the rest of the lower surface. The sides and flanks are shaded with olive brown and obscurely banded. The under tail coverts are buffy, with a slight rufous tinge, and are strongly barred with black. The bars do not quite reach the edges of the feathers, and are connected down the shaft. The sides of the head are almost exactly like *T. striatulus*, but with the ground color darker. Length of wing, 2.15 ins.

This is the darkest *Troglodytes* that I have seen from South or

[1] It is possible this, as well as some others of the unlabelled specimens, came from Cartagena. See pp. 312–13.

Central America, and can be recognized at a glance from any of the other species.

Though its dark under surface makes it appear very different from the white-throated and white-bellied *T. striatulus*, it is evidently most closely allied to that species.

Unfortunately, the label has been lost from the specimen, so that the exact locality is unknown.

The identification of this bird involved a study of all the South and Central American species of *Troglodytes*, and an examination of the specimens in the collections of the Academy and the U. S. National Museum, the latter having been kindly loaned me for the purpose.

While the material is insufficient for a monograph, the results of the investigation may be of value to those engaged in studying this rather perplexing group.

The tropical American species of *Troglodytes* may at once be separated into two groups, those with distinct superciliaries, sharply defined against the color of the head, and those with superciliaries indistinct. The first are not difficult, and stand as given in the British Museum Catalogue, Vol. vi, p. 248. The other group is much more confusing.

From southern Mexico to Panama south of the range of *T. aedon* and its races, we have a Wren with rufous-tinted rump and tail, and vinaceous below, with under tail coverts strongly barred with black, white and vinaceous. This is *T. intermedius* Cab. in Nicaragua and northern Costa Rica (type loc., San José) and *T. inquietus* Baird, in Costa Rica and Panama (type loc., Panama), the more southern form differing in larger size.

The two are, however, so close that it seems undesirable to separate them.

In the vicinity of Bogota we find a totally different bird, *T. striatulus*, which compared with the preceding is olive brown instead of reddish brown above, and much lighter beneath, being pure white on the throat and middle of the abdomen. The under tail coverts are banded with black and white.

Next to this comes the very much darker *T. columbæ* Stone above described.

The rest of South America is inhabited by various races of one wide-ranging form, all of which are peculiar in their strongly rufous tail contrasting with the browner tint of the back and the strongly rufous under tail coverts and thighs, the former with the bars much reduced and sometimes nearly wanting.

Many names have been proposed for the birds of this group, of which the following seem to be recognizable.

1. **Troglodytes musculus** Naum. Vogel's Deutschland, 1823.

*T. furvus Wiedii* Berl.
*T. platensis* Wied.

Distribution.—Brazil, Argentine and Uruguay (type loc., Bahia, Brazil).

This is the darkest form, with obscure bars of blackish on the back always present. Under surface vinaceous, darker and inclining to rufous on the flanks and under tail coverts, but not nearly so tawny as in the west-coast races. Under tail coverts barred or distinctly spotted with black, in direct contrast to the nearly uniform rufous-coverts of the western races.

This bird has been frequently called *T. furvus* Gm., but I agree with Sharpe and Allen in the impossibility of satisfactorily identifying the "Brown Warbler" of Brown's *Illustrations of Zoölogy*, upon which Gmelin based his name. Berlepsch seems to have regarded the Guiana bird (*rufulus*) as true "*furvus*," and renamed this form *T. f. Wiedii*, claiming that although Wied's description of *T. platensis* is unquestionably this form, it is not *Sylvia platensis* Lath., which he quotes. *T. musculus* Naum antedates Berlepsch's name, and must of course be adopted.

2. **Troglodytes musculus rufulus** Cab. Schomb., Reis. Guian., iii, p. 672 (1848).

*T. tobagensis* Lawr.

Distribution.—Guiana, Venezuela and N. E. Colombia (type loc., Roraima, Guiana).

This is a light-colored race banded on the back as in *T. musculus*, but much paler and sometimes quite white below.

3. **Troglodytes musculus rex** (Berl. and Leverk).

Distribution.—Eastern Bolivia (type loc., Samarpata).

A pale form of *musculus*.

4. **Troglodytes musculus hornensis** (Less.).

*T. rosaceus* Less.
*T. pallida* Lafr. and d'Orb.
*T. magellanicus* Gould.

Distribution.—Chile and Patagonia.

The Wrens of the Pacific coast of South America are paler than true *musculus*, and are generally without bars on the back, and with the under tail coverts nearly or quite uniform tawny, the flanks and rump are also much more conspicuously tawny and the whole plumage paler. The specimens I have examined from Patagonia and Chile are darker than those from Callao, Peru, which seem to be *T. m. audax*. If this determination is correct, then *T. m. audax* is the lightest colored, most rufous of the genus, and *T. hornensis* is intermediate between that and *T. musculus*. If *hornensis* and *audax* are both based on pale-colored birds, then they may have to be regarded as synonyms, and *T. magellanicus* revived for the darker more southern birds.

*T. hornensis* is usually described as very pale and rufous, in which case I cannot separate it from *T. audax* of Callao. Sharpe (*Cat. Bds.*, vi, p. 207) seems to regard *T. audax* as not determinable; if this view is followed then probably *hornensis* and *magellanicus* should be adopted as above.

The darker Chilean birds which I here regard as *T. hornensis* are lighter than *musculus* with more tawny tail, under tail coverts with but few spots and back without bars.

5. **Troglodytes musculus audax** (Tschudi).

Distribution.—Coast of Peru (type loc., Peru).

Palest of the group; rump, flank and tail very bright tawny, and dark bars on the tail indistinct and suffused with the prevailing tawny tint. No bars on the back.

6. **Troglodytes musculus tecellatus** (Lafr. and d'Orb.).

(?) *T. murinus* Less.

Distribution.—Peru (type loc., Tacna).

This is a darker bird with distinct cross bars on the back differing in this respect from all the other trans-Andean forms. From *musculus* it differs in being much more rufous both above and below. The tail is very distinctly barred with black, presenting a very different appearance from that of *T. audax*. Mr. Ridgway states that the specimens in the Lafresnay collection labelled as the types of this species are in reality *T. brunneicollis* of Mexico. The labels must have been confused, however, as the description is certainly not from that bird.

7. **Troglodytes musculus puna** (Berl. and Stolz.).

Distribution.—Highlands of Peru (type loc., Queta).

Larger than *T. musculus* and color below not at all rufescent. Under tail coverts with very few spots.

8. **Troglodytes musculus albicans** (Berl. and Tacz.).

Distribution.—Ecuador (type loc., Guaquil).

Throat and middle of abdomen pure white, paler and grayer above than *musculus* and sides more rufescent.

The last two and *T. m. rex* I have not seen, and am therefore in much doubt as to the forms from Peru, Ecuador and Bolivia. If *tecellata*, *puna* and *audax* all occur in Peru, and are perfectly separable, they must occupy very different geographic areas.

The confusion of the tropical American Wrens in the published works is very perplexing. The *Biologia Centrali Americana* recognizes but two forms of the group here treated, *i. e.*, *T. intermedius* of Central America and *T. furvus* of South America! The British Museum Catalogue is much better, but it is difficult to imagine how Dr. Sharpe can unite the Wrens of Panama and Bogota under *T. striatulus* and separate *T. intermedius.* The Panama birds which I have seen are scarcely distinguishable from *T. intermedius,* while the true *striatulus* from Bogota is very different.

**Cinclus leuconotus** Lafr.

Bogota, January 5, 1889.

**Mimus gilvus** Vieill.

Plain of Tolima.

**Merula ignobilis** Sclater.

Rio Totare, Plain of Tolima and Ibague.

**Merula gigas** (Frazer).

Bogota, March 28, 1888.

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A few specimens were obtained by Dr. Detwiller on the north coast of Colombia near Cartagena. These are as follows:

**Chrysolampis moschatus** (L.).

Four specimens.

**Cyanophaia goudoti** (Bourc.).

Three specimens doubtfully referred to this species. They are a little smaller than the specimen from Ibague mentioned above, which is evidently an adult male; and also differ in having the lower part of the abdomen and flanks grayish white, and the back more bronze tinted, one specimen especially showing brilliant coppery reflections. The under tail coverts are greener than in the Ibague specimen, which is exactly the reverse of the supposed females described in the British Museum Catalogue, xvi, p. 235.

While these may be females or young of *C. goudoti*, it seems quite likely that they represent a northern race of this bird.

**Synallaxis candæi** Lafr. and d'Orb.

Base of La Popa, Cartagena, January 23, 1888.

**Arremon schlegeli** Bp.

Two-thirds up La Popa, 600 feet elevation, Cartagena, January 23, 1888.

**Cœreba luteola** (Cab.).

Base of La Popa, Cartagena, January 23, 1888.

## NOTES ON A FEW NORTHWEST AMERICAN LAND SNAILS.

BY HENRY A. PILSBRY.

Through the kindness of the Rev. George W. Taylor, I have recently been able to examine some of the smaller land snails of Alberta and British Columbia, and to compare them with types or typical specimens of species originally described from the United States. In most cases the northwestward extension of these forms has already been recorded by Mr. Taylor, in several valuable lists published by him in Canada. A few have not hitherto been noticed in print.


1 2 3

**Vitrea binneyana** Morse.

The specimen from Nanaimo, Vancouver Island, agrees exactly with those from Maine, but the shell reported from Nanaimo as *Patula* (*Planogyra*) *asteriscus* is not that very distinct Maine shell, but *Punctum clappi* Pilsbry. This extends its northward range a considerable distance. Mr. Taylor believes that he collected the typical *asteriscus* at Comox, B. C., twelve years ago. I have not seen these specimens.

**Vertigo gouldii lagganensis** n. v. Fig. 1.

Resembles *V. gouldii* in size and general characters, but the form is more slender; palatal teeth subequal, the lower one more immersed; upper segment or "auricle" of the outer lip much more pronounced. Alt. 2.1, diam. of last whorl above aperture 1.17 mm.

Laggan, Alberta, collected by the Rev. George W. Taylor.

*V. ventricosa*, to which this form was formerly referred by Mr. Taylor, is a very much more ventricose, shorter species, with shorter palatal folds.

*Pupa decora* Gld. also occurs at Laggan, the specimens having formerly been recorded thence as *P. hoppii*. It is evidently a wide spread species in British America and Canada, as specimens in the collection of the Academy from Labrador, Alberta and Alaska attest.

Among other interesting shells received from Mr. F. H. Andrus, were examples of an apparently new *Vertigo*, a description of which follows:

**Vertigo andrusiana** n. sp. Fig. 3.

Shell cylindrical ovate, but slightly tapering above, obtuse; glossy, of a dark chestnut color, becoming lighter and somewhat gray on the upper whorls. Whorls $5\frac{1}{2}$, moderately convex, the last with a moderate crest or ridge, and then a rather wide constriction behind the slightly expanded lip, a slight furrow crossing the constriction and terminating in a slight entering angle on the outer lip. Aperture rounded and truncate, obstructed by five white teeth; the parietal rather high, short, the columellar situated rather high, a small denticle close to the base of the columella, and two subequal palatal laminæ (their positions indicated by slight indentations outside), the lower one more deeply situated. Alt. 2.46, diam. of last whorl above aperture 1.33 mm.

Douglas county, southwestern Oregon, collected by Mr. F. H. Andrus.

Compared with *V. binneyana* Sterki, this species differs in being much larger, with the outer lip scarcely incurved to define an upper arc of the peristome, and with the palatal folds subequal, the lower one not conspicuously longer. It resembles *Pupa decora* Gld. somewhat in size and color, but is readily separated by the different dentition of the aperture and the transverse groove behind the lip characteristic of *Vertigo*.

For comparison I figure a specimen of *V. binneyana* (fig. 2) from Winnipeg, Manitoba, No. 60,465, Coll. Acad. Nat. Sci. Phila. Shells from Helena, Mont., and Seattle, Wash., are perceptibly more cylindrical than that figured.

# LEUROGNATHUS MARMORATA, A NEW GENUS AND SPECIES OF SALAMANDER OF THE FAMILY DESMOGNATHIDÆ.

BY J. PERCY MOORE.

The family Desmognathidæ was established by Prof. Cope for the American genus *Desmognathus*, of which four species are now known. Boulenger associated with *Desmognathus* the Mexican genus *Thorius* (which Cope had regarded as constituting a distinct family), a view which was later accepted by Cope. Stejneger has added a third genus, *Typhlotriton*, an interesting blind salamander which occurs in the caves of Missouri.

Among some salamanders collected by me in the mountains of North Carolina are three specimens of a fourth genus which is now described.

## LEUROGNATHUS gen. nov.

With the osteological characters of the Desmognathidæ; vertebræ opisthocœlous; carpus and tarsus cartilaginous; snout very flat, broad and depressed; palate not at all vaulted, but very flat and smooth; premaxillary bones completely coössified, not perforated by a fenestra; internal nares widely separated, much further apart than external nostrils; lungless. These characters are exhibited in the figures of the skull, Plate XIV, figs. 4, 5, 6 and 10.

**Leurognathus marmorata** sp. nov.

Diagnosis.—Palatine teeth entirely wanting; thirteen costal grooves between the axilla and the groin; appressed limbs fail to meet by the width of about two costal interspaces; body stout, depressed; tail finned, its length about five-elevenths of entire length; digits well developed; color buff or ashy, marbled with black.

Description of male type.—Form rather robust, body depressed, widest in middle, but becoming nearly quadrate at the insertion of the hind legs, where the width becomes considerably reduced ventrally, while a thick welt overhangs the bases of the thighs dorsally. A distinct median dorsal groove extends from the occiput to the base of the tail, meeting the successive pairs of costal grooves, which are conspicuously developed and extend without break from median ventral to median dorsal lines. Between the origin of the fore and hind limbs there are thirteen pairs of these, the first being directly over the axilla, the thirteenth inguinal. A fourteenth lies directly over the axis of the femur when the leg is extended at right angles to the body. Anterior to the axilla are two more incomplete grooves close together. Somewhat irregularly developed and ill-defined intermuscular grooves are continued for the greater part of the length of the tail.

The tail is five-elevenths of the entire length, quadrate at the base, where it is broader dorsally than ventrally. While the height remains nearly constant till near the end, the thickness decreases rapidly, so that the posterior two-thirds are decidedly compressed. The extreme end of the tail is slightly bent up and terminates in a little compressed tubercle. A prominent dorsal fin-fold occupies rather more than its posterior half, reaching its greatest height sixteen millimeters from the tip. Its free margin is irregular and ragged, the result apparently of wear. A low dorsal fold continues the fin-fold forward on to the base of the tail. A much narrower ventral fold, which is highest posteriorly, extends almost half the length of the tail.

The limbs, especially the hind pair, are well developed. When appressed to the sides of the body the fore limbs reach to a point about half-way between the fifth and sixth costal grooves (counting from the axillary), and the hind limbs similarly appressed reach cephalad of the eighth costal groove, so that the extremities of the two limbs are separated by two costal spaces. The fore limbs are slightly depressed, the digits are long, slender and entirely free; they increase in length in the following order: i, iv, ii and iii, the number of phalanges being respectively 1, 2, 2 and 3. Each digit is terminated by a slightly enlarged dark-brown horny nail which is particularly conspicuous on digit i. No distinct palmar tubercles are developed, but there is a deep groove extending from between the second and third fingers, meeting a curved depressed line which crosses the palm.

The pes is large, broad and flat, with a small first digit and the others long, slender, free and somewhat flattened. Digit i is less than one-half the length of v, then ii, iv and iii become successively longer, but iii and iv are nearly equal. The number of phalanges composing the digits from i to v is respectively 1, 2, 3, 3 and 2. Like those of the hand, the pedal digits bear dark-colored horny tips. Distinct tubercles are absent, but grooves corresponding to those of the manus are present.

The form of the head is very characteristic, the snout being more flattened than in any of our smaller salamanders; its middle part has no evident curvature whatever. Outside of a line joining the anterior angle of the eye to the corresponding nostril it slopes gently downward, causing a faintly marked canthus rostralis, but the profile continues straight to a point between the nostrils, anterior to which it bends sharply downward into the alveolar margin of the jaw. The outline of the snout is a smooth regular curve with a just suggested angle below the nostrils; anteriorly it projects slightly beyond the lower jaw. The nostrils are small but, being surrounded by a raised fold and connected with the margin of the jaw by a groove, are conspicuous. They are separated by a distance about equal to the cleft of the eye.

The cleft of the mouth is slightly sinuous, and above its angle is a rounded elevation bounded behind by a well-marked vertical groove and above by a branch of this groove which is directed toward the eye. There is no conspicuously swollen parotid region and the posterior part of the head is smoothly rounded. The low but well-marked gular fold is, in this example, perfectly straight and is almost continuous on the sides of the neck with a faint dorsal groove.

One of the most striking features of the species, though not diagnostic among its allies, is the prominence of the rather large eyes, which in the living animal are very conspicuous. This results not so much from their size as from the flatness of the snout which forces them to stand out above its surface. Both the anterior and posterior angles present small tubercles, while behind the posterior is a distinct vertical curved fold—a spur from the lower eyelid, which is much broader behind. The upper eyelid about equals the interorbital space in width.

The vent is a narrow longitudinal slit about as long as the diameter of the thigh and situated in the base of the tail. Its margins are smooth and unmodified. The surface of the skin is generally smooth, but on the snout is slightly pitted and papillate.

Three series of dermal sense organs are present on the trunk, the middle one being best developed and most complete. It begins above the axilla, and may be traced about half-way along the tail. The segmental organs are generally one near the anterior border of each costal fold, though some of the anterior somites present two. The dorsal series is very incomplete and disappears on the tail and middle trunk region. The ventral series of sense organs is complete on the trunk somites, several of the anterior and posterior of which are provided with two organs each. On the sides of the head a number of pores are aggregated in a rather large patch behind and below the angle of the mouth. They are arranged more or less into rows and are connected by a transverse line across the occipital region. A line of pores extends forward along the lower jaw and a shorter one on the upper jaw.

The color pattern is rather characteristic. The ground color is a decidedly yellowish buff, everywhere more or less thickly marked, except on the ventral surface, with irregular confluent blotches of black, sometimes distinct, sometimes obscure. On the parietal, frontal and rostral regions the ground color strongly predominates, while the whole occipital and nuchal regions are heavily blotched. On the base of the dorsum of the tail the color pattern takes the form of large blotches of the ground color in a network of black. Extending on to the sides of the body and tail the two colors become interdiffused, producing a gray color with small light yellow specks. The ventral surface is pale yellow, largely pure, but becoming clouded on the tail, pelvic region and throat. The dorsal and ventral surfaces of the limbs are colored respectively like the corresponding surfaces of the body. The toes are tipped with brown.

Of all regions the palate has the most characteristic appearance. Inside of the narrow vertical alveolar margins of the jaw which bound it, it presents a broad, perfectly smooth, unbroken and almost flat surface—a low unarched roof to the mouth. There is no shelf or fold of the integument within and parallel to the alveolar margin, no median pit and no trace of palatine teeth, the region usually occupied by the latter being perfectly smooth and flat. More remarkable still are the choanæ. These are minute slits lying between the anterior outer margins of the orbits and the maxillary tooth line, and consequently diverging posteriorly, where they are separated by a distance twice that between the external nares.

The tongue is broadly reniform, presenting a median longitudinal depression and some irregular wrinkles. Its margin is smooth, but the greater part of the upper surface is thickly covered with slender papillæ, forming a plush-like surface. The lateral and posterior margins are free, the anterior attached in the middle. The pedicle of attachment is triangular in section, its broad part corresponding with the anterior margin, and its apex with the posterior emargination.

The female type specimen is larger and more robust, with a shorter tail and broader, more flattened head. The snout is especially broad and flat, its width on a line with the anterior angles of the eyes being twice its length anterior to that line. The canthal tubercle is almost obsolete. The gular fold is distinctly curved forward. The appressed limbs are separated by slightly more than two costal interspaces. There is but one groove anterior to the axillary. The dorsal series of sense pores is better developed than in the male. The colors are duller and less pure in this example. The ground color above is buff, large blotches of which alternate with still larger blotches of a purplish black on the dorsal surface. These blotches are largest at the base of the tail and pelvic region, but on the head break up and become intermixed. Below, the color is very generally a dull yellowish ash.

A second female example, used for dissection and for the preparation of a skeleton, was similar to the last, but had two preaxillary grooves, as in the male specimen first described. This species exhibits in its skull many peculiarities which readily distinguish it from any of the described species of *Desmognathus*, in which the cranial characters are remarkably uniform. *Thorius* is clearly separated by the very large size of the nostrils which encroach largely upon the consequently very narrow premaxillary, by the high, narrow and strongly convex snout and by the ossified carpus and tarsus. The skeleton of *Typhlotriton* has not been described, but in the arched palate and position of the choanæ, etc., this genus approaches *Desmognathus*, from which it is chiefly distinguished by the strongly developed curved series of palatine teeth and the deep-sunken functionless eyes.

In *L. marmorata* the orbits are large and cause much of the great relative width of the skull, while the interorbital portion of the brain case is comparatively narrow. At their widest part the frontal bones are less than the transverse diameter of the orbit, while in *Desmognathus* they equal or exceed this measurement. On the other hand, the parasphenoid width is greater in the present species, its interorbital portion being distinctly flattened instead of strongly rounded or even ridged as in *Desmognathus*. Consequently a section of this region is quadrate in *Leurognathus* and nearly triangular in *Desmognathus*. A strongly marked raised line crosses the parasphenoid at the posterior margin of the dentigerous plates and joins the periotic process on each side; this is wanting or inconspicuous in *Desmognathus* and in any case does not reach the periotic process.

The snout is perfectly flat between the just evident canthi rostrales, and the profile is straight from the posterior margin of the orbits to the sharply decurved alveolar margin of the jaw, giving this salamander a physiognomy very different from that of the species of *Desmognathus*, in which there is a strong longitudinal as well as a transverse curvature to this region. The entire roof and floor of the nasal chamber are closely approximated, resulting in a remarkable shallowness of the passages and a similarity in the form of the palate and snout. The completely coalesced premaxillaries are broad throughout, being nowhere less than one and one-half times the diameter of the nares, while the breadth between the latter is more than twice their diameter. At the frontal suture the premaxillary is truncated and overlaps the frontal, not bifurcated to embrace the mesial process of the latter as in *Desmognathus*. The premaxillary fontanelle, so conspicuous in *Desmognathus* and other genera of salamanders, is entirely closed, its position being indicated only by a slight depression. The external nares are small and separated by a distance of at least twice their diameter.

Extensively developed vomero-palatine bones constitute most of the roof of the mouth, and as they join the premaxillary and maxillaries with perfectly flush joints, the palate is given that strikingly smooth, flat and unbroken appearance which suggested the generic name. There is no trace of the deep median groove which separates the two halves of this bone anteriorly in *Desmognathus* and communicates (usually above a narrow bridge of bone) with the premaxillary fontanelle. These bones are united with the premaxillary for the whole width of its palatal surface. The internal nares are inconspicuous narrow slits situated close to the anterior margins of the orbits at the extreme posterior outer angle of the vomero-palatines and extending into the palatal plates of the maxillaries. The actual choanæ correspond to the outer ends of these clefts and are consequently very widely separated, a condition very different from that found in *Desmognathus*, in which the clefts cut deep into the vomero-palatines and expand at their inner ends into conspicuous openings, which are the choanæ.

The parasphenoid teeth are borne on a pair of long, slender and pointed dentigerous plates, which are placed together as a sagittate area, posterior to the middle of the orbit. Each plate bears about eighteen or twenty oblique rows of minute teeth, each row containing from five to twelve teeth. There are about one hundred and twenty jaw teeth above and an equal number below, about fifteen being borne by the premaxillary. All of these teeth are set on the inner face of the alveolar flange and have simple, blunt, slightly compressed and undivided crowns. In the posterior part of both jaws they become smaller and more crowded. In the specimen dissected the posterior cranial region, the pterygoids and the branchio-hyal apparatus are essentially as in *Desmognathus*. There are sixteen presacral, one sacral and twenty-four postsacral vertebræ.

The visceral anatomy resembles in its general features the three species of *Desmognathus* which I have studied. There is no trace of lungs, and it may be added that lungs are entirely absent in *Desmognathus nigra* and *D. orchrophæa,*[1] in which this deficiency has not previously been noted.

The three examples of this species above described, being all that have been taken, were found in a large clear rocky pool beneath a waterfall of a stream on the south flank of Grandfather Mt., N. C., and at an elevation of about 3,500 feet. From what observations were made they seem to be essentially aquatic, remaining in the deeper parts of the pool and not burrowing beneath stones in places merely wet, as does the *D. nigra*, which occurs in great numbers in the same region. *L. marmorata* is much less

[1] The examples of this species which Wilder originally described as lungless have more recently been identified as belonging to the species *Spelerpes bilineatus*.

active than the latter species and swims rather sluggishly, but with an easy gliding motion. The individuals seen seemed rather shy, and when alarmed quickly took refuge under the large rocks scattered through the pool, from beneath which, however, they were easily induced to emerge by the attraction of pieces of meat or worms thrown into the water.

*Measurements in Millimeters.*

| | Type ♂. | Type ♀. | ♀ |
|---|---|---|---|
| Total length | 98. | 108. | 117. |
| Tail, from posterior margin of thighs | 45. | 47.5 | 51. |
| Head, from gular fold to end of muzzle | 13.5 | 14. | 15. |
| Snout, from anterior angle of eyes | 4.2 | 4.4 | 4.5 |
| Width at anterior angle of eyes | 7.6 | 8.5 | 9.5 |
| Width at posterior angle of jaws | 9.5 | 11. | 11. |
| Width at gular fold | 9.5 | 10.5 | 10.5 |
| Depth at tip of snout, approximately | 1.8 | 2.3 | 2. |
| Depth midway between eyes | 3.1 | 3.4 | 3.5 |
| Depth midway between angle of jaws | 4.7 | 5. | 5. |
| Depth at gular fold | 6. | 7. | 7. |
| Entire length of arm and hand | 12. | 13. | 14. |
| Entire length of leg and foot | 16.6 | 17. | 18. |

## EXPLANATION OF PLATE XIV.

Figures 1 to 10, *Leurognathus marmorata.*

Fig. 1. The male type, showing the external features from the side. The position of the lateral line sensory pores is indicated by small circles. Natural size.

Figs. 2 and 3. Lateral and ventral views of the head of the same specimen. × 3.2. In fig. 3 the nostrils are slightly too close together.

Figs. 4, 5 and 6. Lateral, ventral and dorsal views of the skull of a slightly larger female specimen. × 3.2. The internal and external nares are blackened and the position of the actual choanæ in the entire head is indicated by a ring of dots in fig. 5.

Fig. 7. Dorsal aspect of the tongue disk of the same female, showing a small area of the closely set papillæ. × 3.2.

Figs. 8 and 9. Palmar aspect of the fore and hind feet of the example represented in fig. 1. × 3.2.

Fig. 10. Section of the skull of the female represented in figs. 4–6, taken just anterior to the internal nares. × 3.5. p, premaxillary; f, frontal; m, maxillary; v, vomero-palatine; na, nasal passage, which is represented by shading.

Fig. 11. A similar section of *Desmognathus nigra.* × 3.5. n, nasal bone; the remaining lettering as in fig. 10.

## THE MARINE FISHES OF PERU.

BY JAMES FRANCIS ABBOTT.

The study of the ichthyology of the west coast of South America, which was begun by Valenciennes in the early volumes of the *Histoire Naturelle*, has been carried on since in a very desultory way. The only general works that have appeared have been the fairly extensive *Fauna Chilena* of Claude Gay, published in 1848, and the, ichthyologically, very incomplete *Fauna Peruana* of Tschudi, published in 1845. The former contains descriptions of 108 species of fishes, the latter of but nineteen. Whatever work has been done since has consisted merely of isolated descriptions of single species or of small collections that have occasionally fallen into investigators' hands. Tschudi himself made extensive collections in Peru, but through a series of misfortunes they were nearly all lost. A few years before, the results of the voyage of "The Beagle" had been published, and the fishes collected by Darwin, quite a number of which had been taken from the west coast of South America, were described by Dr. Leonard Jenyns.

But by far the greater number of the species known from this region have been described by Kner and by Steindachner. The *Ichthyologische Notizen*, which were published by the latter at intervals from 1864 to 1870, and the *Ichthyologische Beiträge*, which followed from 1874 to 1882, contain numerous descriptions of species from Peru and Chile. In 1867–68 Kner published the results of his work upon the fishes in the Godeffroy Museum at Hamburg, which contained many South American examples collected by the captains of Hamburg merchant vessels. More recently Steindachner has described the collection of fishes obtained by Dr. L. Plate in his extensive exploration of Chile.[1] Many of these are from Iquique, and are here included, while others heretofore known only from Peru or northward are recorded from Chilean waters for the first time.

[1] Fauna Chilensis, ii, Supplement to *Zoologische Jahrbücher*, July, 1898.

And yet it is fair to state that the total number of valid species known to-day from Cape Horn to the equator does not exceed 300, and of these only 100, more or less, are found between the equator and the Tropic of Capricorn. In contrast to this we recognize over 300 species along the west coast of Mexico and Central America alone, from Panama to the Tropic of Cancer.

It is certain that the southern region is fully as rich as the northern, and the field—at least of Peru—remains practically unexplored. Very nearly all the material that has been collected has been obtained from one source—the fish-markets. The tide-pools are untouched, the deep-sea fishes almost unknown, and a multitude of forms, of little importance economically but of great interest scientifically, await the word of the investigator to introduce them to the world.

The basis of the present paper has been a collection of marine fishes made in Callao by Rear-Admiral L. A. Beardslee, U. S. N., retired, on a cruise of U. S. S. "Philadelphia," during the month of January, 1896. Though rather small, the collection contains a great deal of interesting material.

The scattered condition of the literature has hindered a study of the subject, and one of the principal purposes of the present brief paper has been to collect and modernize the synonymy of the species inhabiting this region.

We have included all the marine species known to us, inhabiting a range from Pecasmayu bay on the north to Iquique on the south, and limited in a general way by the political boundaries of Peru. The detailed synonymy has been given for all references to the west coast of South America, and the author responsible for the present generic and specific name of each form has been cited, but otherwise only enough synonymy has been included to guide the reader to other sources. The page references to Cope and Steindachner are those of the reprints containing their descriptions.

The habitats given to many species by early workers were very general, and many ranges that we have copied from their descriptions will doubtless have to be restricted. A few species have been described from "the west coast of South America," and have been admitted provisionally into the present list until future investigation shall have established their true position.

One hundred and two species, belonging to forty-two families, are here recognized as valid. Of these, fifty are confined to the Peruvian region, twenty-seven are common to both Peru and Chile, and thirteen are recorded north of the equator.

The following are here described as new:

*Basilichthys octavius.*

*Basilichthys regillus.*

*Basilichthys jordani.*

*Pisciregia beardsleei*, new gen. and sp.

*Sciaena gilberti.*

The writer wishes to express his indebtedness to Admiral Beardslee, through whose efforts the Callao collection was made, and the present paper made possible. He is also indebted to Mr. James Douglas Ogilby, of Sydney, N. S. W., who has contributed important information and suggestions, as well as to Dr. G. A. Boulenger, of the British Museum, who has very kindly examined types and in other ways rendered valuable assistance. Especially must he express his obligations to Dr. Charles H. Gilbert, of Leland Stanford, Jr. University, in whose laboratory the work was carried on, and to President David Starr Jordan, who has taken a personal interest in the work and who personally supervised it.

## BRANCHIOSTOMIDÆ.

1. **Branchiostoma elongatum** Sundevall.

*B. elongatum* Sundevall, Œfvers. Vet. Akad. Förhandl., 1852, 147; Steindachner, Fauna Chilensis, 334, 1898.

Steindachner records this species from Cavancha bay, Iquique.

## GALEIDÆ.

2. **Galeus mento** (Cope).

*Mustelus mento* Cope, Proc. Amer. Phil. Soc., May 4, 1877, 31 [Pecasmayu Bay, Peru].

*Mustelus edulis* Perez Canto, Estudias sobre algunos Escualos de Chile, 4, 1886; R. A. Philippi, Ann. del Universidad de Chile, lxxi, 1887, 15.

Local name, *Tollo.*

This species, which is not represented in the present collection, is very close to *G. dorsalis*, from which it differs especially in the more anterior position of the first dorsal, the distance between the origin of that fin and the tip of the snout being about six and two-thirds times in the total length (Philippi). The flesh is much esteemed as food by the Chilean people.

*Range.*—Pecasmayu bay to Juan Fernandez.

**3. Galeus dorsalis** (Gill).

*Mustelus dorsalis* Gill, Proc. Acad. Phila., 1864, 149 [Panama].
*Galeus dorsalis* Jordan and Evermann, Fishes of North and Middle America, i, 30, 1896.

Local name, *Cazon.*

The five specimens in the collection show a most remarkable color variation. Two of them have the typical silvery plumbeous ground color, paler ventrally and slightly flecked with light spots along the sides. The other three are transversely barred with about sixteen rather broad black bands, extending across the back half-way down on each side. There are five or six in front of the first dorsal, the two anterior ones bounding the interorbital space. These are not sex markings, as both sexes occur in each variety. The most careful comparison and elaborate and accurate measurements fail to reveal any other difference. The anal arises under the posterior third of the dorsal, barely extending beyond that fin.

The following measurements are in hundredths of the total length and have been computed on the U. S. Fish Commission's proportional scale:

| | |
|---|---|
| Snout to origin of first dorsal | .29–.31 |
| Base of first dorsal | .11–.12 |
| Anterior margin of first dorsal. | .12 |
| Distance between two dorsals | .20–.22 |
| Base of second dorsal | .05–.09 |
| Anterior margin of second dorsal | .10–.11 |
| Second dorsal to tip of caudal | .30–.32 |
| Distal lobe of caudal | .07–.09 |
| Anterior edge of ventral | .07–.09 |
| Anterior margin of pectoral | .13–.14 |
| Tip of snout to eye | .08 |
| Eye | .03 |
| Eye to origin of first dorsal | .20–.22 |
| Anal to tip of caudal | .29 |
| Length | 300–430 mm. |

*Range.*—Gulf of California, Panama, Callao.

For comparison the following measurements were taken on a specimen of *G. dorsalis* collected by Dr. Gilbert at Panama:

| | |
|---|---|
| Snout to first dorsal | .31 |
| Base of first dorsal | .12 |
| Margin of first dorsal | .13 |
| Interdorsal | .20 |
| Base of second dorsal | .10 |
| Anterior margin second dorsal | .10 |
| Second dorsal to caudal tip | .27 |
| Caudal lobe | .065 |
| Anal to caudal tip | .26 |
| Anal to ventrals | .15½ |
| Ventral, anterior margin | .08 |
| Anal, anterior margin | .075 |
| Pectoral to ventral | .25 |
| Anterior margin of pectoral | .15 |
| Snout to pectoral (second slit) | .21 |
| Snout to eye | .085 |
| Eye | .025 |

4. **Carcharhinus brachyrrhynchus** (Philippi).

*Carcharias brachyrrhynchus* Philippi, Tiburones de Chile, Ana'. Univ. Chile, tomo lxxi, 8, 1887 [Iquique].

## SPHYRNIDÆ.

5. **Sphyrna peruana** (Philippi).

*Zygaena peruana* Philippi, Tiburones, etc , de Chile, Anales Univ. de Chile, tomo lxxi, 13, 1887.

Very abundant on the coast of Peru (Philippi).

## SQUATINIDÆ.

6. **Squatina armata** (Philippi).

*Rhina armata* Philippi, l. c., 29, làm vii, fig. 1.

Iquique.

## RAJIDÆ.

7. **Psammobatis brevicaudatus** Cope.

*P. brevicaudatus* Cope, Proc. Amer. Phil. Soc., May 4, 1877, p. 32.

*Habitat.*—Pecasmayu bay, Peru.

8. **Raja chilensis** Steindachner.

*Raja chilensis* Steindachner, Fauna Chilensis, 332, Taf. 21, fig. 15, 1898.

*Habitat.*—Iquique.

## NARCOBATIDÆ.

**9. Discopyge tschudii** Heckel.

*Discopyge tschudii* Heckel, in Tschudi, Fauna Peruana, Fish 33, Taf. 6, 1845; Steindachner, Fauna Chilensis, ii, 332, Taf. 21, fig. 14–14*b*, 1898 [Calbuco, Chile].

Following is the original description:

"Genus *Discopyge* Hæckel, MSS. Caract. Gen. Discus orbicularis. Os transversum ad angulos labiis incrassatis instructum; maxilla medio lamina dentali extrorsum inflexa, denticulis minimis in quincuncim dispositis. Dentes plani rhomboidales, angulo postico acuto. Velum pone maxillam superiorem et inferiorem. Valvula nasalis truncata, in medio processu sinuato instructa, subtus frenulo cum plica circulari oris juncta. Spiracula oculis adjacentia, margine nudo. Pinnæ ventrales sub cauda in unam junctæ. Pinnæ dorsales duæ æquales. Pinnæ caudales oblique ovatæ (Heckel in lit.).

"*D. tschudii* Hæckel. Die Scheibe ist, wenn man sich die Wendung der Brustflossenränder als in ihrer Richtung fortlaufend und rückwärts verbunden denkt, volkommen kreisrund.

"Der Mund liegt am Ende des vordern diametralen Viertheils dieser Scheibe und sein Querdurchmesser macht den dritten Theil dieses Viertheils oder die Entfernung von dem Mund bis zum Scheibenrande aus; er ist verschiebbar wie bei Narcine oder den Accipenserarten. An den Winkeln umgibt ihn ein fleischiger Lippenwulst, unter dem die kleinen obern und untern Lippenknorpel bemerkbar sind. Die in den Mundhöhlen breiteren Zahnplatten beider Kiefer wenden sich schmaler werdend nach aussen über den mittleren Mundrand um und schlagen sich gleich einer mit Zähnen gepflasterten Mittellippe zwischen den beiden eigentlichen Winkellippen zurück. Die untere Plattenumschlag ist etwas schmäler, verliert sich rückwärts spitzer; der obere ist etwas breiter, weniger umgeschlagen und abgerundet. Die Zähne auf diesen Zahnplatten stehen nicht nur dicht in verschobenen Reihen (quincunx) aneinander, sondern überdecken sich ein wenig mit ihrem hintern Rande; die innerste oder längste Reihe enthält ungefähr 12 Zähne, die nachfolgenden nehmen allmählig ab. Die einzelnen Zähne sind glatt, flach, beinahe rhomboidal und an jenen in der Mundhöhle sitzenden verlängert sich der nach hintern gewendete Winkel in eine kleine scharfe Spitze. Sowohl hinter der untern als obern Zahnplatte schiebt sich ein dem Ansehen nach glatter Kiefersegel hervor und verschliesst beinahe die ganze Mundhöle gleich einem zweiten Kieferpaare. Die Entfernung der beiden Nasenlöcher von einander gleicht 1, 5 der Mundbreite. Die Nasenklappe ist etwas schmaler, reicht zurückgelegt bis an den Lippenwulst und hat in der Mitte einen vorspringenden ausgebuchteten Lappen, der den Umschlag der obern Zahnplatte zwischen den oberen Lippenrudimenten genau überdeckt und verhüllt. Wird die Nasenklappe vorwärtsgeschlagen, so zeigt sich dieser vorspringende Lappen als das nach beiden Seiten etwas ausgebreitete Ende des Nasenbändchens (Frenulum), welches durch seine Basis mit der allgemeinen, den ganzen Mund umfassenden circulären Hautfalte in Verbindung steht. Die Augen sind, wie gewöhnlich, sehr klein, liegen senkrecht über dem Mund in einer zweimal so grossen Entfernung als die Nasenlöcher auseinander. Dicht hinter den Augen befinden sich die grossen glattrandigen Spritzlöcher. Weiter rückwärts bemerkt man, wie an andern *Torpedines*, zwei nahe aneinander liegende, Schleim ausführende Poren auf dem Rücken, die aber hier nur um ein Drittheil des Augenzwischenraumes hinter den Spritzlöchern liegen. Die electrischen Organe scheinen aus minder zahlreichen Säulschen zu bestehen als in den Gattungen *Torpedo* und *Narcine;* ihre Gestalt ist, wie gewöhnlich, meistens hexagon.

"Der hintere Rand der Brustflossen überdeckt den Anfang der Bauchflossen deren *gemeinschaftlicher* hinterer Rand ein mit der Scheibe paralleles, zu beiden Seiten abgerundetes Bogensegment darstellt. Diese so merkwürdige Vereinigung beider Bauchflossen miteinander, welcher einigermassen an die der Trichterlosen *Gobien* errinnert, geschiet mittelst einer an der untern Schwanzbasis hinter dem After befestigten Membran. Die Länge des Schwanzes vom After bis zum äusseren Flossenrande is dem Diameter der Scheibe gleich. Zu beiden Seiten des Schwanzes laufen den ganzen Länge nach zwei horizontale, breite Keilfalten hin und enden etwas nach dem Anfange der terminalen, ruderförmigen, schief abgerundeten Schwanzflosse. Beide auf dem Schwanzrücken sitzenden Rückenflossen sind gleich gross und folgen nahe aufeinander; die erste beginnt etwas vor dem Bauchflossenrande und die zweite reicht zurückgelegt über den Anfang der Schwanzflosse, ihre Höhe übertrifft die Länge der Basis um einen Viertheil.

"*Färbung.*—Die ganze Oberseite ist dunkel röthlichbraun, auf der Mitte des Rückens dunkler als an den Scheibenrändern. Unterkörper matt weisslich.

"Länge, 5″—6‴. Grösste Breite, 2″—10.5‴.

"*Vorkommen.*—Das hier beschriebene Exemplar wurde in der Heradura einer Caleta zwischen Huacho und Chancay, gefangen."

## MYLIOBATIDÆ.

**10. Myliobatis californicus** Gill.

*Holorhinus vespertilio* Gill, Proc. Acad. Nat. Sci. Phila., 1862, 331; *Myliobatis californicus* Jordan and Gilbert, Synopsis, 51, 1883.

Local name, *Raya.*

One specimen, from which unfortunately the tail has been cut. Breadth of disc, 470 mm.; line from eye to origin of ventrals, 200 mm.; breadth of head, 80 mm.; distance between nasal openings, 31 mm.; width of first middle tooth, 16 mm.; length, 4 mm.

*Range.*—Cape Mendocino, San Diego, Callao.

## SILURIDÆ.

**11. Galeichthys peruanus** Lütken.

*Galeichthys peruanus* Lütken, Ichthyographische Bidrag, ii (Vidensk. Meded., 1874, 205) [Callao]; Steindachner, Ichthyol. Beiträge, iv, 34 (S. B. Ak. Wien, lxxii, 1875) [Callao, Altata, Panama].

*Tachysurus peruanus* Eigenmann and Eigenmann, Proc. Calif. Acad. Sci., 2d Series, i, 140, 1888 [Callao]; *ibid.*, Revision of South American Nematognathi, Occasional Papers, i, Cal. Acad. Sci., 51, 1890 [Callao].

Local name, *Bagre* (common for most Siluroids).

Three specimens. Head .25 of total length, depth .16. Distance from snout to origin of dorsal .31; gill rakers 5 + 9, 6 + 10, 6 + 8; D. I, 6 to 7, A. 14 to 15.

One ♀ specimen (No. 11,962, L. S., Jr., U.) appears to differ from the others, but not sufficiently to warrant separating it from the species. The head is somewhat shorter, .22 in total length; the ventrals are longer, .16 in total length. The dorsal is inserted somewhat more anteriorly (.29 to end of snout) and the outline of the humeral process is orbicular instead of being irregular, as in the other specimens.

The number of gill rakers in all three differs somewhat from the count given by Eigenmann.

Length 290–320 mm.

*Range.*—Callao to Tropic of Cancer.

## LEPTOCEPHALIDÆ.

12. **Leptocephalus multimaculatus** Steindachner.

*L. multimaculatus* Stein., Ichthyologisc. Notizen, ix, 27, 1869 ["Peru"].

13. **Leptocephalus peruanus** Steindachner.

*L. peruanus* Stein., Ichthy. Notizen, ix, 28, 1869 [Peru].

## OPHICHTHYIDÆ.

14. **Ophichthus callaensis** (Günther).

*Ophichthys callaensis* Günther, Jour. Mus. Godeffroy, iv, 92 [Callao].

We have been unable to consult the description of this species.

15. **Ophichthus pacifici** (Günther).

*Ophichthys pacifici* Günther, Cat. Fish. Brit. Mus., viii, 76, 1870 ["Chile and Peru"].

16. **Ophichthus grandimaculatus** (Kner and Steindachner).

*Ophichthys grandimaculata* Kner and Steind., Sitz. Ak. Wiss. Wien., 1866, liv, 389, fig. 13 (Neue Fische aus Mus. Godef., 34) [Peru].

17. **Ophichthus uniserialis** (Cope).

*Ophichthys uniserialis* Cope, Proc. Amer. Phil. Soc., 1877, 31 [Pecasmayu bay].

## MURAENIDÆ.

18. **Lycodontis wieneri** (Sauvage).

*Gymnothorax wieneri* Sauvage, Bull. de la Societé Philomathique de Paris, July 7, 1883, 161 ["Chile or Peru" (sic)].

## CLUPEIDÆ.

19. **Clupanodon fimbriata** (Kner and Steindachner).

*Alosa fimbriata* Kner and Stein., Sitz. Ak. Wiss. Wien, 1866 (Neue Fische aus Mus. Godeffr., 31, fig. 15 [Valparaiso].
*Clupea sagax* Günther (not of Jenyns), Cat. Brit. Mus , vii, 443, 1868.

Local name, *Sardina.*

H. $3\frac{1}{2}$; D. $4\frac{1}{2}$–$4\frac{1}{5}$. Dorsal 18 (19); anal 16 (18). 20 scutes anterior to ventrals, 15 between ventrals and anus. Maxillary $2\frac{1}{2}$ in head.

Compared with *C. cæruleus,* the rays in the dorsal are more numerous and are peculiar in that the last two and again the two preceding are pressed out side by side so as to lie in two layers covered by the enlarged scales at the base of the fin. The head is longer, the ventral scutes more numerous and the striæ on opercle much more numerous and finely divided than in *cæruleus.*

Compared with specimens of the same species from Valparaiso, no constant differences were observed, except in the head, which is slightly shorter in the latter specimens.

Four individuals, length 240–300 mm.

*Range.*—Chile and Peru, coastwise.

**20. Potamalosa notacanthoides** (Steindachner).

*Clupea (Alosa) notacanthoides* Stein., Ichthy. Notizen, ix, 20, Pl. vii, (good).

Local name, *Machete.*

This species is very closely related to *Potamalosa (Clupea) notacanthus* (Günther),[2] from Valparaiso, with which it may be identical. The type locality of Steindachner's species was given erroneously as Mazatlan, but the specimen doubtless came from further down the coast. The principal differences that separate the two species lie in the scales, which are striate and fimbriate in *notacanthoides*, and in the veinules of the opercle which are very prominent in that species. Dr. Boulenger very kindly examined the types of *Clupea notacanthus* for us. He says: "The scales, about 48 in lat. line, show no trace of striations and the opercle is not veined. The dorsal scutes number 23 and 27 respectively. No traces of dark spots." It is worthy of note, however, that Günther's types are all small, 4 inches, and it may be that the difference in size and age is accountable for the differences noted above. We have examined specimens of *P. notacanthoides* from Valparaiso, and find that they agree with those from Callao in every particular.

The diagnosis of the genus Potamalosa,[3] which was created to receive the species *P. antiqua* Ogilby (*Clupea novæhollandiæ* Günther, not *Meletta novæhollandiæ* Valenciennes) will have to be somewhat modified to admit *P. notacanthoides*. The constant characters that appear to be of generic value are the position of the dorsal, which originates well in advance of the middle of the body, the number of branchiostegals and the rays of the anal.[4]

Five specimens, l. 200–240 mm.

Head $3–3\frac{1}{5}$; depth 3; eye $4\frac{1}{2}–5$; pectoral $1\frac{4}{5}$ in head (as in Steindachner's figure, $2\frac{3}{4}$ in his description). There is considerable

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[2] Günther, Cat. Fishes Brit. Mus., vii, 443, 1868.

[3] Ogilby, Proc. Linn. Soc. N. S. Wales, xxi, 1896, 504 (1897). *Ibid.*, l. c., 1897, Pt. i, Apr. 28, p. 70.

[4] The following synopsis will show the differences between the two species of the genus:

Gen. *Potamalosa* Ogilby. Origin of dorsal well in advance of middle of body; branchiostegals 8 or 9; anal rays 18 or less,—

(a) Dorsal scutes feeble; scales pectinate and striate; muciferous system highly developed; opercle veined ........................ *notacanthoides*.

(b) Dorsal scutes prominent; scales entire; muciferous system confined to main arteries; opercle quite smooth ........................ *antiqua*.

variation in the number of ventral scutes, which run from 19 to 21 before the ventrals and from 16 to 18 behind them. Dorsal scutes 24—27 in one specimen (misprinted 7 in Steindachner's description). Opercular veinules prominent. Color, above dark greenish brown, below silvery yellow. Dorsal dark, caudal with broad dark margin; other fins pale, six or eight round or elongate dark blotches along the side in the silvery portion. A like number more or less parallel with them in the darker upper half of body, just above the color line.

*Habitat.*—Coasts of Chile and Peru.

21. **Potamalosa** (?) **maculata** (Cuvier and Valenciennes).

*Alausa maculata* Cuv. and Val., Hist. Nat. Poiss., xx, 430 (1847) [Valparaiso] ; Gay, Hist. Chile Zool., ii, 322, làm. 10, fig. 2.
*Clupea maculata* Günther, Cat. Brit. Mus., vii, 443, [Callao] ; Steindachner, Fauna Chilensis, 330, 1898 [Iquique].

This species is very close to *Potamalosa notacanthoides* and possibly belongs to that genus, though no dorsal serrature has been described. But the type specimens in the British Museum are in such poor condition that one is not warranted in saying that a dorsal serrature is absent in the adult,[5] and in the description of Steindachner's single specimen no mention is made of the matter. I therefore, for the present, place *maculata* with *notacanthoides* in *Potamalosa*.

*Range.*—Coasts of Peru and Chile.

22. **Clupanodon sagax** (Jenyns).

*Clupea sagax* Jenyns, Voy. Beagle, 134, 1842 [San Lorenzo isl.] ; Günther, Shore Fishes, Challenger, 25, 1880 [Valparaiso] ; Steindachner, Fauna Chilensis, 331, 1898 [Iquique].

23. **Clupanodon fimbriatus** (Kner and Steindachner).

*Alausa fimbriata* Kner and Stein., Neue Fische, Mus. Godefr., 31, fig. 15 ; Sitz. Ak. Wiss. Wien, 1866 [Valparaiso].

Local name, *Sardina Hispaña.*

Two specimens. The pectoral is a little longer than in the original description, $1\frac{2}{3}$ in head. The species is readily distinguished from *C. cœruleus* by the greater number of fin rays and the numerous and more delicate striæ on sides of head. Length, 300 mm.

*Range.*—Coasts of Peru and Chile.

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[5] Dr. G. A. Boulenger, in lit., 6, 15, 98.

## ENGRAULIDIDÆ.

**24. Stolephorus tapirulus** (Cope).

*Engraulis tapirulus* Cope, Proc. Amer. Phil. Soc., May 4, 1877 (separate, p. 29) [Pecasmayu bay?].

The two specimens in the collection evidently belong to this species. The brevity of Cope's description, however, seems to require a more extended one.

D. 14, A. 23–24, depth $4\frac{1}{5}$, head $3\frac{1}{2}$, eye $4–4\frac{1}{4}$ in head, 5 in snout, equal to interorbital. Body strongly compressed, outline not strongly curved. Head very acute, top flat. Mouth very oblique, giving head a triangular outline, the depth at occiput equalling length. Maxillary very long, acutely truncate, extending slightly past articulation of mandible and quadrate. Teeth very small. Gill rakers long and slender, but shorter than eye. Dorsal low, its origin nearer beginning of caudal than end of snout by twice the diameter of eye. Its longest ray about two in head. Pectoral $1\frac{3}{4}$ in head, not reaching ventrals by half diameter of eye. Ventrals short, $3\frac{1}{3}$ in head, extending slightly beyond perpendicular from origin of dorsal. Anal low, beginning slightly in advance of vertical from end of dorsal base. Scales thin, about 37 in a series from pectoral to caudal.

Color, silvery yellowish. Lateral band rather obscure, mediate. Scales above finely sprinkled with black dots. Snout and top of head peppered with dots. Occiput dark. Length 180 mm.

This species is close to *S. peruanus* Steindachner, differing in the smaller number of dorsal and anal fin rays, origin of anal, length of pectoral, position of lateral stripe and depth of head at occiput (2 in head in *S. peruanus*).

Two specimens.

Local name, *Llanamarca*.

**25. Stolephorus peruanus** (Steindachner).

*Engraulis peruanus* Stein., Ich. Beiträge, viii, 60, 1878 [Callao].

**26. Engraulis nasus** (Kner and Steindachner).

*E. nasus* Kner and Stein., Neue Fische aus Mus. Godeffr., 33, fig. 17, 1866 [Chinchas islands, Peru].

This species is certainly distinct from *E. ringens*, differing in having a larger eye, greater depth and much longer premaxillary.

**27. Engraulis ringens** Jenyns.

*Engraulis ringens* Jenyns, Voy. Beagle, 136, 1842 [Callao]; Steindachner, Ich. Beiträge, 62, 1879; Günther, vii, 386, 1868; Steindachner, Fauna Chilensis, 331, 1898 [Tumbes, Chile].

Local name, *Anchobeta*.

The single specimen of this species is a typical *Engraulis*, and when compared with the California specimens of *E. mordax* establishes without doubt the individuality of the two species.

They differ most markedly in coloring and in the shape of the head. The specimens of *E. mordax* examined are truly spindle-shaped, the dorsal and ventral outlines curving symmetrically from snout to tail; in *E. ringens* the dorsal outline is nearly straight, the greatest body depth is at the pectorals and the ventral outline slopes without much curve to the caudal peduncle which is slightly thicker in *ringens* ($3\frac{1}{4}$ in head to $3\frac{2}{3}$ in *mordax*). In the former species the head is deeper in proportion to its length, being $1\frac{2}{3}$ in its length at the occiput to $1\frac{3}{4}$–$1\frac{7}{8}$ in *E. mordax*. The maxillary is contained $5\frac{1}{2}$ times in the length in *ringens*, $4\frac{1}{2}$ in *mordax*. In the former species the mandible reaches nearer to the end of the snout than in the latter, ending about half way between nostril and tip of snout. In *E. mordax* it does not quite reach nostril, thus falsely giving *E. ringens* the appearance of having a shorter snout. The distance from the end of the mandible to the tip of the snout is contained $1\frac{2}{3}$ in the eye in *ringens*, to $1\frac{1}{2}$ in *mordax*.

In *ringens* the gill cleft is much longer, beginning almost level with the back and the opercle is correspondingly produced, rounding out in a full curve instead of descending abruptly to the posterior angle as in *mordax*. The distance between the limit of the interopercle and the outer edge of the opercle at the upper angle of gill cover is contained in the head $5\frac{1}{3}$ times in *E. ringens*, 7 times in *E. mordax*.

In *ringens* the pectorals reach two-thirds of the way to the ventrals, in *mordax* they extend almost to the ventrals. In the former species the anal is somewhat more posterior, the distance from the end of the anal to the beginning of the caudal being contained twice in the head, to $2\frac{1}{2}$ times in *mordax*. The anal is somewhat shorter in the former, its base being contained 6 times in the length to $5\frac{1}{2}$ in *mordax*.

The dorsal is also shorter, its base being contained $2\frac{3}{4}$ times in the head in the former to twice in the latter. In the former the ventrals are 3 in the head, in the latter $2\frac{1}{2}$.

The specimen in hand is dark olive green above the silvery stripe. This is narrower than in specimens of *E. mordax* examined, beginning about midway of the body, while in *mordax* the silvery part covers about three-quarters of the side.

D. 14; A. 20. Length, 112 mm.

*Habitat.*—Coasts of Peru and Chile.

## STROMATEIDÆ.

**28. Stromateus maculatus** Cuvier and Valenciennes.

*Stromateus maculatus* Cuv. and Val., Hist. Nat. Pois., ix, 399, 1833 [Valparaiso]; (?) Jenyns, Zoöl. Beagle. Fishes, 74, 1839 [Chiloe]; Gay, Hist. Chile, Zoöl., ii, 248, Atl. Ichth., lám 3 bis., f. 1; Fordice, Review of Stromateidæ, Proc. Acad. Nat. Sci. Phila., 1884, 314 [Rio Grande do Sul]; Steindachner, Fauna Chilensis, 299, 1898 [Puerto Montt, Chile].

This species belongs to the more southern Chilean fauna, but Valenciennes is authority for the statement (ix, 400) that it is a common market fish at Lima from May to July, and hence may be considered to range from Peru to Patagonia (Jenyns).

## EXOCOETIDÆ.

**29. Exocoetus volitans** Linnæus.

*Exocoetus evolans* Linnæus, Systema Natura, Ed. xii, 521, 1766.
*Exocoetus chilensis* Abbott, Proc. Acad. Nat. Sci. Phila., 1860, 472 [Chile].
*Halocypselus evolans* Jordan and Gilbert, Synopsis, 377, 1883 [Atlantic coast, U. S.].
*Exocoetus volitans* Jordan and Evermann, Fishes of N. A., 1898, Addenda, p. 2835.

Although there are no specimens of this species in the Beardslee collection, yet we have identified some taken 6° south of the equator in the East Pacific by the U. S. S. "Albatross," and it may be considered to be within the limits of Peruvian waters.

**30. Exonautes speculiger** (Cuvier and Valenciennes).

(?) *Exocoetus exiliens* Jenyns, Zoöl. Voyage Beagle, Fishes, 122, 1842 (not of Gmelin) [Coast of Peru].
*Exocoetus speculiger* Cuv. and Val., Hist. Nat. Pois., xix, 94, 1846 [Pacific coast, S. A.].
*Exocoetus rufipinnis* Cuvier and Val., Hist. Nat. Pois., xix, 99, 1846 [Payta, Peru].
*Exonautes speculiger* Jordan and Evermann, op. cit., Addenda, 2836, 1898.

The fish described by Jenyns as *Exocœtus exiliens* Bloch without doubt belongs to this species.

## SYNGNATHIDÆ.

**31. Leptonotus blainvillianus** (Eydoux and Gervais).

*Syngnathus blainvillianus* Eydoux and Gervais, in Guérin, Mag. Zoöl., 1837, iv, pl. 17; Voyage Favorite, Zoöl., 79, pl. 32; Günther, Cat. Brit. Mus., viii, 162, 1868; Gay, Hist. de Chile, ii, 348, 1848; Steindachner, Fauna Chilensis, 331, 1898 [Tumbes, Chile].
*Leptonotus blainvillei* Kaup, Lophobranchii of Brit. Mus., 46, 1856 [Peru].

Peru, Chile (India, Auckland Islands, New Zealand, *Kaup*).

**32. Siphostoma aciculare** (Jenyns).

*Syngnathus acicularis* Jenyns, Fishes, Voyage Beagle, 147, pl. xxvii, fig. 3, 1842 [Valparaiso]; Steindachner, Fauna Chilensis, 331, 1898 [Iquique].

## ATHERINIDÆ.

The large Atherinoids of the west coast of South America form in number a very considerable proportion of the fish fauna of that region. They are of the very finest of food fishes and with *Mugil cephalus* comprise the bulk of the market fish in Callao and Lima during the months of December and January, great quantities being consumed daily.

Until recently, nearly all fishes of the Basilichthys group have been referred to the two species, *Basilichthys* (*Atherinichthys*) *laticlavia* Cuv. and Val. and *B. microlepidotus* Jenyns, both originally from Chile. But it is evident that there must exist a great variety of forms throughout the whole region. Gay, indeed, hazarded the suggestion (*Fauna Chilena*, p. 255) that there "must be many other species [than the above two] in the seas, lakes and rivers of Chile." Two of these have recently been described by Steindachner[6] as *Chirostoma* (*Basilichthys*) *affine* and *C. gracile*, both very closely related to the forms here described.

*B. microlepidotus* has been very well figured and described by Jenyns,[7] Girard[8] and Kner.[9] It is characterized especially by the small, low, few-spined, first dorsal set rather close to the second dorsal.

*B. laticlavia* has been less fortunate. The original description[10] is too brief to offer any decisive characters separating it from the closely related species and its status was not improved by the altered description of the species which Günther gives in his

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[6] Fauna Chilensis (von L. Plate gesam.), 281–339, July, 1898.
[7] Voyage Beagle, 78, pl. xvi, 1, 2, 1841.
[8] U. S. Astron. Exp. Southern Hem., ii, 238, pl. xxx, 6–9, 1854.
[9] Novara Fische (ii), 222 (no plate), Wien, 1865.
[10] Cuv. and Val., Hist. Poiss., x, 473, 1835.

*Catalogue* (Vol. iii, 402). It is likely that either the specimens described by Günther did not belong to *laticlavia*, or else that more than one species was included under that name. However, from Valenciennes' descriptions it is evident that *laticlavia* has the head shorter in proportion to the length than in any other related species of which we know, except *affine*, and the first dorsal is relatively more posterior than in any species we have examined.

*Basilichthys brevianalis* (Günther)[11] from Valparaiso has larger scales than any of the Peruvian species (67 in lateral line) and *B. alburnus* (Günther)[12] from the Strait of Magellan, much smaller scales (105 in lateral line).

Humboldt observed a Piexe-rey at Callao to which he gave the name *regia*, and which is described by Cuvier and Valenciennes,[13] but so briefly that it is almost impossible to refer any specimen definitely to that species. The genus *Basilichthys*, as here understood, includes those Atherinoids with premaxillaries protractile and broadened posteriorly, scales small (70–100 in lateral line), and with the upper jaw developed fully as strongly as the lower.

**33. Basilichthys regillus** Abbott. New species.

Head 4, depth $5\frac{1}{2}$, eye 5 in head, $1\frac{3}{5}$ in interorbital space, snout $2\frac{7}{8}$.

D. VI–I, 10; A. I, 16. 14 rows of scales at level of ventrals, in a series from opercle to root of caudal, 11 rows on tail.

Body rather thick, rounded, low. Head rather long in proportion to depth, flat or slightly convex above. Teeth fine, in two to four rows, vomer without teeth. Mouth moderate, the jaws almost even, the upper jaw slightly projecting; gill rakers fine—7+24 (circ.). Scales sinuate, most of them with from 3 to 6 radiate striæ as described by Jenyns and others. (This character of striæ does not appear to be of any taxonomic importance.) Scales on top of head arranged irregularly in a sort of shield; cheeks and opercles scaled, jaws and snout naked. Origin of first dorsal nearer snout than base of caudal by one-third length of head, and inserted almost even with, or slightly in advance of vertical from tip of ventrals. Second dorsal inserted above the seventh ray of anal. Interdorsal space large, $5\frac{3}{4}$ in body length (measuring from first

[11] Shore Fishes, Challenger Exp., 25, 1880.
[12] Cat. Fishes British Museum, iii, 404, 1861.
[13] x, 474 (1835).

spine of first dorsal to spine of second dorsal). Ventrals short, $2\frac{3}{4}$ to 3 in head. Pectorals $1\frac{1}{2}$ in head, minutely dotted with color. Lateral stripe obscure in outline, broad, covering $\frac{1}{2} + 2 + \frac{1}{2}$ scale rows, margined above with dark plumbeous, spreading to a large blotch on opercle, narrowing to $1\frac{1}{2}$ scale rows on caudal peduncle, and terminating in a round spot at root of caudal. Color dusky above lateral stripe, pale below, scales above the stripe margined with dark dots. Numerous narrow, dark branching lines running along middle of back from occiput to caudal.

Length 210 mm. No. 6,071 in Leland Stanford, Jr. Univ. Mus. Six cotypes, No. 6,072, vary in length from 190 mm. to 245 mm. Head $4–4\frac{1}{5}$. D. VI or VII–I, 10; A. I, 15 or 16.

Some of the specimens have the scales smooth and closely adherent, others rough and loose, a condition due probably to rough handling in the markets.

34. **Basilichthys octavius** Abbott. New species.

Very close to *B. regillus*, differing in the number of dorsal spines, insertion of first dorsal, greater interdorsal space and lesser depth.

Head $4\frac{1}{2}$, depth $6\frac{4}{5}$, eye $5\frac{1}{2}$, snout 3.

D. VIII–I, 9; A. I, 15. Body slender, depth less in proportion to length than in *regillus*. Cheeks scaled to point of maxillary, snout and preopercle smooth and bare. No teeth on vomer or palatines. 15 scale rows at ventrals, 11 on tail, 86 in longitudinal series. Gill rakers 7 + 24.

First dorsal almost exactly midway between root of caudal and tip of snout, inserted over middle of ventrals. Interdorsal space $4\frac{4}{5}$ in body length.[14] Origin of second dorsal about even with eighth anal ray. Pectoral $1\frac{2}{3}$ in head, ventrals 3. Color as in

[14] The difference in interdorsal space in the two species, *octavius* and *regillus*, is due to the more posterior location of the first dorsal in the former, the position of the second dorsal being practically constant, as will be seen in the following table (the numbers represent hundredths of the total length):

| | *Octavius.* | *Regillus.* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| First dorsal to snout.......... | 44 | $47\frac{1}{2}$ | 46 | 47 | 47 | 47 | 47 | 46 |
| Second dorsal to snout........ | 62 | 62 | 61 | 61 | 61 | 63 | 61 | 61 |
| Interdorsal space............. | 19 | 15 | $14\frac{1}{2}$ | 15 | 15 | 15 | 15 | $15\frac{1}{2}$ |

*B. regillus* and other species. Lateral stripe covering $\frac{1}{2} + 2 + \frac{1}{2}$ scale rows, the silver being replaced anteriorly by dark plumbeous.

One specimen, l. 255 mm. No. 6,069 in the Leland Stanford, Jr. Univ. Mus.

**35. Basilichthys jordani** Abbott. New species.

In the presence of vomerine teeth and in the development of the lower jaw, this species approaches *Chirostoma*. But in its appearance and the smallness of its scales it is a typical *Basilichthys*.

The striking difference in appearance between fishes of the genera *Basilichthys* and *Chirostoma* seems to lie not so much in the strengthening of the mandible in the latter, as in the more noticeable weakening of the upper jaw, so that the lower jaw projects and forces the mouth into a strongly diagonal slant. In *Basilichthys* the upper jaw is as strong as the lower and slightly projecting, and the mouth is almost horizontal.

Head $4\frac{1}{4}$; depth $5\frac{1}{2}$; eye 5 in head; $1\frac{1}{2}$ in interorbital, snout $2\frac{3}{4}$. D. VI–I, 10; A. I, 16.

Body rather thick, head quadrangular. Mouth moderate, the lower jaw stronger than in other related species, even with, or very slightly projecting beyond upper. Teeth comparatively strong. Vomerine teeth prominent, in a triangular patch, scattering at the sides. Gill rakers 7 + 25. Scales small, 14 series at ventrals, 10 on tail, 87 from opercle to root of caudal, some of them radially striate.

Pectoral $1\frac{4}{5}$, ventral 3 in head. First dorsal inserted nearer tip of snout than root of caudal by somewhat less than the diameter of the eye, its first spine vertically above tip of ventral. Interdorsal space $5\frac{1}{2}$ in body length. Second dorsal inserted above eighth anal ray. Color as in other related species. Medio-dorsal lines present but obscure. Stripe covering $\frac{1}{2} + 2 + \frac{1}{2}$ scale rows at middle of body.

Length 235 mm. No. 6,070 in Leland Stanford, Jr. Univ. Mus. A cotype, No. 6,073, in the same collection has the head 4 in length and seven spines in the first dorsal. Length 250 mm.

It gives me great pleasure to name this species for President David Starr Jordan, of Leland Stanford, Jr. University, to whose friendly interest and wealth of experience and knowledge the younger students of ichthyology in this country owe so much.

**36. Basilichthys affinis** (Steindachner).

*Chirostoma affine* Steindachner, Fauna Chilensis, 313, 1898 [Iquique].

This species apparently closely resembles the preceding. It appears to differ from *B. jordani* in the absence of vomerine teeth, and from *jordani*, *regillus* and *octavius* in the much shorter head and in the position of the first dorsal. Steindachner also describes (l. c. 314) a species of the same genus, *gracile,* from Juan Fernandez which is distinct from those mentioned above, though closely related.

**PISCIREGIA** Abbott. New genus.

Body and head pike-like. Premaxillary not protractile, its skin continuous with that of the forehead. First dorsal small, with few spines, situated posteriorly. Teeth rather strong, the outer series in each jaw enlarged. Vomer with teeth. Mouth margined entirely by premaxillary, the maxillary lying behind. Caudal peduncle thick. The genus is related to *Atherinops* and *Atherinopsis* by the non-protractile premaxillary, differing from the former in having simple teeth and from the latter in the presence of vomerine teeth, in the enlargement of the outer series of the maxillary and in the small size of the first dorsal.

**37. Pisciregia beardsleei** Abbott. New species.

Head $4\frac{1}{4}$, depth $5\frac{1}{2}$, eye $6\frac{1}{2}$ in head, 3 in interorbital, snout $2\frac{4}{5}$, preorbital $1\frac{1}{2}$ in eye.

D. IV–I, 11; A. I, 15. Scales small, 20 series at ventral, 14 on tail, 87 in longitudinal series. Head broad, flat, angular, scaled above to posterior nostril, cheeks, opercles and suborbital scaled. Preorbital, snout and jaws smooth and naked. Chin with a series of six pores on each side. Teeth rather large, incurved, in three or four series, the outer enlarged in each jaw. Vomer with half a dozen recurved teeth at apex. Gill rakers 4 + 14, short and stout, 2 in eye. Scales small, entire or sinuate, with radiate striæ.

First dorsal short and low, of 4 weak spines, the height of the longest one-third of base of second dorsal, the fin inserted slightly in front of the vertical from vent. Second dorsal strong, its longest ray about equal to its base, inserted above sixth ray of anal. Anal high, its second ray equal to its base, $1\frac{2}{3}$ in head and equalling the pectoral; ventral $2\frac{1}{2}$ in head. Caudal peduncle stout, its depth $2\frac{1}{2}$ in head. Interdorsal space short, $2\frac{1}{3}$ in head. Caudal oblong, forked and but slightly spreading.

Coloration resembling the various species of *Basilichthys*. Lateral stripe broad, covering $\frac{1}{2} + 3 + \frac{1}{2}$ scale rows. Body pale below, the scales above margined with dark dots; a blotch on opercle. Lines on middle of back not evident. Dorsals and caudal dark, other fins pale, with very few, if any, dots of color.

One specimen, l. 290 mm. No. 11,961 in the Museum of Leland Stanford, Jr. University.

## MUGILIDÆ.

**38. Mugil cephalus** Linnæus.

*Mugil cephalus* L., Syst. Natura, Ed. x, 316, 1758; Steindachner, Fauna Chilensis, 315, 1898 [Juan Fernandez].
*Mugil rammelsbergii* Tschudi, Fauna Peruana, Ichth., 20, 1845 [Peruvian coast]; Garman, Proc. Boston Soc. Nat. Hist., 203, 1876.
*Mugil liza* Gay, Hist. Chile Zool., ii, 256, lám 4b, fig. 2.

Local name, *Liza*.

After making careful comparisons between six specimens of this species from Callao and others from Italy, Texas, Florida and Mazatlan, Mexico, we are forced to corroborate the conclusion given by Jordan and Evermann (*Fishes of N. A.*, i, 811) that all belong to one and the same species.

*Range*.—Europe, West Atlantic, East Pacific. A valuable and abundant food fish.

Five specimens, 180 mm. to 200 mm.

One younger, 140 mm.

Following is Tschudi's original description of *M. rammelsbergii*:

"D. IV–I, 8. A. II, 8. C. 16. V. I, 5. P. 16.

"Verhältniss der Höhe zur Länge 1: 5, des Kopfes zum Körper 1:3, 6. Grösste Breite des Kopfes gleich seiner Höhe. Auge rund, ein Viertheil seines Durchmessers vom Stirnrande, zwei Drittel desselben vom Unterkieferrande, seinen Durchmesser von der Schnauzenspitze und dreimal denselben vom Vordeckelrande entfernt.

"Das Maul ist klein, nicht ganz bis unter die Knochen gespalten, dreieckig. Die Zähne sehr zahlreich, aber fein. Nasenlöcher nahe am Canthus rostralis. Der Deckelrand ist nach oben etwas ausgeschnitten und läuft nach hinten in einen runden Fortsatz aus. Der Vordeckelrand ist einfach, ganz abgerundet.

"Die Beschuppung des ganzen Körpers ist sehr regelmässig, auf dem Scheitel und dem Deckel etwas grösser.

"Die erste Rückenflosse steht etwas vor der Mitte des Rückens, der 1ste und 2te Stachel sind die längsten und gleich lang; der 4te der kürzeste, steht vom 3ten ziemlich weit ab. Ihre ganze Länge von ihr entfernt steht die 2te Rückenflosse, deren Anfang und Ende dem der Afterflosse gegenüber fällt; sie ist etwas ausgeschnitten, indem der letze Strahl etwas höher ist als die drei vorhergehenden; der Stachel is dünn und schwach. Schwanzflosse stark ausgeschnitten. Die beiden Stacheln der Afterflosse sind schwach; sie stimmt in Form und Länge ganz mit der zweiten Rückenflosse überein.

" Die Bauchflosse beginnt beinahe am Ende der Brustflosse; der Stachel ist halb so long als der erste Flossenstrahl. Die Brustflosse ist hoch oben angeheftet, der oberen Hälfte des Auges gegenüber; sie überragt nur ein wenig den Anfang der Bauchflosse.

"*Färbung.*—Auf dem Rücken grünlich gelb; silberweiss am Bauche.

" Länge 10″–12″.

" *Vorkommen.*—In den Monaten Mai und October sehr häufig um die Insel San Lorenzo; in der übrigen Zeit scheinen sich diese Fische mehr auf das hohe Meer zurückzuziehen."

## POLYNEMIDÆ.

39. **Polydactylus approximans** (Lay and Bennet).

*Polynemus approximans* Lay and Bennet, Beechey's Voyage, Zoöl. Fish, 57, 1849 [Mazatlan].
*Polydactylus approximans* Jordan and Evermann, Fishes of N. A., i, 829, 1897.

Local name, *Barbuda.*

One specimen, l. 250 mm. A common food fish of the western coast of Central America, hitherto recorded no farther south than Panama; north to Lower California (Thominot, *Bull. Soc. Phil.*, 1886).

## SCOMBRIDÆ.

40. **Scomber colias** Gmelin.

*Scomber colias* Gmelin, Syst. Nat., p. 1329, 1788 [Sardinia]; Steindachner, Ichthy. Notizen, vii, 25, 1868 [Chile]; Dresslar and Fesler, Rev. of Scombridæ, Bull. U. S. F. C., vii, 432, plate ii, 1889; T. Kitahara, Scombridæ of Japan, photo-plate iv, Jour. Fisheries Bureau, vi–i of Tokyo, 1897.

Local name, *Cabinsa, Caballa.*

Seven specimens, l. 220–250 mm.

D. IX–12–V (one specimen, VIII–12–V); A. I–I, (I–I, 11–V).

*Range.*—West coast of North and South America, Japan, southern Europe. Occasional in West Atlantic.

**41. Sarda chilensis** (Cuvier and Valenciennes).

*Pelamys chilensis* Cuv. and Val., Hist. Nat. Pois., viii, 163, 1831 [Valparaiso]; Steindachner, Ichthy. Notizen, vii, 25, 1868 [Chile]; Kitahara, Jour. Fish. Bureau, Tokyo, vi, i, 3, pl. iv, fig. 10.
*Sarda chilensis* Jordan and Gilbert, Proc. U. S. N. M., iii, 27, 1880.

Local name, *Chanchilla, Bonito.*

Two adult specimens, one young.

Head $3\frac{1}{2}$, depth $4\frac{3}{4}$–5. D. XVII(XVIII)–I,13–VII(VIII). A. II,11–VI (VII). Length 220, 400, 430 mm.

The large specimens appear to be typical, though the color markings are somewhat obscure. We are inclined to recognize the specific identity of *S. orientalis*[15] as distinct from *S. chilensis*, notwithstanding the fact that Jordan and Evermann, following Dresslar and Fesler (*Bull. U. S. F. C.*, vii, 1887, 441) place both in the synonymy of *Sarda chilensis*.

In the specimens in hand the eye is 8 in head as against $9\frac{1}{2}$ in *orientalis* (same length fish), and the posterior end of the maxillary, instead of being irregular in outline and concave on its upper border as in *S. orientalis* and *S. sarda*, is regular and almost round. The single juvenile specimen shows the same peculiarities in color markings as have been noted in the young of *S. sarda*, by Steindachner (*Ichthy. Berichte*, v, 8, 1868). There are no traces of longitudinal striping, but the sides are barred two-thirds of the way from pectoral to tail with ten or eleven dusky vertical stripes. The posterior end of the maxillary is also weakly, but evidently serrate.

The discrepancies in color markings to be noticed in the published figures of both *S. sarda* and *S. chilensis* are doubtless due to the fact that the specimens drawn have been in all stages of transition between the juvenile barred type and the adult form with narrow longitudinal stripes.

## ISTIOPHORIDÆ.

**42. Istiophorus audax** (Philippi).

*Histiophorus audax* Philippi, Sobre los Tiburones, etc., de Chile, 35, 1887.

Local name, *Pez-aguja*, described by Philippi from specimens from Iquique.

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[15] Temminck and Schlegel, Fauna Japonica, 52.

## XIPHIIDÆ.

43. **Xiphius gladius** Linnæus.

*Xiphius gladius* (?), Philippi, l. c., 33, 1887.

Philippi describes specimens from Iquique and Talcahuano.

## CARANGIDÆ.

44. **Trachurus picturatus** (Bowdich).

*Seriola picturata* Bowdich, Excursion to Madeira, 123, fig. 27, 1825.
*Caranx trachurus* (2me subdiv.) Cuvier and Valenciennes, iii, 17, 1833 [Valparaiso].
*Trachurus cuvieri* (Lowe) Lütken, Spolia Atlantica, 126, 1880 [Chile].
*Caranx cuvieri* Steindachner, Ich. Beiträge, ii, 16 [Talcahuano, Callao, Juan Fernandez, Galapagos].

Local name, *Furrel.*

One specimen. D. VIII–I, 32. A. II–I, 28. Length 325 mm.

*Range.*—San Francisco to Valparaiso, Azores, Mediterranean, New Zealand, Atlantic.

45. **Caranx peruanus** Tschudi.

*Caranx peruanus* Tschudi, Fauna Peruana, Ichth., 19, 1845.

The validity of this species is questionable. Following is Tschudi's original description:

"D. IX–I, 28. A. II, 28. V. I, 10. P. 20.

"Verhältniss der Höhe zur Länge 1 : 6, 5, des Kopfes zum Körper 1 : 3. Auge gross, breiter als hoch nahe am Stirnprofil, 1, 3 seines Längedurchmessers vom Unterkiefer; zweimal seiner Querdurchmesser von der Schnauzenspitze, 2, 8 mal vom Vordeckelrande.

"Nasenlöcher fast in der Mitte zwischen der Schnauzenspitze und dem vorderen Rande des Auges, letzerem doch etwas näher. Maul nicht ganz bis unter das Auge gespalten. Die Zähne in beiden Kiefern sehr klein, fein, hechelförmig. Ueber die Mitte der Zunge eine dicht besetzte Zahnleiste, die etwas weniger grossen Gaumenzähne bilden ein ⊢. Der Unterkiefer ist ziemlich vorspringend.

Die beiden Kieferäste sind einfach, der Winkel abgerundet. Der Vordeckel ist in seinem oberen Drittel stark ausgeschnitten und hat zwei dornähnliche Fortsätze, die durch eine Membran mit einander verbunden sind. Die Schuppen des Körpers sind klein. Die Seitenlinie macht den letzten Rückenflossenstrahlen gegenüber eine starke Biegung nach unten und setzt sich fort, indem der spitzige Fortsatz jeder Schuppe, durch die sie geht, mehr comprimirt, also höher ist und die einzelnen Schuppen dichter anliegen.

"Der nach vorn gerichtete erste Stachel der Rückenflosse ist kurz, aber stark; von den aufrechtstehenden sind der 3te und 4te die längsten. Die Rückenflosse nimmt nach hinten beträchtlich an Höhe und Stärke der Strahlen ab. Ihr Ende, so wie das der Afterflosse, wird durch eine aus 5–6 Stacheln zusammengesetzte, pinselförmige Flosse gebildet. Die Rückenflosse reicht von der Mitte der Bauchflosse bis zum Ende der Afterflosse; diese letztere beginnt der Mitte der Bauchflosse gegenüber bis zum Ende der Afterflosse; diese beginnt dem Ende des ersten Viertels der weichen Rückenflosse gegenüber; ihre beiden Stacheln sind stark, aber kurz; der hintere stark nach hinten gebogen. Die Brustflosse beginnt etwas vor der Bauchflosse und reicht bis zum ersten Rückenflossenstrahl. Die Bauchflosse reicht bis zur Hälfte der Brustflosse.

"*Färbung.*—Der ganze Fisch ist blaugrau, am Rücken wenig dunkler und am Bauche kaum merklich heller.

"Länge 2′ 6″.

"*Vorkommen.*—Ziemlich gemein an der ganzen peruanischen Küste."

**46. Vomer gabonensis** Guichenot.

> *Argyreiosus setipinnis* var. A., Günther, Cat. Brit. Mus., ii, 459, 1860.
> *Vomer gabonensis* Guichenot, Ann. Soc. Linn. Maine et Loire, 42, 1865.

This doubtful species was described as a variety by Günther from thirteen specimens, two of which were in the Haslar collection from Peru, and the rest from Brazil and the West Indies. Guichenot's specimens came from the Gaboon, W. Africa.

**47. Seriola peruana** Steindachner.

> *Seriola peruana* Steindachner, Ich. Beiträge, xi, 13, 1881 [Callao].

## CENTROLOPHIDÆ.

**48. Centrolophus peruanus** Steindachner.

> *Centrolophus peruanus* Steindachner, Ichthy. Beiträge, i, p. 10, (Sitzb. d. Ak. Wiss. Wien, lxix, 384, 1874), [Callao]; *ibid.*, Fauna Chilensis, 299, 1898 [Iquique].

Callao to Iquique.

## SERRANIDÆ.

49. **Acanthistius pictus** (Tschudi).

*Plectropoma pictum* Tschudi, Fauna Peruana, 5, 1844 [Peru] ; Kner, Neue Fische aus Museum Godeffroy, 2 (Sitzb. Ak. Wien. lvi, i, 1867, 710) [Iquique].
*Alphestes pictus* Jordan and Swain, Proc. U. S. Nat. Mus., 1884, 395.
*Acanthistius pictus* Boulenger, Fishes of Brit. Museum, i, 140, 1895 [Chile] ; Steindachner, Fauna Chilensis, 282, 1898 [Iquique].

A Chilean species, rare along the Peruvian coast.

50. **Mycteroperca xenarcha** Jordan.

*Mycteroperca xenarcha* Jordan, Proc. Acad. Phil., 1887, 387 [Galapagos islands].
*Epinephelus xenarchus* Boulenger, Cat. Brit. Mus., i, 266, 1895.

Galapagos island, to Payta, Peru.

51. **Paralabrax humeralis** (Cuvier and Valenciennes).

*Serranus humeralis* Cuv. and Val., Hist. Nat. Poiss., ii, 246, 1828 [Chile] ; Gay, Hist. Chile, Zool., ii, 149, 1847 ; Kner, Neue Fische aus Mus. Godef., 4, (Sitzb. Ak. Wiss. lviii, i, 1868) [Peru]; Boulenger, Cat. Brit. Mus., i, 278, 1895.
*Serranus semifasciatus* Gay, Hist. Chile Zool., ii, 151 (plate I bis, fig. 2), 1847 [Juan Fernandez] (copied by Jordan and Eigenmann, 390, *vide infra*).
*Percichthys godeffroyi* Günther, Jour. Mus. Godeffr., i, H. 2, 97, 1873 [Iquique].
*Paralabrax humeralis* Jordan and Eigenmann, Bull. U. S. Fish Comm., viii, 389, 1890.

Local name, *Cabrilla*.

The collection contains four specimens of this species. There is evidently some variation in coloration between representatives from different localities, though there is no reason for confounding *humeralis* with the very distinct though closely allied form *P. albomaculatus* from the Galapagos Island.[16]

Compared with specimens from the type locality, aside from the very striking and constant difference in color markings, *albomaculatus* differs from the present species in having a considerably narrower interorbital width, narrower pectoral, smaller eye, and lunate (sometimes almost truncate) instead of forked caudal.

The specimens described by Kner (*l. c.*) from Peru, às *Serranus humeralis* (var. ?) doubtless belong to an unnamed species.

Head $2\frac{1}{2}$, depth $4\frac{1}{2}$, eye $5\frac{2}{3}$. Gill rakers $10 + 21$. Lateral line (pores) 62–67. Color somewhat obscured by alcohol, very dark above; broad bands along sides. Opercle dark with lighter spots. Ventrals and middle rays of caudal dark. Soft dorsal mottled.

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[16] Boulenger, Cat. Brit. Mus., i, 278.

The condition of the reproductive organs indicates the time of capture (January) to have been the height of the breeding season.

Length 180–220 mm.

**52. Diplectrum conceptione** (Cuvier and Valenciennes).

*Serranus conceptionis* Cuv. and Val., Hist. Nat. Poiss., ii, 246, 1828 [Conception de Chile]; Boulenger, Cat. Brit. Mus., i, 296, 1895.
*Centropristis conceptionis* Günther, Cat. Brit. Mus., i, 84. 1859.
*Diplectrum conceptione* Jordan and Eigenmann, Bull. U. S. F. C., viii, 1890 (1888), 399.

Local name, *Mojarrilla*.

Five specimens, length 180–200.

Depth $3\frac{2}{3}$–4, head $2\frac{2}{3}$–3, eye $4\frac{3}{4}$ in head, interorbital $\frac{2}{3}$–$\frac{7}{8}$ in eye.

D. X, 12. A. III, 7. Lateral line (pores) 53 circ.

Body outline low. Profile almost straight from anterior edge of orbit to beginning of dorsal. Snout broad but sharp. Mouth rather large, maxillary reaching to posterior edge of pupil, its distal end about $\frac{1}{3}$ of eye in width, its dorsal edge with a longitudinal groove and ridge, somewhat imitating the accessory maxillary bone of the Epinephelinæ. Canines weakly developed. Cheeks and opercles covered with strongly ctenoid scales. Snout, jaws and interorbital space as far as occiput, including ring about the eye, naked. Opercle with a stoutish spine. Angle of preopercle with three or four stout plectroid spines—above and below are two or three weaker and gradually shorter spines merging above into the fine denticulations of the vertical edge of preopercle. Lower edge entire. Gill rakers slender, 8+14. Lateral line concurrent with back, about 6 or 7 scale rows between it and dorsal.

Dorsal spines rather weak, the fourth and fifth the longest, subequal, 3 in head. Tenth spine about two-thirds of first ray. Origin of dorsal on the vertical with that of pectoral. Ventrals very slightly in advance of latter. Pectorals $1\frac{3}{5}$. Ventrals 2 in head. Caudal lunate, the upper lobe the longer. Anal spines rather weak, the third the longest, $4\frac{1}{3}$ in head.

Head dark reddish brown, a black blotch on opercle. Inner surface of opercle black. Side of body with seven or eight bars of rose to level of pectoral, dirty yellow below. Soft dorsal mottled. Ventrals and margin of caudal dark. A few spots on caudal.

*Range.*—Coasts of Chile and Peru.

53. **Pronotogrammus peruanus** (Steindachner).

*Anthias (Hemianthias) peruanus* Steindachner, Ichthy. Beiträge, i, 4, (Sitzb. Ak. Wiss. lxix, i, 1874) [Payta].
*Pronotogrammus peruanus* Jordan and Eigenmann, Review of Serranidæ, Bull. U. S. F. C., viii, 413, 1890 [Chile].

*Range.*—Coasts of Chile and Peru.

54. **Serranus peruanus** Lesson.

*Serranus peruanus* Lesson, Voyage de la Coquille, tome ii, part i, 234 1828 [Payta]; Jordan and Eigenmann, Review of Serranidæ, Bull. U. S. F. C., viii, 408, 1888.

Payta, Peru.

55. **Hemilutjanus macrophthalmos** (Tschudi).

*Plectropoma macrophthalmos* Tschudi, Fauna Peruana, Ichth., 6, 1845 [Callao]; Kner, Neue Fische aus Mus. Godeffroy, 3, plate I, (Sitzb. Ak. Wiss. i, lvi, 1867) [Iquique.]
*Hemilutjanus macrophthalmos* Jordan and Eigenmann, Review of Serranidæ, Bull. Fish Comm., viii, 345, 1890.
*Pomodon macrophthalmus* Boulenger, Cat. Brit. Mus., i, 144, 1895; Steindachner, Fauna Chilensis, 281, 1898 [Iquique].

*Range.*—Coasts of Chile and Peru.

## HÆMULIDÆ.

56. **Anisotremus scapularis** (Tschudi).

*Pristopoma scapulare* Tschudi, Fauna Peruana, 12, 1844 [Huacho].
*Diagramma melanospilum* Kner, Neue Fische Mus. Godef., p. 4; (Sitz. d. Ak. Wiss., lvi, 1867).
*Pristipoma notatum* Peters, Berl. Monatsb., 106, 1869 [Mazatlan].
*Pomadasys modestus* Jordan, Proc. Acad. Nat. Sci. Phila., 286, 1883.
*Anisotremus scapularis* Jordan and Fesler, Rep. U. S. F. C. (Rep. '89–'91), 485, 1893; Jordan and Evermann, Fishes of North and Middle Amer., ii, 1320, 1898.

There are two specimens of this well marked species in the Callao collection, length 240 mm. and 285 mm.

57. **Pomadasys bipunctatus** (Steindachner).

*Pomadasys bipunctatus* Steindachner, Fauna Chilensis, 286 [Iquique].

West coast of South America.

58. **Isacia conceptionis** (Cuvier and Valenciennes).

*Pristipoma conceptionis* Cuv. and Val., Hist. Nat. Poiss., v, 268, 1830 [Conception de Chile].
*Isacia conceptionis* Jordan and Fesler, Rep. U. S. F. C., '88–'91, 1893, 501 [Mexillones, Peru].

Local name, *Cabinsa.*

Two specimens, length 250 mm. and 215 mm.

This species, the type of the genus *Isacia*, is separated from Bleeker's genus *Parapristipoma* by the long anal and absence of its scaly sheath. The value of the first character is questionable, as the species of Parapristipoma show a regular gradation in number of anal rays up to the number in the present species, and the character of the scaly sheath is apt to be misunderstood, as there is present in *I. conceptionis* (at least in the specimens at hand) a slight development of scales at the base of the anal, two or three scale-rows deep and at its widest part about one-ninth the length of the longest ray. On the other hand, the sheath in *Parapristipoma trilineatum*, the type of that genus, is, according to Bleeker's figure,[17] about two-fifths of the length of the first ray, and composed of 7 or 8 scale rows at the widest part. The preopercular spines of *I. conceptionis* are weak and partly hidden by the skin and there appears to be no special development of them at the angle. The spines of *Parapristipoma* are rather strong, especially at the angle.

Head $3\frac{1}{4}$, D. $3\frac{2}{5}$ (4), pores in lat. line 54–56, eye $4\frac{1}{2}$, snout $2\frac{3}{4}$ ($3\frac{3}{4}$). D. XIII–14; A. III, 13 (12).

*Range.*—West coast of South America.

Gay gives *Cabinza* as the common name in Chile for *Mendosoma cærulescens.*

**59. Orthopristis cantharinus** (Jenyns).

*Pristipoma cantharinum* Jenyns, Voy. Beagle, Fish, 49, 1842 [Galapagos isl.].
*Hæmulon modestum* Tschudi, Fauna Peruana, 11, 1845 [Peru].
*Orthopristis cantharinus* Jordan and Fesler, Rep. U. S. F. C., 1889–91, p. 500 (1893).

*Range.*—Pacific coast of tropical America.

A rare species along the Peruvian coast, according to Tschudi.

## SPARIDÆ.

**60. Doydixodon freminvillei** Valenciennes.

*Doydixodon freminvillei* Valenciennes, Voyage de la Vénus, 323, pl. 5, 1855 [Galapagos].
*Doydixodon fasciatum* Kner und Steindachner, Neue Fische aus Mus. Godeffroy, 3 (Sitz. Ak. Wien, liv, 358, 1866), pl. ii, fig. 2 [Iquique].

*Range.*—Tropical South America.

**61. Doydixodon lævifrons** (Tschudi).

*Pimelepterus lævifrons* Tschudi, Fauna Peruana, 18, 1845 [Huacho].
*Doydixodon lævifrons* Jordan and Fesler, Review of Sparidæ, Rep. U. S. F. C. ('89–'91), 532, 1893; Steindachner, Fauna Chilensis, ii, 289, 1898 [Iquique].

[17] Arch. Neerl., viii, 1872.

*Range.*—Peruvian coast. Tschudi's original description is copied by Jordan and Fesler (*l. c.*).

## SCIÆNIDÆ.

**62. Archoscion analis** (Jenyns).

*Otolithus analis* Jenyns, Zool. Beagle Fishes, 164, 1842 [Callao].

Local name, *Allanque.*

It is the conviction of the writer that no hard and fast lines can be drawn between the genera *Archoscion, Isopicthus* and *Cynoscion* and that their species should come under one generic head, for which the name *Cynoscion* has priority. But in the absence of material for a comparative study of the groups, we are forced to follow precedent in placing this and the two following species under *Archoscion.*

Three examples, length 330 mm. to 350 mm. Head $3\frac{3}{5}$, depth $4\frac{7}{8}$; D. ix–i,24 (23); A. i,15 (14). Eye $6\frac{1}{2}$; interorbital broad, 4 in head; snout $3\frac{3}{4}$.

Body elongate, compressed, back but little elevated. Snout long, lower jaw projecting. Head long, profile straightish, very slightly convex above eyes. Maxillary extending to posterior border of pupil, $2\frac{1}{3}$ in head, its broad distal end about one-half the length of the snout in width. Preorbital narrow, $2\frac{2}{3}$ in eye. Upper anterior canines stout, conical, slightly incurved. The 5 to 7 lateral teeth of the lower jaw enlarged, scattered, about one-third the length of the upper canines. Anterior teeth of lower jaw in two rows, rather small and crowded. Preopercle with a crenulate membranaceous border. Soft flap of opercle extending to or past origin of pectoral. Opercular spines absent. Gill rakers long, slender, 7 + 9.

First dorsal spine very weak, third the longest, $2\frac{1}{4}$ in head. Interdorsal space equal to eye. Origin of second dorsal nearer to caudal than to snout. Pectoral narrow, $1\frac{3}{5}$ in head. Ventrals shorter, about 2 in head. Caudal shallowly lunate.

Scales moderate, 63 pores in lateral line, about 75 transverse rows from opercle to caudal. Lateral lines somewhat decurved under origin of soft dorsal. Head everywhere scaled, except on premaxillary.

Color, dark umber above, lighter on sides, yellowish white below. Sides below lateral line with a great number of small orange spots arranged longitudinally. Posterior margins of scales peppered with dark dots. Upper half of pectoral dark. Ventrals pale. Axil dark.

*Habitat.*—Peru.

**63. Archoscion altipinnis** (Steindachner).

*Ancylodon altipinnis* Steindachner, Ichthy. Notizen, iii, 2, plate 1, fig. 2, 1866 ["West Coast of South America"].

*Archoscion analis* Jordan and Eigenmann, Rep. U. S. F. C., '86, 353, 1889 [Callao].

Although there are no specimens of this species in the Beardslee collection, yet a careful comparison of Steindachner's description and plate, with examples of *C. analis*, indicate conclusively that it is distinct from Jenyn's species. In *analis* the interdorsal space is large, as long as eye, and the two dorsals are not connected. In *altipinnis* the two fins are connected by a low membrane and are presumably close together (distance equal to pupil, Jor. and Eig.). The eye is somewhat smaller in *analis*, being 6 in head to 5 in *altipinnis;* the snout is longer, $3\frac{1}{2}$ in head to $4\frac{1}{2}$ in *altipinnis*, and the depth in the former rather less, $4\frac{7}{8}$ in body, while Steindachner gives $4\frac{1}{3}$. The most important difference seems to lie in the lack of developed opercular spines in *analis*, while the other species has two quite strong spines.

*Habitat.*—Peru, perhaps extending southward.

**64. Archoscion peruanus** (Tschudi).

*Otolithus peruanus* Tschudi, Fauna Peruana, Ichthy., 10, 1845.

This species, which is very closely related to *C. analis*, is known only from the original description. It appears to differ from *analis* in having the second dorsal equidistant from snout and caudal and hardly separated from the first dorsal, while in *analis* the two fins are widely separated and the second is considerably nearer caudal than snout. The ventrals are longer in *peruanus*, reaching past pectorals, while in the former species the pectorals are considerably longer.

Following is Tschudi's original description:

"D. 8–22. A. 15. V. 5. P. 18.

"Verhältniss der Höhe zur Länge 1 : 4, 8, des Kopfes zum Körper 1 : 2, 5. Auge breiter als hoch, steht 1, 6 seines Querdurchmessers von der Schnauzenspitze und viermal seinen Querdurchmesser vom obern Dorn des Vordeckels, einhalbmal seinen Längedurchmesser von der Stirnkante und 1, 5 vom Unterkieferrande. Das Maul ist bis unter die Mitte des Auges gespalten. Die erste Reihe der Oberkieferzähne ist dünn und spitzig, hinter denselben in der Mitte stehen die beiden langen, nach hinten gebogenen sehr scharfen Eckzähne, zu jeder Seite von ihnen befinden sich einige ebenfalls rückwärts gebogene schwächere Zähne. Die mittleren Zähne des Unterkiefers sind klein, spitzig, schwach und ziemlich zahlreich: die seitlichen stark, ziemlich lang, spärlich und von aussen nach innen etwas comprimirt.

" Die Nasenlöcher stehen näher dem Auge als der Schnauzenspitze, das hintere ist grösser, schief, und schmal. Auf dem Deckelwinkel stehen membranöse Zähnchen, der Vordeckel ist einfach mit abgerundetem Winkel.

" Die erste Rückenflosse beginnt etwas hinter den Brustflossen und reicht so weit als diese; zusammengelegt reicht der 2te Flossenstachel bis zu Ende der ganzen Flosse. Der 1ste ist ein Viertheil kürzer als der 2te, vom 4ten nehmen sie schnell an Grösse ab. Die zweite Rückenflosse beginnt in der Mitte der Rückenlänge und erstreckt sich bis zum Ende der Afterflosse. In der vordern Hälfte ist sie beinahe halbmal höher, als in der hintern. Die Afterflosse beginnt hinter der Mitte der zweiten Rückenflosse und ist ziemlich hoch. Die Bauchflosse beginnt wenig weiter nach hinten als die Brustflossen und reicht weiter als diese.

" *Färbung.*—Blaugrau, am Bauche heller, fast gelblich weiss.

" Länge 1′ 3″.

" *Vorkommen.*—An der ganzen peruanischen Küste.

**65. Cynoscion stoltzmanni** (Steindachner).

*Otolithus stoltzmanni* Steindachner, Neue u. seltene Fische, K. K. Zool. Mus. Wien., Denkschrift Ak. Wien, xli, 35, pl. ii, fig. 1, 1879 [Tumbez, Peru].
*Cynoscion stoltzmanni* Jordan and Gilbert, Bull. U. S. F. C., 1881, 320; Jordan and Evermann, Fishes of N. A., 1412, 1898.

*Range.*—Panama to Peru.

**66. Stellifer minor** (Tschudi).

*Corvina minor* Tschudi, Fauna Peruana, Ichth., 9, 1845.
*Sciæna minor* Günther, Cat. Brit. Mus., ii, 295, 1860.
*Stelliferus minor* Jordan and Eigenmann, Review of Sciænidæ, 51, Rep. U. S. F. C., '86, 393, 1889.

Local name, *Mojarrilla.*

Seven specimens, average length 165 mm. Evidently a common species at Callao, but confined to that region.

**67. Stellifer agassizii** (Steindachner).

*Corvina* (*Homoprion*) *agassizii* Steindachner, Ichthy. Beiträge, ii, 26 (Sitz. d. Ak. Wiss. Wien, lxxi, 1875) [Caldera, Callao, Payta].
*Corvina agassizii* Cope, Proc. Amer. Phil. Soc., May, 1877, 26 [Pecasmayu and Chimbote bays].

*Range.*—Coast of Peru.

**68. Sciæna gilberti** Abbott. New species.

In the Review of the Sciænidæ, *Rep. U. S. F. C.*, 1889, p. 59, Jordan and Eigenmann place the Peruvian species *S. deliciosa* by itself under a subgenus *Callaus*. The present species is very closely related to *deliciosa*, and comes under the same subgeneric head. In contrast to other related genera and species, *S. gilberti* and *S. deliciosa* agree in having short and moderate second anal spine, moderately long and numerous gill rakers, and weak preopercular armature. They appear to be most nearly allied to the putative genus *Bola* of Hamilton, differing in not having the upper teeth greatly enlarged. Regarding the two forms as species of the genus *Sciœna*, they stand as a connecting link between those genera with long and slender gill rakers and those with gill rakers short and thick, in that respect approximating *Bairdiella* on the one hand, and *Sciœnops* on the other. *S. gilberti* differs from the other Peruvian species *S. wieneri* in lacking a strongly toothed preopercle and in having a shorter maxillary, larger head and much larger eye.

*Description.*—Head $3\frac{1}{5}$, depth $3\frac{1}{2}$. D. IX–I, 22 (3). A. II, 9. Eye 5, interorbital $3\frac{2}{3}$, preorbital 9 in head, $1\frac{4}{5}$ in eye, maxillary $2\frac{1}{2}$. Lateral line (pores) 55.

Body elongate, elliptical, back not very elevated, profile almost straight, rather low. Snout sharp, $3\frac{3}{4}$ in head. Mouth somewhat oblique, the maxillary extending beyond pupil. Second nasal slit rather short, $3\frac{1}{2}$ in eye. Preopercular serræ weak, flexible, flattened, yet still of a bony nature. No spinous development at lower angle. Lower jaw scaled. Teeth small, in two or three rows, outer row very slightly enlarged in lower jaw, somewhat more so in upper jaw. Mucous slits present but not especially prominent. Gill rakers 8 + 15, equal to, or slightly exceeding the pupil, about $3\frac{1}{2}$ in the second anal spine.

Lateral line following the curve of the back, dipping somewhat under soft dorsal, sometimes sending up a branch at right angles, at base of caudal, which may be continued along the upper margin of the fin. Ventrals almost twice in head reaching about halfway to the vent. Pectorals moderate, about $1\frac{1}{2}$ in head.

Second anal spine about one-half length of longest ray, $2\frac{7}{8}$ in head. Caudal subtruncate, the outer rays somewhat the longer.

Scales above lateral line very oblique, those below in longitudinal series, each scale with a central streak forming narrow parallel stripes. Ground color olivaceous above, darker on head. Silvery below, tinged with rufous. Axil of pectoral dark. Lips thickly speckled with small brown spots.

Type, No. 11,918, Leland Stanford, Jr. Univ. Mus., length 240 mm.

This with *S. deliciosa* is a very important food fish on the Peruvian coast. It gives me much pleasure to name the species for my friend and instructor, Dr. Charles H. Gilbert, to whom my interest in ichthyology is wholly due.

**69. Sciæna wieneri** Sauvage.

> *Sciæna wieneri* Sauvage, Bulletin de la Société Philomathique, July 7, 1883, 156 [Peru].

Known, we believe, only from the original description.

**70. Sciæna deliciosa** (Tschudi).

> *Corvina deliciosa* Tschudi, Fauna Peruana, 8, 1845.
> *Sciæna deliciosa* Jordan and Eigenmann, Review of Sciænidæ (Rep. U. S. F. C., '86), 1889, 401, 406.

Local name, *Lorna.*

One large specimen. Head 3, depth $3\frac{2}{5}$, snout $3\frac{2}{3}$, eye equal to preorbital, $6\frac{1}{3}$. D. X–I, 22. A. II, 9. Scales 55. Length 325 mm.

Compared with *S. gilberti*, *deliciosa* has a much broader interorbital, longer and blunter snout, and hence not quite so steep a profile, longer pectoral and shorter gill rakers. In *gilberti* the nostrils are nearer eye than end of snout; in *deliciosa* they are midway.

**71. Sciæna fasciata** (Tschudi).

> *Cheilotrema fasciatum* Tschudi, Fauna Peruana, Ichth., 13, pl. 1, 1845 [Huacho to Callao].
> *Corvina fasciata* Günther, Cat. Brit. Mus. ii, 305, 1860; Steindachner, Ichth. Notizen, vii, 21, 1868 [Chile].
> *Sciæna fasciata* Jordan and Eigenmann, Review of Sciænidæ, Rep. U. S. F. C. '86, 403, 407, 1889.

*Range.*—Pacific coast of South America.

**72. Genyanemus peruanus** Steindachner.

*Genyanemus peruanus* Steindachner, Ichth. Beiträge, ii, 29 (Sitz. d. k. Ak. Wiss. Wien, 1875).

This species is very plentiful at Payta, rarer at Callao, where it lives on the sandy bottoms.

**73. Umbrina imberbis** Günther.

Beiträge aus dem Museum Godeffroy ; Jour. des Mus. Godeffroy, H. ii, 101, 1874.

Following is the original description of this species. We believe it is not otherwise known:

" Dorsal X–I, 24. Anal II, 9, L. lat. 65.

" Der Bartfaden am Kinn ist auf ein kleines Knötchen zwischen den zwei Paaren von Mandibular-Poren reducirt. Die Höhe des Körpers ist ein Drittel der Totallänge (ohne Schwanzflosse), die Kopflänge zwei Siebentel. Die Schnautze stumpf, abgerundet, über die Mundspalte gewölbt, länger als das Auge, dessen Durchmesser $\frac{1}{6}$ der Kopflänge beträgt. Der Oberkiefer reicht bis unter die Mitte des Auges. Präoperculum schwach gezähnelt. Dorsal Stacheln schwach aber nicht alle biegsam, der dritte der längste. Der zweite Analstachel ziemlich stark und etwas mehr als halb so lang als der erste Strahl. Schwanzflosse leicht ausgeschnitten. Brustflosse nicht viel kürzer als der Kopf. Einfärbig silberig; die Basis der Brustflosse schwärzlich.

" Ein Exemplar von Iquique (Chili) 13 Zoll lang."

## CIRRHITIDÆ.

**74. Cheilodactylus variegatus** Cuvier and Valenciennes.

*Cheilodactylus variegatus* Cuv. and Val., Nat. Poiss., ix, 493, 1833 [Valparaiso] ; Gay, Hist. Chile Zool., ii, 199, 1848.
*Cheilodactylus tschudi* Müller and Tröschel, Hor. Ichth., iii, 25.
*Cheilodactylus cinctus* Tschudi, Fauna Peruana, Ich., 15, taf. 2, 1845.
*Chilodactylus variegatus* Günther, Cat. Brit. Mus., ii, 81, 1862 ; Steindachner, Fauna Chilensis, ii, 290 [Iquique], 1898.

Local name, *Pintadilla.*

Three large specimens. One juvenile. Length 395 mm. and 97 mm.

The fin counts differ from those given by Valenciennes, but the specimens agree in color markings and in other respects with his rather general description. Direct comparison with the type may disclose other differences.

D. XVII, 28. A. III, 10. Head $3\frac{1}{2}$, depth 3, eye $5\frac{3}{4}$ in head. Lateral line 56. Pectoral $4\frac{1}{5}$ in body. Anal 6. Premaxillary spines reaching eye. The juvenile specimen is much darker than the others, almost black.

Valparaiso to Callao.

## POMACENTRIDÆ.

**75. Chromis crusma** (Cuvier and Valenciennes).

> *Heliases crusma* Cuv. and Val., Hist. Nat. Poiss., ix, 377, 1833 [Chile]; Jenyns, Zool. Beagle, 54, 1840; Gay, Hist. Chile Zool., ii, 206, làm. 4, 1848.
>
> *Heliastes crusma* Günther, Fishes Brit. Mus., iv, 61, 1862; Steindachner, Fauna Chilensis, ii, 317, 1898 [Iquique].

Local name, *Congito* or *Conquito.*

Four specimens, length 260–280 mm.

**76. Eupomacentrus latifrons** (Tschudi).

> *Pomacentrus latifrons* Tschudi, Fauna Peruana, Ich., 17, 1845 [Huacho].
>
> *Glyphidodon latifrons* Steindachner, Fauna Chilensis, ii, 316, 1898 [Iquique].

Following Jordan and Evermann (*Fishes of N. A.*, ii, 1,550, 1898), we have placed this species in *Eupomacentrus* on the character of a single row of teeth in each jaw. Following is the original description:

"D. 13–20. A. 2–14. V. 1–5. P. 20.

"Verhältniss der Höhe zur Länge 1:2, 8, des Kopfes zum Körper 1:3, 2. Auge rund, weniger als sein Durchmesser vom vordern Stirnrande und fast zweimal denselben vom Vordeckelrande entfernt; nahe am Stirnrande, dreimal sein Durchmesser vom Unterkieferwinkel.

"Nasenlöcher klein, kreisrund, näher dem Stirnrande als dem Auge. Maul klein, nicht bis zum Auge gespalten. In jedem Kiefer eine Reihe ziemlich gleichmässige schmaler, von vorn nach hinten etwas comprimirter und rückwärts gebogene Zähne. Der verticale Ast des Deckels ist einfach und biegt sich unter rechtem Winkel in dem Queren, welcher nach unten etwas convex ist. Der untere Dorn des Vordeckels ist stärker als der obere, zwischen beiden ist der Deckel stark nach vorn ausgeschnitten.

"Der Kopf ist klein, die Stirn breite und schwach gewölbt, die Rückenkante ziemlich schmal, Stirn, Gesicht und Deckel klein-, der übrige Körper gross beschuppt. Die Flossen, besonders die

After-, Brust- und Schwanzflossen, mit kleinen Schuppen besetzt. Die Seitenlinie geht der Rückenkante sehr hoch nach oben parallel.

" Die Rückenflosse beginnt etwas weiter vorn als die Brustflosse und reicht etwas weniger weit als die Afterflosse. Der 3te bis 6te Flossenstachel sind die längsten, der 1ste, 12te, 13te die kürzesten. Der 5te bis 8te Flossenstrahl sind die längsten. Schwanzflosse in der Mitte stark ausgeschnitten und breit. Die Afterflosse beginnt der weichen Rückenflosse gegenüber, der 2te Stachel ist doppelt so gross und stark als der 1ste, aber doch noch kürzer als der erste Flossenstrahl. Die Bauchflosse beginnt hinter der Brustflosse und reicht nach hinten gelegt bis zur Basis des ersten Afterflossenstrahls. Die Brustflosse beginnt tiefer als der untere Vordeckeldorn und reicht bis zum 10ten Rückenflossenstachel.

"*Färbung.*—Der ganze Körper ist hellgrau, ungefleckt, aber auf dem Rücken rosafarben überlaufen und daher etwas dunkler. Der Bauch in der Mittellinie am hellsten.

" Länge 9″.

" *Vorkommen.*—Wir haben nur wenige Examplare dieser Species in Huacho, nördlich von Lima, erhalten."

## LABRIDÆ.

**77. Pimelometopon canis** (Philippi).

> *Trochocopus canis* Philippi, Sobre los Tiburones de Chile, 38, 1887, lám. vii, fig. 3.

Local name, *Peje-perro.*

The size of the scales evidently places the species under *Pimelometopon.*

*Habitat.*—Iquique.

**78. Pimelometopon darwinii** (Jenyns).

> *Cossyphus darwinii* Jenyns, Voy. Beagle, Fishes, 100, pl. 20, 1842 [Galapagos].
> *Labrus asper* Valenciennes, Voy. de la Venus, Poiss., 338, pl. 8, fig. 1, 1855.
> *Trochocopus darwinii* Günther. Cat., iv, 100, 1862; Steindachner, Fauna Chilensis, 317, 1898 [Iquique].
> *Pimelometopon darwinii* Gill, Proc. Acad. Nat. Sci. Phila., 1864, 59.

## OPLEGNATHIDÆ.

**79. Oplegnathus insignus** (Kner).

> *Scaristoma insigne* Kner, Neue Fische aus Mus. Godeffroy, 7 (Sitz. d. k. Ak. Wiss. Wien, i, pl. ii, 1867).

This species is known only from Kner's description and excellent plate. It is closely related to *O. fasciatus* from Japan (*Scaradon fasciatus* Temminck and Schlegel, *Fauna Japonica*, 89, pl. 46, 1847), specimens of which we have examined, but we are inclined to consider the two species as distinct, although the color pattern and the dentition in *fasciatus* appear to vary with age.

*Habitat.*—"West coast of South America."

## BALISTIDÆ.

**80. Balistes adspersus** Tschudi.

*Balistes adspersus* Tschudi, Fauna Peruana, 31, 1845 [Huacho].

Following is Tschudi's original description:

"D. 3–24. A. 1–20. P. 14.

"Verhältniss der Höhe zur Länge 1:2, 6; des Kopfes zum Körper 1:3. Auge rund, nahe am obern Stirnrande, viermal sein Durchmesser von der Schnauzenspitze, fünfmal denselben vom Unterkiefer entfernt. Maul sehr klein.

"Die vordere Rückenflosse besteht nur aus drei Stacheln; der erste ist dick und lang, auf seiner obern Fläche gezähnelt, der lezte der kleinste und steht etwas abgerückt. Die zweite Rückenflosse beginnt dem After gegenüber; sie bildet ein Dreieck, dessen hinterer Schenkel der längste ist und reicht unbedeutend weiter nach hinten als die Afterflosse. Schwanzflosse fächerförmig nach hinten gewölbt, an den Enden etwas nach vorn eingeschnitten. Die Afterflosse is wie die Rückenflosse, ihr vorderer Ansatz aber etwas weiter nach hinten gerückt. Die Bauchflosse besteht aus *einem* stumpfen, kurzen, mit kleinen Dörnchen besetzten Stachel. Die Brustflosse ist abgerundet, fächerförmig ausgebreitet und sitzt dem ersten Rückenflossenstachel gegenüber am untern Winkel der Kiemenspalte.

"*Färbung.*—Schwarzblau, mit weisslich blauen runden Fleckchen, die an Menge nach dem Bauche hin zunehmen.

"Länge 10″.

"*Vorkommen.*—Das hier beschriebene Exemplar wurde in Huacho gefangen."

## SCORPÆNIDÆ.

**81. Sebastodes darwini** Cramer.

(?) *Sebastes oculata* Jenyns, Voyage of the Beagle, Fish, 37, 1840 [Valparaiso].

*Sebastodes darwini* Cramer, Proc. Cal. Acad. Sci., 1896, p. 240 [Mexillones, Peru]; Jordan and Evermann, Fishes of N. A., ii, 1832, 1897 (copied).

Local name, *Cabrilla*.

An interesting species, originally described from Peru, close to *S. rosaceus*, but less pronounced with respect to spinous development. Not represented in the Callao collection.

*Range.*—Peru and Chile.

**82. Agriopus peruanus** Cuvier and Valenciennes.

*Agriopus peruanus* Cuv. and Val., Hist. Nat., iv, 389, 1829 [San Lorenzo islands]; Gay, Hist. Chile Zool., ii, 181, 1848; Günther, Voyage Alert, Fish, 20, 1881 [W. coast Patagonia]; Steindachner, Fauna Chilensis, 297, 1898 [Iquique].

## BATRACHOIDIDÆ.

**83. Porichthys porosus** Cuvier and Valenciennes.

*Porichthys porosus* Cuvier and Valenciennes, Hist. Nat., xii, 506, pl. 368, 1837 [Valparaiso]; Gay, Hist. Chile Zool., ii, p. 296, 1848; Günther, Shore Fishes, Challenger, 25, 1880 [Valparaiso]; Steindachner, Fauna Chilensis, 306, 1898 [Iquique].

**84. Auchenionchus crinitus** (Jenyns).

*Clinus crinitus* Jenyns, Voy. Beagle, Fishes, 90, pl. 18, fig. 1 [Coquimbo]; Gay, Hist. Chile, ii, 280; Steindachner, Fauna Chilensis, 311, 1898 [Iquique].

(?) *Clinus peruvianus* Cuvier and Valenciennes, xi, 383, 1836 [no definite locality].

*Auchenionchus*, gen. char. Gill, Proc. Acad. Phila., 1860, 103.

## GOBIIDÆ.

**85. Gobiodes peruanus** (Steindachner).

*Amblyopus broussonetii* Günther, Cat. Brit. Mus., iii, 136, 161 [coast of Peru].

*Amblyopus peruanus* Steindachner, Denk. Ak. Wien, xlii, 1880, 94 [Zur Fisch Fauna der Flüsse bei Guayaquil].

*Habitat.*—Peru and Ecuador, coastwise and in streams.

## BLENNIIDÆ.

**86. Labrisomus philippi** (Steindachner).

*Clinus philippi* Steindachner, Ichth. Notizen, iii, 3 (Sitz. Ak. Wiss. Wien, liii, 210, 1866) ["West coast of South America"].

*Clinus fortidentatus* Cope, Proc. Amer. Phil. Soc., 26 (sep.), 1877 [Callao].

Local name, *Frambollo.*

Six specimens, length 260 mm. (circa).

Head $3\frac{1}{2}$, depth 4–5 in body. Eye $5–6\frac{1}{2}$, 2 in snout.

A very voracious fish. The throat and stomach of two of the specimens were gorged with *Stolephorus tapirulus*, fully 100 mm. long. The stomach in each was found full of mollusc shells, sea urchin spines and plates, and small crustaceans, including a good-sized crab with shell unbroken.

87. **Labrisomus microcirrhis** (Cuvier and Valenciennes).

*Clinus microcirrhis* Cuv. and Val., Hist. Nat. Poiss., xi, 384, 1836 [Valparaiso]; Cope, Proc. Amer. Phil. Soc., 1877, 26 [Callao].

*Habitat.*—West coast of South America, from Peru to Chile.

88. **Blennius tetranemus** Cope.

*Blennius tetranemus* Cope, Proc. Amer. Phil. Soc., 1877, 26 [Pecasmayu bay].

89. **Hypleurochilus paytensis** (Steindachner).

*Blennius paytensis* Steindachner, Ichthy. Beiträge, v, 171 (Sitzb. Ak. Wiss. i, lxxiv, 1876), [Payta, Peru].

90. **Scartichthys rubropunctatus** (Cuvier and Valenciennes).

*Salarias rubropunctatus* Cuv. and Val., Hist. Nat. Poiss., xi, 348, 1836 [Juan Fernandez]; Gay, Hist. Chile Zool., ii, 271 [Juan Fernandez]; Steindachner, Fauna Chilensis, 309, 1898 [Juan Fernandez].

*Scartichthys rubropunctatus* Jordan and Evermann, Fishes of North and Middle America, 2396, 1898 [Callao].

Not *Salarias rubropunctatus* Kner, Novara Fische, 198 [Valparaiso].

*Range.*—Coast of South America, from Panama to Chile.

91. **Scartichthys gigas** (Steindachner).

*Salarias gigas* Steindachner, Ichthy. Beiträge, v, 172, (Sitzb. Ak. Wiss. i, lxxiv, 1876), [Callao].

92. **Scartichthys eques** (Steindachner).

*Salarias eques* Steindachner, Fauna Chilensis, 307, Taf. 19, figs. 5, 5a, 1898 [Iquique].

93. **Scartichthys viridis** (Cuvier and Valenciennes).

*Salarias viridis* Cuv. and Val., xi, 344, 1836 [Valparaiso]; Steindachner, Fauna Chilensis, 308, Taf. 19, figs. 6, 6a, 1898 [Iquique].

Local name, *Burracho.*

94. **Ophioblennius semifasciatus** (Kner and Steindachner).

*Blennophis semifasciatus* Kner und Stein., Neue Fische aus Mus. Godeffr. 14, fig. 6 (Sitz. d. k. Ak. Wiss. Wien, 1866) [Iquique].

## TRACHINIDÆ.

95. **Trachinus draco** Linnæus.

*Trachinus draco* Kner, Neue Fische aus Mus. Godeffroy 9 (Sitz. d. Ak. Wiss. Wien, 1 Ab., 1867) [Iquique].

As to the reliability of the presence of this species upon the Peruvian coast, we have only the assurance of Kner that his specimen from Iquique agreed "in allen Punkten" with European specimens. There is, of course, the possibility of a mistake in labelling.

## ECHENEIDÆ.

96. **Remora remora** (Linnæus).

*Echeneis remora* R. A. Philippi, Peces Nuevos de Chile, Anales de la Univ. de Chile, tomo xciii, 1896, p. 376.

Philippi mentions specimens in the National Museum at Valparaiso from Panama, Guayaquil, Iquique, Quinteros and Algarroba, mentioning the fact that the Iquique specimen is somewhat darker than the others.

## GOBIESOCIDÆ.

97. **Gobiesox sanguineus** (Müller and Tröschel).

*Sicyases sanguineus* Müller and Tröschel, Wiegmann Archive, 298, 1843; Günther, Cat. Brit. Mus., iii, 494, 1861 [Valparaiso]; Steindachner, Fauna Chilensis, ii, 315, 1898 [Juan Fernandez and Iquique].

*Gobiesox brevirostris* Gay, Hist. Chile Zool., ii, 335, lám 9, fig. 1.

Local name, *Peje Sapo.*

The four specimens of this large species in the Callao collection are faded in the alcohol, though the fins, head and back are unmistakably red. The belly and sides of the body are a bluish copper marbled with darker. The fin rays showed considerable variation in the four fish counting as follows:

D. 9, A. 5; D. 8, A. 5; D. 9, A. 6; D. 8, A. 6.

Length 140 mm. to 180 mm.

*Range.*—Coasts of Peru and Chile.

98. **Gobiesox marmoratus** Jenyns.

*Gobiesox marmoratus* Jenyns, Voy. Beagle, 140, pl. xxvii, fig. 1, 1842 [Chiloe]; Gay, Chile Zool., ii, p. 336, 1848; Steindachner, Fauna Chilensis, 316 [Iquique, Calbuco, Juan Fernandez].

99. **Arbaciosa pyrrhocinclus** (Cope).

*Sicyases pyrrhocinclus* Cope, Proc. Amer. Phil. Soc., 27, 1877.

Peru [Pecasmayu bay?].

100. **Arbaciosa petersii** (Garman).

*Sicyases petersii* Garman, Proc. Boston Soc. Nat. Hist., xviii, 203, 1876.

Peru.

## PLEURONECTIDÆ.

101. **Paralichthys adspersus** (Steindachner).

*Pseudorhombus adspersus* Steindachner, Ichthy. Notizen, v, 9, pl. ii, (Sitzb. Ak. Wiss. i, lv, 1867), [Chinchas islands].

Not *Paralichthys adspersus* Jordan and Gilbert, Proc. U. S. N. Mus., 1882, 372; Jordan et al., Proc. Calif. Acad. Sci., 1895, 503, and others.

Local name, *Zingua.*

Four specimens. This species has been confused for a long time with the common *Paralichthys* of Mazatlan, from which it is wholly distinct. The Mexican species (*P. sinaloæ* Jordan and Abbott, in *Fishes of N. A.*, Addenda, 2872) has cycloid scales and fewer gill rakers (14 or 13), while in *adspersus* the scales are strongly toothed, and the gill rakers average 16 or 17.

The four specimens at hand are sinistral, glossy black on the eyed side, and show the spots and ocelli peculiar to the species.

D. 68–74. A. 54–56. Length 250 mm. to 320 mm.

*Habitat.*—Coast of Peru.

**102. Etropus ectenes** Jordan.

*Etropus ectenes* Jordan, in Jordan and Goss, Review of the Flounders. Rep. U. S. F. C., 1886, 277 (1889).

Callao, Paraca bay, Peru.

July 11.

Mr. Charles Morris in the Chair.

Eight persons present.

July 18.

Mr. Charles Morris in the Chair.

Ten persons present.

*A New Ampullaria.*—Dr. H. A. Pilsbry spoke of an *Ampullaria* recently collected by himself and Dr. T. H. Montgomery, Jr., in a creek flowing from the Everglades near Miami, Dade County, in southeastern Florida, specimens of the shell being exhibited.

The species, which he proposed to name *Ampullaria miamiensis*, is similar to *A. depressa* Say, of the St. John's river, in size and general contour, but adult shells are remarkably solid and strong, with the peristome heavily thickened, the callus being especially strong at the base of the columella. The color is very dark, with obscure spiral bands, usually more or less lost in the general duskiness in adult individuals.

July 25.

Mr. Charles Morris in the Chair.

Eighteen persons present.

Papers under the following titles were presented for publication:

"Descriptions of Six New American Rabbits," by Gerrit S. Miller, Jr.

"Descriptions of New Mexican Land and Fresh-water Mollusks," by Henry A. Pilsbry.

R. A. F. Penrose, Jr., and Benjamin West Frazier were elected members.

The following was ordered to be printed:

## MORPHOLOGICAL AND SYSTEMATIC NOTES ON SOUTH AMERICAN LAND SNAILS: ACHATINIDÆ.

BY HENRY A. PILSBRY AND EDWARD G. VANATTA.

Dr. H. von Ihering, director of the Museu Paulista, having entrusted to the senior author of this paper a considerable collection of alcoholic preparations of land snails amassed during his residence in Brazil, a beginning of their study is herein made.

It must be regretted by all that von Ihering, urged by the pressure of official duties, could not himself conduct the investigation of this important material; for his large experience with South American forms of life and his genius for dealing with problems of molluscan morphology, would have given an especial value to the work.

Alcoholic specimens of two genera of *Achatinidæ* are present. Neither of them has hitherto been investigated.

### Genus NEOBELISCUS Pilsbry.

Nautilus, x, p. 46 (August, 1896).

Shell solid and strong, large, imperforate, turreted, slowly tapering, several earlier whorls rapidly tapering, forming a conic apex. Whorls about 10, similarly sculptured, convex. Aperture irregularly ovate, the outer lip unexpanded, acute, columella vertical, foldless, its edge narrowly revolute and adnate throughout.

Foot very short and broad, squarely truncated behind; with no appearance of grooves or specialized granulation above the margins; sole undivided.

Genitalia (Pl. XV, fig. 5) without accessory organs, the atrium short. ♂ system with a long, club-shaped penis with strongly folded internal walls, and terminal retractor muscle and vas deferens. Talon (fig. 5*a*, *t.*) large, consisting of a swollen distal portion on a narrow, devious duct of similar length. ♀ system with the vagina rather short, spermatheca oblong, borne on a duct of about double its own length, and remote from the heart. Free oviduct as long as the spermatheca duct. Uterus with thin walls, enormously distended when containing young, two of which occupy it at a time.

Albumen gland (figs. 5, *5a*, *a. gl.*) very small, shorter than the talon and far smaller than the spermatheca. Median moiety of the hermaphrodite duct extravagantly convoluted and knotted.

Viviparous; the shell of the young at birth is nearly one-fourth the length, and exceeds one-third the diameter of adult shells, with half the number of whorls.

Retractor muscle system (Pl. XVI, fig. 9) somewhat resembling that of *Rumina ;* right, left and tail retractors free except at the very insertion, where they are very shortly united. Tail retractor very long; right retractor splitting up distally into (1) numerous anterior and lateral pedal retractors, (2) the retractor of the eye, and (3) the retractor of the penis; left retractor giving rise (1) far anteriorly to the short pharyngeal retractor which is shortly bifurcate anteriorly, and (2) in front of this, splitting into ocular and pedal retractors.

Lung (Pl. XVI, fig. 14) long and narrow, the venation faint, mainly concentrated anteriorly and consisting chiefly of fine parallel veins transverse to the pulmonary vein, which is otherwise unbranched. Heart normal. Kidney more than double the length of the pericardium, quite narrow, its length contained about $3\frac{1}{2}$ times in that of the lung. Ureter retrograde, continued along the gut, closed throughout.

The jaw (Pl. XV, fig. 4) is arcuate, densely striated, under strong magnification showing transverse striolation in its substance, crenulating the vertical striæ.

Radula composed of 44, 1, 44 teeth in slightly bow-shaped rows (Pl. XV, fig. 1). Centrals very narrow, less than one-fourth the width of the adjacent laterals, and bearing no cusps in adult animals. Laterals with the basal plate wide and square, tricuspid, the median cusp broadly conic, not as long as the basal plate, side cusps short and blunt. Marginal teeth with longer and blunt cutting points on the median, and more acute cutting points on the side cusps.

Salivary glands united above. Crop moderately swollen, stomach small, globose.

Type *N.* [*Helix*] *calcarea* Born. Distribution, Brazil and upper Amazon drainage.

### *Affinities of Neobeliscus.*

*Neobeliscus* is a genus full of novel and interesting structures; and while future knowledge of those genera of Stenogyroid *Achatinidæ* of which the soft anatomy is yet unknown will doubtless reduce the number of characteristics peculiar to the genus, it will probably still remain somewhat isolated. The clumsy summit of the shell, very different from the small bulbous nucleus of *Stenogyra obeliscus*, *Rumina decollata* and other large forms, is one of the obvious conchological stigmata.

The dull silken lustre of the shell of the enormous uterine young, produced by dense fine lamellose striæ, and uncut by the spirals which appear on the post-natal growth, is not paralleled in *Stenogyra*, which is glossy at first. But it is in the reproductive organs that the most striking features are seen.

The penis is simple in structure, wanting the peculiar external sheath so characteristic of *Achatina;* but its retractor muscle arises not from the diaphragm as in almost all *Vasopulmonata*, but *from the right tentacular and pedal band.* It would not seem reasonable to question the homology of this penial retractor with the usual one, but how so radical a change of base could have been effected is problematic. We know of no other snail in which the tentacular retractor contributes a fascia to the genital system. The talon (shown partially straightened out in fig. 5*a*, *t.*) is large as in *Callionepion*, but of a different shape. The attached portion of the sperm duct is composed of a dense mass of radiating vermiform tubules or cæca, a detail not drawn in the figure. The uterus in virgin or functionally inactive individuals is shrunken, and lies in numerous deep, regular longitudinal plaits. When carrying young at almost full term it presents the appearance shown in fig. 5, the young lying with the head directed anteriorly, the ventral face toward the sperm duct. The head of the uterine young is retracted; and from the upper surface of the foot, about the position of the operculum in an operculate snail, there arises a flat membrane which spreads over the ventral face of the young shell (Pl. XV, fig. 6, *ap.*). From the hollow base of this placenta-like organ a duct penetrates forward and upward through the tissues of the foot; but from the poor preservation of the infant tissues in our material we could not ascertain what it communicates with. From what was observed it appears likely that the spreading membrane and its duct are analogous to the mammalian placenta and umbilical cord. This probability is enhanced by *the reduction of the albumen gland to a mere rudiment or vestige*, evidently of but slight functional importance, and probably throwing the function of supplying nutriment to the embryo upon the arteries of the uterus.

In the viviparous *Stylodonta* something of the same sort occurs,[1] though I do not know that the albumen gland is obsolete in that genus.

The jaw and teeth are quite what we would expect, though the absence of a cusp on the narrow central is a further specialization in line with the general degeneration of that tooth in *Achatinidæ*. In the radula of a uterine embryo, however, that cusp was found developed (Pl. XV, fig. 2), and all of the cusps, as would be expected of teeth which had never been used, are longer and more acute.

The myology offers some interesting characters. As in *Rumina* (figured for comparison in Pl. XV, fig. 10), the retractor of the pharynx (*ph. r.*) is short and branches from the left retractor band far forward. Unlike *Rumina*, it bifurcates. We regard the branch *br.* of the left retractor band as probably a mere anomaly. It is one of the lateral pedal retractors. All three retractor bands are free to the proximal root, where they are very shortly though firmly united. This is unlike *Rumina*, in which the right retractor and the tail retractor are united for a distance nearly as great as the free length of the latter. The anomalous insertion of the retractor of the penis has already been discussed.

The lung resembles that of *Rumina* (figured in Pl. XVI, fig. 15 for comparison) in the absence of large branches on the pulmonary vein, and the mainly transverse venation, which in *Neobeliscus*, however, is much finer and fainter.

### *History of the Generic Name.*

In regard to the name herein used for the genus, some explanation may be advisable. In a former paper,[2] the senior author proposed the name *Neobeliscus* for the species *calcareus* Born and *cuneus*

[1] See Vigner's paper, or the synopsis given in *Man. Conch.* (2), ix, p. 150.

[2] *Nautilus*, x, 46 (1896).

Pfr. Hitherto they have been grouped together with another series of large species, of which *Helix obeliscus* Moric. is a typical example, under the name *Obeliscus* Beck;[3] but Gray, in 1847, nominated as the type of that group the *Helix obtusata* of Gmelin, a species of Madagascar for which the name *Clavator* was subsequently proposed. *Obeliscus* has also been used by Humphrey[4] in 1797 as a generic name for the *Trochus dolabratus* of Linné, which was later called *Pyramidella* by Lamarck. Clearly, then, we cannot retain the name for these South American snails.

In 1854, Shuttleworth[5] proposed the genus *Stenogyra* to include as subgenera the prior groups *Rumina* Risso (1826), *Obeliscus* and *Subulina* Beck (1837), *Opeas* Albers (1850), and the new subgenus *Pseudobalea*.

These sections, as Shuttleworth terms them, are briefly defined, but no types are mentioned; after which the species of the island of Porto Rico are enumerated: *Stenogyra* (*Opeas*) *subula* Pfr., *Stenogyra* (*Opeas*) *octonoides* C. B. Ad., *Stenogyra* (*Opeas*) *margaritacea* Shuttl., *Stenogyra* (*Opeas*) *alabastrina* Shuttl., *Stenogyra* (*Opeas*) *gomphorium* Shuttl., *Stenogyra* (*Opeas*) *Goodalli* Mill., *Stenogyra* (*Pseudobalea*) *Dominicensis* Pfr., *Stenogyra* (*Obeliscus*) *Swiftiana* Pfr., *Stenogyra* (*Obeliscus*) *terebraster* Pfr., *Stenogyra* (*Subulina*) *octona* Ch., *Stenogyra* (*Subulina*) *acicularis* Shuttl.

No type species was selected, nor did Dr. von Martens name one in treating of the group in the second edition of Albers' *Die Heliceen*. It is obvious that *Stenogyra* cannot replace the older groups mentioned above, but can only be used for some constituent of the mass not already provided with a name. Such a one is found in the so-called *Obeliscus* of Shuttleworth's list; for, as explained above, *Obeliscus* cannot be used in this connection. We would therefore restrict *Stenogyra* to the *Obeliscus* of Shuttleworth's list, taking *S. terebraster* as the type. Other large Antillean species, such as *S. Salleana* of San Domingo and *S. gigas* of Cuba belong here, with probably the larger continental species grouping around *S. obeliscus*. None of the species are known anatomically, but the small apical whorls and more numerous volutions separate them from those now referred to *Neobeliscus*.

[3] *Index Molluscorum*, p. 61 (1837).
[4] *Museum Calonnianum*, p. 24.
[5] *Diagn. Neuer Moll.*, No. 6, Bern. Mittheil., 1854, p. 137.

Compare *S. obeliscus* (Mor.) with *N. calcareus* (Born), or *S. gigas* (Poey) with *N. cuneus* (Pfr.).

### Genus CALLIONEPION nov.

Shell turreted, slowly tapering, with diamond-granulate nepionic shell of about $2\frac{1}{2}$ whorls, retained in the adult, the subsequent whorls differently sculptured. Type species with $9\frac{1}{2}$ moderately convex whorls, apex very obtuse. Aperture ovate, with slightly expanded outer lip, the columellar lip with free expanded edge (as in *Bulimulus* or *Opeas*); columella with a small, rather sharp oblique median fold.

Genitalia (Pl. XV, fig. 8) without accessory organs; atrium short. ♂ system with the penis large, elongate, the vas deferens inserted at its apex, beyond which a hollow tube or sack (fig. 8, *x.*) of unknown nature extends, terminating in a short retractor muscle; talon (*t.*) large, composed of a thick curved basal portion and a slightly longer, narrow terminal part. ♀ system with the vagina short; spermatheca globular, lodged near the heart, its duct long and slender; free oviduct very short, the convoluted portion unusually long; albumen gland well developed. Hermaphrodite duct moderately convoluted.

Apparently oviparous, the young shell when hatched about one-tenth the length and less than one-third the diameter of the adult shell.

The right eye-retractor muscle passes between ♂ and ♀ branches of genital system; the penis retractor muscle is inserted upon the diaphragm.

The jaw is lost, and the radula obtained is frayed at the edges, so that the number of teeth in a transverse row cannot be stated, but it was probably not over fifty. The rachis consists of well-developed teeth, fully as wide as the laterals, with square basal plate and tricuspid reflection, the middle cusp large, though shorter than the basal plate; the side cusps small. In the lateral teeth an inner cusp is absent. Marginals similar, with oblique mesocone, acute small ectocone and short basal plate.

Type *Callionepion Iheringi* n. sp.

*Affinities of Callionepion.*

The peculiar disparity between the sculpture of the nepionic and post-nepionic whorls of the shell (when not obscured by erosion), the free, expanded edge of the columellar lip, and the sharp though small median fold on the columella, are characters sundering *Callionepion* from other South American Stenogyroid genera.

The vagina is much shorter than in *Rumina* (where it equals the length of the spermatheca duct), and the duct of the spermatheca is longer than in *Rumina, Achatina, Neobeliscus* or *Opeas*, being caught with the gut in the loop of the aorta, and consequently the spermatheca lies near the heart, as shown in the diagram annexed to fig. 8*a*.

In the wide teeth of the median row, this genus differs remarkably from all known American *Achatinidæ* of the "Stenogyra" form, departing from the type of dentition nearly universal in the family.

**Callionepion Iheringi** n. sp. Pl. XV, figs. 11, 12, 13.

Shell rimate, turreted, narrow, subregularly tapering; surface glossy, covered with a greenish cuticle, somewhat irregularly plicatulate, decussated by numerous minute spiral striæ or very short cuticular processes, which are lost by wear from the greater part of the shell, and then appear as lightly impressed lines. Whorls $9\frac{1}{2}$, moderately convex, separated by impressed sutures, the apex very obtuse, with depressed tip, surface of the earlier $2\frac{1}{4}$ whorls cut into an evenly granose pattern by close, deep, obliquely descending grooves intersecting at right angles; last whorl rounded at base. Aperture irregularly ovate, slightly oblique, its length contained $3\frac{1}{2}$ times in that of the shell; peristome thin, acute, the outer margin slightly expanded, columellar margin reflexed, dilated, impressed at its insertion, bearing a low, narrow submedian oblique fold. Internal pillar slender and nearly straight, with a low spiral fold within the last whorl.

Alt. 24, diam. 7, length of aperture 6.6 mm.

Alt. 23.5, diam. 7, length of aperture 7 mm.

Piquete, Prov. São Paulo, Brazil (Dr. H. von Ihering).

The peculiar apical sculpture separates this from all other South American Stenogyroid species known to me. When this sculpture is obscured by erosion, as occurs to a greater or less extent in many adult shells, the slightly expanded lip and median fold of the columella are still obvious recognition marks. The type is No. 71,258, coll. Acad. Nat. Sci. Phila.

*Summary.*—The two genera described above are not closely related to forms known anatomically from other regions, and therefore throw no light upon the vexed questions of the alliance of the South American fauna to that of tropical Africa or other regions. They can have no bearing on the hypothetical Antarctica. *Neobeliscus* is the most highly specialized member of the *Achatinidæ* known, and apparently forms no capsule of albumen, but nourishes the embryo directly, as in mammals. The teeth are ultra-achatinoid, and the muscle system aberrant. *Callionepion* is probably an individualized survivor of a primitive achatinoid, retaining the early form of teeth. There is no reason for believing that either genus reached South America from without.

## DESCRIPTION OF PLATES.

### Plate XV.

Fig. 1. *Neobeliscus calcareus* (Born). Teeth of an adult individual. R., rachidian or median tooth; the side teeth are numbered.

Fig. 2. Teeth of a uterine young individual (fig. 7) of the same species.

Fig. 3. *Callionepion Iheringi* n. sp. Teeth. R., rachidian; L., 1; laterals 15, a marginal tooth.

Fig. 4. *Neobeliscus calcareus.* Jaw.

Fig. 5. *Neobeliscus calcareus.* Genitalia of an individual carrying two uterine young, the anterior one about at full term. × $1\frac{1}{4}$. No. 73,455, coll. Acad. Nat. Sci. Phila. *a. gl.*, albumen gland; *atr.*, atrium; *h. d.*, hermaphrodite, or ovisperm duct; *r. r.*, right retractor muscle; *p. r.*, penis retractor; *p.*, penis; *sp.*, spermatheca; *t* , talon; *ut.*, uterus.

Fig. 5*a*. Albumen gland (*a. gl.*), talon (*t.*) and beginning of the hermaphrodite duct (*h. d.*), of the same individual. × 4, the organs separated.

Fig. 6. Uterine young of the same, ventral aspect. *f.*, foot; *ap.*, placenta-like appendage. Somewhat less than natural size.

Fig. 7. Shell of the same. Somewhat less than natural size.

Fig. 8. *Callionepion Iheringi.* Genitalia × $3\frac{1}{4}$. Letters as for fig. 5; *x.*, hollow sack. No. 73,454, coll. Acad. Nat. Sci. Phila.

Fig. 8*a*. Diagram showing the relation of the cephalic branch of the aorta (*ao.*) to the gut ($G^2$, $G^3$) and spermatheca (*sp.*). *H.*, heart.

## Plate XVI.

Fig. 9. *Neobeliscus calcareus.* Free retractor muscles, dorsal aspect. *br.*, branch of left retractor; *l. o. r.*, left ocular retractor; *l. r.*, left retractor; *p.*, penis; *ph.*, pharynx, or buccal mass; *ph. r.*, pharyngeal retractor; *p. r.*, retractor of the penis; *r. o. r.*, right ocular retractor; *r. r.*, right retractor; *r. t. r.*, right tentacular retractor; *t. r.*, tail retractor.

Fig. 10. *Rumina decollata* (L.). Free retractor muscles × 2, dorsal aspect. Lettering as in preceding figure. Specimen from Malta, No. 72,504, coll. Acad. Nat. Sci. Phila. The pharynx and pharyngeal retractor are removed from their normal median position, and placed to the left.

Fig. 11. *Callionepion Iheringi.* Shell, natural size. No. 71,258, coll. Acad. Nat. Sci. Phila.

Fig. 12. Apical whorls of same, much enlarged.

Fig. 13. Aperture of same, enlarged.

Fig. 14. *Neobeliscus calcareus.* Intestine and pallial region, slightly less than natural size. $G^{1-4}$, four folds of the gut; *g. u. r.*, secondary ureter; *H.*, heart; *k.*, kidney; *p. v.*, pulmonary vein; *st.*, stomach; *ur.*, ureter.

Fig. 15. *Rumina decollata.* Intestine and pallial region × 2. *ph.*, pharynx; *s. g.*, salivary gland.

Fig. 16. Pharynx and salivary gland, ventral aspect, × 2, of the same specimen.

Fig. 17. Genitalia, × 2, of the same specimen.

August 1.

Mr. Benjamin Smith Lyman in the Chair.

Nine persons present.

The deaths of J. Blodget Britton and Daniel G. Brinton, M.D., members, were announced.

In compliance with the recommendation of the Committee on the Hayden Memorial Geological Award, the medal and the interest on the fund for 1899 were conferred on Prof. Gilles Joseph Gustave Dewalque, of the University of Liége, Belgium.

The following biographical note was presented with the report:

G. J. Gustave Dewalque, Professor Emeritus of the University of Liége, Belgium, was born at Stavelot, December 2, 1826. He entered the University of Liége, received first prize for a memoir on *The Nature of Chemical Affinity* in 1849 at the University competition. He graduated as a Doctor of Medicine, Surgery and Obstetrics in 1853, and Doctor of Natural Sciences in 1854. The cholera having reappeared, he was made resident physician of the temporary hospital of St. Julien in 1854; then of St. Thomas in 1855. He sought, but without success, the microbe of cholera in the air, but proved the transmission of the malady from man to the dog. He became a member of the Council of Public Health of the province in 1857; General Secretary in 1872; President in 1875, and Honorary President in 1895. He was one of the organizing members of the Malacological Society in 1863, and of the Society of Public Medicine in 1877. He was Chairman of the Committee on Medical Topography from its origin.

He commenced instructing as supplementary Professor of Physics and Chemistry in 1850 at the College of Liége; was made Demonstrator of the course of Human and Comparative Physiology at the University in 1852, and joined with these functions, at the request of A. Dumont, in 1855, those of Conservator of the Mineral Collections and Instructor in Mineralogy and Geology at the School of Mines. The unexpected death of his illustrious master opened to him these chairs in 1857. L. G. de Koninck very shortly thereafter transferred to him the instruction in paleontology. In 1897 he was admitted to the degree of Emeritus.

Having published, for the use of his pupils, an *Atlas of Crystallography* and a *Description of the Crystalline System*, he issued in 1858 the *Prodromus of a Geological Description of Belgium*, a model of clearness, precision and science, which exercised the greatest influence on the study of geology in Belgium.

In 1874 he founded the Geological Society of Belgium, of which he has been the General Secretary from its origin to the year 1898, when the advance of years induced him to retire. He was made Honorary General Secretary, and a medallion in bronze was presented to him with his portrait in profile. He was made Chevalier of the Order of Leopold in 1870, Officer in 1881, and Commander in 1892.

He became a member of the Academy of Science in 1854, was its President in 1870. He is President of the Committee of National Biography (of which he has been a member since its origin in 1860), to which he has furnished more than eighty notices.

In coöperation with the Geological Society, he suggested the preparation of a detailed geological map of Belgium at the expense of the State. This resulted in a suitable recognition of capable geologists, so that in ten or twelve years a map consisting of 226 sheets on a $\frac{1}{40,000}$ scale will have been completed. He translated the *Review of Pyrogenetic Minerals*, of Gurlt (1857); the memoir of Beyrich on the *Tertiary Series of North Germany* (1857); The Chapter of the *Siluria* of Sir Roderick Murchison: *The Paleozoic Terranes of the Rhenish and Belgian Provinces* (1860); *The History of the Names "Cambrian" and "Silurian,"* by the regretted T. Sterry Hunt (1875); and finally the *Paleocene Fauna of Copenhagen*, by A. von Koenen (1886).

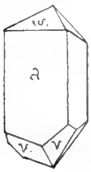
He also made numerous excursions abroad, notably to Devonshire and Wales, which enabled him to establish the correlation of the Cambrian formations of England and Belgium (1873). At the first International Geological Congress, held in Paris in 1879, he was appointed Secretary of the Committee on Classification and Uniformity of Nomenclature, and this appointment was repeated at Bologna, Berlin and London. The reports which he presented to the Congress of Bologna and Berlin are distinguished by impartiality, clearness and method.

On the occasion of his promotion to the grade of Commander he was presented with his bust in white marble. The account of this manifestation of high esteem enumerates twenty-five publications relative to natural or medical sciences, and two hundred and eighty-six concerning the mineral sciences. Some of these latter related to mineralogy and paleontology, notably the description of the fossils of the secondary formations of Luxembourg in collaboration with F. Chapuis, crowned by the Academy in 1851. The greater part are concerned with the geology of Belgium, notably his notes on the Lias, in which he solved the question of the Sandstone of Luxembourg and of Hettange; those on the anthracitic of the Condroz, in which he assigned, after others, but often differently, the Devonian beds to the Eifelian or middle Devonian, and the Famennian or upper Devonian; his discussion with M. Dupont relating to the gaps which that observer admitted in the Carboniferous limestone; on the plicated appearance of the beds of the Ardennes; on the granite of Lammersdorf; on mineral waters, especially of Spa; on the pudding-stone of the Baraque-Michel: the origin of the labors which have demonstrated that the Tertiary (Oligocene) sea covered the Ardennes; on the giant pot-holes of the same region, and finally his remarkable geological map of Belgium and the neighboring provinces on a scale of $\frac{1}{500,000}$, the minuteness of which does not prevent one from realizing the immense progress accomplished since the death of Dumont, in the corrections made on the German map in certain divisions of the Devonian, and in the beds of Daleiden which are represented for the first time.

Prof. Dewalque has also published a coup d'oeil of the advance of the mineral sciences in Belgium (1870); the *Secular Report on the Works of the Academy (Mineral Sciences*, 1872), and the *Catalogue of the Works on Mineralogy, Geology, and Paleontology, together with the Geological Maps which are found in the Principal Libraries of Belgium*, issued by the Geological Society in 1884.

*Monazite in Delaware County, Pa.*—MR. S. HARBERT HAMILTON stated that the occurrence of crystals of Monazite in the feldspar of the ancient rocks of eastern Pennsylvania had been reported to the Students' Mineralogical Club by Mr. J. Glading Dailey.

Monazite has been noted previously from several localities in the crystalline rocks of the Atlantic coast, but never before from Pennsylvania. The particular locality discovered by Mr. Dailey is in the quarry just below Morgan's Station on the southeast side of Chester creek, about five miles from the city of Chester. The associate minerals are magnetite, hematite, green mica, quartz and a flesh-colored feldspar in which the crystals, about one-quarter of an inch in length, were observed. Two or three perfect crystals were found and a quantity of fragments. Mr. Dailey has subjected his find to the following examination:




"The best crystals were examined with the aid of a polariscope, and what appeared to be parallel extinction was observed, thus excluding the possibility of its being distorted garnet, which had been suggested, and it apparently confined the crystallization to practically tetragonal or orthorhombic; but upon looking up Monazite, which had been suggested, the angles of extinction were found to very nearly approach right angles; thus the apparent parallel extinction of a monoclinic mineral was explained. Measurements (rough, to be sure, for the surfaces did not permit the reflection of a well-defined image) were made with the reflecting goniometer of two angles, one of which was an essential angle. For angle *a w*, which according to Dana is 39° 12′ 30″, was found 39° and about 19′, and angle *v v*, which should be 73° 19′ 00″, was found about 73° 30′.

A qualitative chemical analysis was thought necessary to insure and corroborate the above. The pulverized fragments were taken to dryness with hydrochloric acid, taken up with water and precipitated with oxalic acid. This precipitate gave upon ignition the peculiar red color of the cerium group. Another portion of powder upon fusion with white flux and solution in nitric acid gave with ammonium molybdate the characteristic reaction for phosphorus.

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## August 8.

Mr. Benjamin Smith Lyman in the Chair.

Six persons present.

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## August 22.

Mr. Benjamin Smith Lyman in the Chair.

Six persons present.

A paper entitled "New Species and Varieties of Mollusks from

Miami, Florida," by Henry A. Pilsbry, was presented for publication.

The death of W. D. Hartman, M.D., a correspondent, was announced.

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AUGUST 29.

MR. BENJAMIN SMITH LYMAN in the Chair.

Nine persons present.

*Confirmation of the Generic Characters of Ashmunella.*—DR. PILSBRY stated that living specimens of a new form of *Ashmunella* (*A. thomsoniana porteræ* Pils. & Ckll.) had been found recently by Miss Wilmatte Porter, one of Prof. Cockerell's pupils. It proves to be similar in anatomy to the type of the genus, thus confirming the generic diagnosis.

The following were ordered to be printed:

## DESCRIPTIONS OF SIX NEW AMERICAN RABBITS.

BY GERRIT S. MILLER, JR.

The collection of rabbits in the United States National Museum contains the following hitherto undescribed forms, all from parts of America north of Panama. I publish this paper here by permission of the Secretary of the Smithsonian Institution.

### Subgenus **MACROTOLAGUS** Mearns.

**Lepus asellus** sp. nov.

*Type* adult ♀ (skin and skull), No. $\frac{20,895}{36,009}$ United States National Museum, collected at the city of San Luis Potosi, Mexico, October 22, 1891, by P. L. Jouy. Original number, 270.

*General Characters.*—In size and color most like *Lepus merriami* Mearns, but tail shorter and ears much longer, the latter fully equalling those of the largest *L. texianus.* Nape scarcely darker than back. Skull slightly heavier than in *Lepus merriami,* the nasals broader, and the audital bullæ larger.

*Color.*—Back an irregular grizzle of black and white, darker along median line. Sides and rump slightly paler than back. Tail entirely clear black above, grayish white beneath. The black caudal area is continued forward over rump, gradually becoming narrower, and finally disappearing about 80 mm. from base of tail. Nape like back, only more finely grizzled. A small dusky area immediately behind base of ear. Ears broccoli brown, paler behind, rimmed with buff. The buff rim is continuous except where interrupted by the black tip. It is paler along outer margin (near base of which it becomes nearly white), and darker along inner margin, where the hairs are noticeably lengthened. Tip of ear black, the dark area about 40 mm. long and at base 25 mm. in width. It lies mostly on the outer half of the ear. Posterior base of ear blackish for about 20 mm. Crown of head like back, but more closely grizzled. Cheeks like sides. An indistinct, narrow, pale area surrounding eye. Chin, upper part of throat and whole of belly white, very faintly tinged with bluish gray. Neck ruff well developed, buff sprinkled with a few blackish hairs.

Legs light smoke gray tinged with bluish gray on inner side of thighs and with broccoli brown on front feet and forearms. Hind feet whitish above. On the front legs the white of the belly extends in a narrow line to wrist; on the hind legs to feet.

*Skull and Teeth.*—The skull of *Lepus asellus* is about the size of that of *L. merriami* or the small races of *L. texianus*. It is conspicuously smaller than that of *Lepus allini* or *L. texianus texianus*. In form it differs from the skull of *L. merriami* in its broader, deeper rostrum, broader nasals, wider interpterygoid fossa, longer, slightly narrower basioccipital, and slightly larger audital bullæ.

*Measurements.*—External measurements of type (from fresh specimen by collector): Total length, 558; tail vertebræ, 62; hind foot, 120; ear from crown, 175.

Cranial measurements of type: greatest length, 100; basal length, 84; basilar length, 78; henselion[1] to posterior edge of bony palate (median), 37; least (lateral) length of bony palate, 7; posterior edge of bony palate to hamular, 21; length of incisive foramen, 26; width of incisive foramina, 10.4; zygomatic breadth, 44; interorbital breadth (inclusive of supraorbital processes), 30; greatest breadth of braincase, 32.4; breadth of rostrum at base of zygomata, 27; greatest (diagonal) length of nasals, 43; greatest breadth across both nasals, 22; least breadth across both nasals, 15.4; depth of brain case at anterior end of basioccipital, 30; diastema, 28.4; maxillary molar series (alveoli), 16.8; mandible, 74; diastema, 23; mandibular molar series (alveoli), 17.

*Specimens Examined.*—I have seen only the type of this species.

*General Remarks.*—*Lepus asellus* is readily distinguishable from *L. merriami* by its somewhat smaller size, relatively as well as actually much longer ears, and gray nape. From the Mexican *Lepus callotis*, two specimens of which Mr. Jouy collected at Guadalajara, Jalisco, it is instantly recognizable by its black-tipped ears and gray (not whitish) sides.

Although four names have been based on Mexican jackrabbits, it is easily shown that all refer to animals with white-tipped ears, not in the least like *Lepus asellus*. Presumably the first of these is *Lepus callotis* Wagler (*Nat. Syst. der Amphibien mit voran-gehender Classif. der Säugeth. und Vögel*, p. 23, 1830). The

[1] Post-incisive homologue of gnathion.

description of the animal is very brief, but positive reference is made to the white outer surface of the ears.[2] Another name published in 1830 is the *Lepus mexicanus* of Lichtenstein (*Abhandl. K. Akad. Wissensch. Berlin* (1827), p. 101, 1830). This is based on a Mexican specimen collected by Deppe, but, as in the case of Wagler's *L. callotis,* no definite type locality is mentioned. The author, referring to Hernandez, "*Citli* sive *Lepus,*" remarks that the description of this animal is so brief that it has been hitherto overlooked, but that it nevertheless refers to a well-marked species characterized by the extreme length and breadth of the ears. "Had he but added," Lichtenstein continues, "that these ears are dark colored on their anterior half, and on the posterior, less conspicuous part wholly white, the two colors sharply divided at the middle line, he would have sooner directed attention to an animal that first reached Europe in a shipment from Mr. Deppe, and which is deposited in our museum under the name *Lepus mexicanus.*"[3] This description leaves no doubt that Lichtenstein had in hand a member of the white-eared *callotis* group. Three years later the same animal or a closely related form was described as *Lepus nigricaudatus* by Bennett (*Proc. Zoöl. Soc. London,* I, p. 41, 1833). Concerning the ears of this species the account reads: "These are in front mixed black and yellow, giving a grizzled appearance; on the hinder part they are entirely ochraceous for about two-thirds of the length of the ear, the terminal third, as well as the tip and the hinder fringe, being white. . . . ." This is one of the species "obtained by the [Zoölogical] Society from that part of California which adjoins Mexico." Whatever it may be, it is evident that it is not the animal that I have called *Lepus asellus.* The last of the names which need to be considered here is the *Lepus flavigularis* of Wagler (Schreber's *Säugethiere,* Supplementband, Abth. iv, p. 106, 1844). It is based on a specimen from no certain locality. While there is some doubt as to the

[2] ". . . . auribus longissimis extus albis . . . ."

[3] Hätte er noch hinzugefügt, dass diese Ohren in ihrer vordern Hälfte dunkel gefärbt, in der hinteren (weniger zum Vorschein kommenden) völlig weiss sind und dass beide Farben in einer geraden Mittellinie sich unmittelbar und scharf begränzen, so würde er die Aufmerksamkeit früher auf ein Thier gelenkt haben, das in Herrn Deppe's Sendungen zum erstenmal nach Europa gekommen und in unserm Museum unter dem Namen *Lepus mexicanus* aufgestellt ist.

identity of *Lepus flavigularis* with *L. callotis* there can be no question as to its distinctness from *L. asellus*, since the ears are said to be wholly yellowish on the outer side.[4]

Subgenus **MICROLAGUS** Trouessart.

**Lepus bachmani ubericolor** subsp. nov.

*Type* adult ♂ (skin and skull), No. $\frac{19.964}{35.371}$ United States National Museum, collected at Beaverton, Oregon, February 25, 1890, by A. W. Anthony.

*General Characters.*—Darker and redder than *Lepus bachmani bachmani*[5] from California.

*Color.*—General color throughout (except as otherwise described) a fine grizzle of reddish brown[6] and black, the black slightly more conspicuous on back, the brown paling a little on sides, especially at flanks and shoulders. Nape patch small and inconspicuous, dull cinnamon in color. Ears blackish, heavily sprinkled with broccoli brown externally and frosted with whitish internally, and at base. Near edge of inner surface of ear there is a strong sprinkling of wood brown. Belly, chin and upper part of throat dull cream buff. Chest and lower throat light wood brown. Legs like sides. Dorsum of manus and pes dull white *heavily sprinkled with brown.* Tail dull brown throughout, sprinkled with color of back above, and with dull white beneath; the extreme base inconspicuously clear, dull white.

*Skull and Teeth.*—The skull and teeth exactly resemble those of *Lepus bachmani bachmani*, except that they appear to be slightly larger throughout, and the audital bullæ may be relatively somewhat smaller.

*Measurements.*—External measurements of type (from dry specimen, a well-prepared skin): Total length, 280; tail vertebræ, 15; hind foot, 75; ear from crown, 55.

Cranial measurements of type: Greatest length, 67; basal length, 57; basilar length, 52; henselion to posterior edge of palate (me-

[4] "Auch an den Ohren hat das Gelbe die Oberhand ; die ganze Aussenseite ist gelb behaart, ohne den grossen weissen Fleck, der den *L. callotis* var. 1 auszeichnet ; nur die Spitze und der innere Rand sind mit einem weissen, der äussere mit einem ochergelben Haarsaume eingefasst" (p. 107, footnote).

[5] *Lepus bachmani* Waterhouse, *Proc. Zoöl. Soc. London*, p. 103 (not *L. bachmani* of Baird, 1857, and authors from 1857 to 1898) = *Lepus trowbridgei* Baird, 1857.

[6] The exact shade is intermediate between the wood brown and russet of Ridgway (*Nomencl. of Colors*, pl. III, figs. 16 and 19).

dian), 25.4; posterior edge of bony palate to hamular, 14; length of incisive foramen, 16; width of incisive foramina, 7; zygomatic breadth, 32; interorbital breadth (exclusive of supraorbital processes), 11.6; greatest breadth of brain case, 25.6; breadth of rostrum at base of zygomata, 18.8; greatest (diagonal) length of nasals, 18.4; greatest breadth across both nasals, 12.6; least breadth across both nasals, 8.6; depth of brain case at anterior end of basioccipital, 21.4; diastema, 18; maxillary molar series (alveoli), 13; mandible, 48.6; diastema, 14; mandibular molar series (alveoli), 13.

*Specimens Examined.*—Two, both from the type locality.

*General Remarks.*—*Lepus bachmani ubericolor* is a typical 'northwest-coast form,' differing from the Californian phase of the species in richer, more abundant pigmentation.

### Subgenus **SYLVILAGUS** Gray.

In the absence of positive knowledge of the relationships of the cottontails, I have treated the four forms here described as subspecies of *Lepus floridanus*.

### Lepus floridanus yucatanicus subsp. nov.

1877. *Lepus aquaticus* Allen, Monogr. N. A. Rodentia, p. 365, (part). Not of Bachman, 1837.

1890. *Lepus sylvaticus aztecus* Allen, Bull. Am. Mus. Nat. Hist., iii, p. 191, December 10, 1890. Not of Allen, *ibid.*, p. 188.

*Type* adult ♀ (skin and skull), No. $\frac{11441}{37772}$ United States National Museum, collected at Merida, Yucatan, February 22, 1865, by A. Schott. Original number, 207.

*General Characters.*—Closely related to *Lepus floridanus aztecus* (Allen), from Tehuantepec, but larger and darker. Skull with disproportionately large audital bullæ.

*Color.*—Back a uniform coarse grizzle of black and light buff, the latter slightly predominating. On the sides and rump the buff becomes paler and the black less conspicuous, producing a very slightly paler grizzle. Under fur on back bluish gray, becoming distinctly brownish at tip. On the rump the basal color of the under fur is paler and the terminal half of the hairs (10 mm.) becomes bright cinnamon rufous, imparting to the fur of the region a distinct reddish cast. Tail (imperfect in the type, but complete in other specimens) white beneath, dull, grizzled, reddish brown above. Nape patch clear bright cinnamon rufous. Ears gray, on the outer surface blackening on the terminal fourth and along anterior edge. Extreme anterior margin fringed with pale buff. This border is continuous through whole periphery of ear, but is broadest and composed of the longest hairs through lower anterior half. Inner surface of ear thickly sprinkled with fine whitish hairs. Crown of head slightly darker than back. Cheeks paler than sides, but strongly shaded with black. A conspicuous whitish area surrounding eye and broadening posteriorly to a width of about 10 mm. Chin and upper part of throat dull white. Chest and lower throat ochraceous buff, darkened by a sparse sprinkling of black tipped hairs. The hairs of this buff area are slightly lengthened to form an inconspicuous ruff. Legs cinnamon rufous, the gray of the sides extending over most of outer side of thigh, but scarcely reaching below shoulder. White of belly extending down inner side of hind leg and covering dorsum of pes. On front leg it extends as a narrow band on inner side to carpus. Belly dull white, strongly tinged with buff on chest.

*Skull and Teeth.*—The skulls of *Lepus floridanus yucatanicus* average slightly larger than those of *L. floridanus aztecus,* and the zygomatic arches are relatively deeper and heavier. Otherwise I can see no tangible differences in general form. Audital bullæ considerably larger and more inflated than in *L. floridanus aztecus.*

*Measurements.*—External measurements of type : Total length, 430 mm. (estimated, skin stretched); hind foot, 198; ear from crown, 71. Average of five specimens, including the type: Total length, 412 (400–430); tail vertebræ, 33.5 (33–34); hind foot, 92 (85–98); ear from crown, 73.5 (68–75). These measurements are taken from badly prepared skins, and are only approximately reliable.

Cranial meaurements of type: Greatest length, 82 mm.; basal length, 64; basilar length, 62; henselion to posterior edge of bony palate (median), 33; least (lateral) length of bony palate, 7.8; posterior edge of bony palate to hamular, 17; length of incisive foramen, 21; width of incisive foramina, 9.4; zygomatic breadth, 39; interorbital breadth (inclusive of supraorbital processes), 20; greatest breadth of brain case, 29; breadth of rostrum at base of zygomata, 22.6; greatest (diagonal) length of nasals, 37; greatest breadth across both nasals, 16; least breadth across both nasals

10; depth of brain case at anterior end of basioccipital, 26; diastema, 23.6; maxillary molar series (alveoli), 14; mandible, 62; diastema, 19; mandibular molar series (alveoli), 14.6.

*Specimens Examined.*—Six, all from the type locality.

*General Remarks.*—*Lepus floridanus yucatanicus* and *L. floridanus aztecus* resemble each other rather closely, but differ in easily recognizable characters. *Lepus floridanus aztecus* is the smaller animal of the two, with blacker back, more buffy sides and clearer gray cheeks. The cranial differences between the two forms are well marked. It is highly probable that these red rumped animals are specifically distinct from *Lepus floridanus.*

**Lepus floridanus subcinctus** subsp. nov.

*Type* adult ♀ (skin and skull), No. $\frac{20,435}{35,665}$ United States National Museum, collected at Hacienda El Molino, near Negrete, Michoacan, Mexico, June 15, 1892, by P. L Jouy. Original number, 415.

*General Characters.*—Most like *Lepus floridanus chapmani* Allen, from Corpus Christi, Texas, but slightly larger, the ears longer, and color of under parts duller. Color of sides strongly encroaching on dull white of belly and almost dividing it immediately in front of hind legs. Skull slightly larger than that of *L. floridanus chapmani,* but not appreciably different in form.

*Color.*—Back a uniform grizzle of black and buffy white, the latter slightly predominating. On the sides and rump the white becomes clearer and the black less conspicuous, thus producing a paler grizzle slightly contrasted with that of back. Under fur on back light, bluish gray with scarcely noticeable brownish tips. On rump the basal color is slightly paler and the tips of the hairs for about 5 mm. are pinkish buff. Tail, snowy white beneath, hair brown grizzled with whitish above. Nape patch light cinnamon. Ears uniform gray faintly tinged with buff on inner surface, and narrowly rimmed with blackish along external anterior border near tip. Lower half of anterior border fringed with lengthened white hairs. Crown of head like back, but slightly yellower. Cheeks like sides of body, and distinctly shaded with black below and behind eye. A whitish eye ring. Chin and upper part of throat dull white, strongly darkened by the bluish gray bases of the hairs. Chest and lower throat cream buff, darkened by a sparse sprinkling of black-tipped hairs as well as by the gray under fur; the hairs of the buff area lengthened to form an inconspicuous ruff. This buff area extends backward to include front legs and form a narrow but distinct line of demarkation between color of sides and that of belly. Legs ochraceous buff tinged with cinnamon on outer side and suffused with white on inner side and on upper side of feet. Hind leg paler than front leg. Belly *dull white*, the white area much narrower than in the ordinary forms of the species, and nearly interrupted by an incomplete, dull buff girdle immediately in front of the hind legs.

*Skull and Teeth.*—Except for its greater size, the skull of *Lepus floridanus subcinctus* does not differ appreciably from that of *L. floridanus chapmani.*

*Measurements.*—External measurements of type (from fresh specimen by collector): Total length, 434; tail vertebræ, 47; hind foot, 86; ear from crown, 76.[7] Average of three specimens including the type:[8] Total length, 423 (400–435); tail vertebræ, 43 (42–47); hind foot, 87 (86–88); ear from crown, 74 (71–76).

Cranial measurements of type: Greatest length, 76; basal length, 62; basilar length, 58; henselion to posterior edge of bony palate, 28; least (lateral) length of bony palate, 6; posterior edge of bony palate to hamular, 18; length of incisive foramen, 18; width of incisive foramina, 7.8; zygomatic breadth, 35; interorbital breadth (inclusive of supraorbital processes), 19; greatest breadth of brain case, 18; breadth of rostrum at base of zygomata, 20.4; greatest (diagonal) length of nasal, 34.8; greatest breadth across both nasals, 16; least breadth across both nasals, 9; depth of brain case at anterior end of basioccipital, 24; diastema, 20.4; maxillary molar series (alveoli), 14; mandible, 58; diastema, 17; mandibular molar series (alveoli), 12.

*Specimens Examined.*—Three, all from the type locality.

*General Remarks.*—*Lepus floridanus subcinctus*, though closely related to *L. floridanus chapmani*, is readily distinguishable by its longer ears. In color the two forms are essentially alike, but the Mexican animal is slightly more dull, especially on the belly. On

[7] In the dry specimen the ear has shrunk to 70 mm.

[8] Four topotypes of *Lepus floridanus chapmani*, measured in flesh by collector (ear excepted), average: Total length, 393 (390–400); tail vertebræ, 38.2 (37–40); hind foot, 79 (76–83); ear from crown, 55 (52–57).

the other hand it has more gray in the rump, which is distinctly aler than the tail, while in *L. floridanus chapmani* rump and tail are of essentially the same color.

**Lepus floridanus caniclunis** subsp. nov.

*Type* adult ♂ (skin and skull), No. 63,137, United States National Museum, collected at Fort Clark, Texas, December 27, 1892, by Edgar A. Mearns. Original number, 2,172.

*General Characters.*—Like *Lepus floridanus chapmani* Allen, but slightly paler throughout; sides, rump and upper surface of tail conspicuously paler, and white of belly pure and not encroached upon by color of sides.

*Color.*—The color is so much like that of *Lepus floridanus subcinctus* that no detailed description is necessary. The pale band on the hairs of the back is very slightly lighter, but the black tips are considerably less abundant. This is true throughout the dorsal and lateral surfaces. Head and ears distinctly paler than in *subcinctus*. Rump and tail conspicuously paler, the difference produced partly by a reduction in the number of black-tipped hairs, but more especially by lightening the brown terminal band of the under fur to ecru drab. Throat ruff, slightly paler than in *subcinctus*. White of belly clear and pure throughout, not in the least encroached upon by the color of the sides, as in the case of *L. floridanus subcinctus* and *L. floridanus chapmani*. Color of sides fading abruptly into that of belly without intervention of buff lateral line.

*Skull and Teeth.*—The skull of *Lepus floridanus caniclunis* is slightly smaller than that of *L. floridanus subcinctus*, but it differs in no way in form. It is indistinguishable from the skull of *L. floridanus chapmani*.

*Measurements.*—External measurements of type (from fresh specimen by collector): Total length, 395; tail vertebræ, 52; hind foot, 87; ear from crown, 72. Average of ten specimens from type locality: Total length, 382 (365–400); tail vertebræ, 57.8 (50–67); hind foot, 85.4 (80–90); ear from crown, 68.9 (64–72).

Cranial measurements of type (measurements in parenthesis are those of a topotype of *L. floridanus chapmani*, No. 2,982, American Museum of Natural History): Greatest length, 66 (64.6);

basal length, 54 (54); basilar length, 50 (50); henselion to posterior edge of bony palate (median), 25 (25.4); least (lateral) length of bony palate, 5.8 (6.4); posterior edge of bony palate to hamular, 15.4 (—); length of incisive foramen, 16.4 (16); width of incisive foramina, 6.8 (7); zygomatic breadth, 33 (33); interorbital breadth (inclusive of supraorbital processes), 16.4 (17); greatest breadth of brain case, 27 (27); breadth of rostrum at anterior base of zygomata, 7.6 (9); greatest (diagonal) length of nasals, 29.2 (29); greatest breadth across both nasals, 14 (15); least breadth across both nasals, 8.4 (8.4); depth of brain case at anterior end of basioccipital, 22.8 (22.6); diastema, 18 (18); maxillary molar series (alveoli), 12.4 (12 4); mandible, 49 (49); mandibular molar series (alveoli), 13.6 (12.6).

*Specimens Examined.*—Twelve, all from the type locality.

*General Remarks.*—*Lepus floridanus caniclunis* agrees with *L. floridanus chapmani* in its small size, but differs in much paler color—therefore in exactly the opposite direction from the dark *L. floridanus alacer* Bangs. Its most striking peculiarity, as compared with its nearest allies, is its very pale rump and tail.

**Lepus floridanus sanctidiegi** subsp. nov.

*Type* adult ♀ (skin and skull), No. 60,668 United States National Museum, collected at monument No 258 (Pacific Ocean), Mexican boundary line, San Diego County, California, July 10, 1894, by Edgar A. Mearns.

*General Characters.*—Like *Lepus floridanus auduboni* Baird, but color paler throughout and belly pure white. Ears probably longer than in true *auduboni.*

*Color.*—Back a uniform grizzle of black and light cream buff, the latter slightly predominating. On the sides the buff becomes even paler, while the amount of black is noticeably reduced. On the rump the buff fades abruptly to whitish gray, producing a small but well-defined pale rump patch. Under fur on back light bluish gray, changing to dull wood brown at tip. Long hairs of back bluish gray at base, darkening to nearly black close below broad subterminal cream buff band, and black at tip. Tail dark brown above, the hairs inconspicuously paler tipped; snowy white beneath. Nape patch clear ochraceous buff, slightly more tawny than the figure given by Ridgway (*Nomencl. of Colors,* pl. v, fig. 10). The nape patch is very large, extending back as far as the point reached by the tips of the ears, and even suffusing the fur for a short distance beyond. It also extends on each side of the neck to angle of jaw. Ears gray internally and externally, blackening at tip outside, and margined with whitish. Lower half of ear distinctly paler than crown of head, and wholly without dusky shading. Crown of head about like back, but more finely grizzled. Cheeks slightly browner than sides of body, not darker posteriorly than anteriorly. A dull whitish eye ring, nearly interrupted above and below. Chin and upper part of throat white, faintly tinged with plumbeous. Chest and lower throat cream buff. Legs ochraceous buff, the white of belly extending to back of hind feet, and to wrists. Dorsal surface of front feet cream buff. Back of thighs suffused with cream buff. Belly pure white, faintly tinged with plumbeous.

*Skull and Teeth.*—Having no skulls of *Lepus floridanus auduboni* at hand, I am unable to compare that of the present race with its nearest relative. As compared with that of *L. floridanus holzneri* (Mearns) the skull as a whole is slightly smaller, the brain case is relatively broader and shorter and the audital bullæ are perceptibly larger.

*Measurements.*—External measurements of type (from fresh specimen by collector): Total length, 385; tail vertebræ, 63; hind foot, 85; ear from crown, 78.

Cranial measurements of type: Greatest length, 69; basal length, 56; basilar length, 52; henselion to posterior edge of bony palate, 26; least (lateral) length of bony palate, 5.4; posterior edge of bony palate to hamular, 16.4; length of incisive foramen, 18; width of incisive foramina, 6; zygomatic breadth, 33; interorbital breadth (inclusive of supraorbital processes), 19; greatest breadth of brain case, 25; breadth of rostrum at anterior base of zygomata, 16; greatest (diagonal) length of nasals, 29; greatest breadth across both nasals, 13.6; least breadth across both nasals, 8.4; depth of brain case at anterior end of basioccipital, 23; diastema, 18.4; maxillary molar series (alveoli), 12.8; mandible, 50; diastema, 15; mandibular molar series (alveoli), 13.6.

*Specimens Examined.*—Twenty-five, all from the extreme southern part of San Diego County, California, and adjacent Lower California.

## DESCRIPTIONS OF NEW SPECIES OF MEXICAN LAND AND FRESH-WATER MOLLUSKS.

BY HENRY A. PILSBRY.

During February, March and April of this year, Mr. and Mrs. S. N. Rhoads made a journey through parts of eastern and central Mexico, their chief object being zoölogical investigation and collecting. Their researches were mainly confined to the States of Vera Cruz, Mexico, Michoacan and Nuevo Leon.

The mollusks collected, especially those from the State last named, prove to be of considerable interest, and a full report will be prepared later. Meantime the following forms, recognized as new, may be described:

**Schazicheila fragilis** n. sp.

Shell subglobose, about the form of *S. alata* Mke.; thin, rather fragile, reddish; the spire conoidal; whorls 4, the last rounded at the periphery, impressed in the center below. Sculpture of very numerous short cuticular spiral liræ. Aperture semicircular, slightly oblique, with a very slight sinus above; peristome thin, slightly expanded; columellar callus thin and small. Alt. 4.5, diam. 6 mm.

Diente, near Monterey, State of Nuevo Leon, Mexico.

Differs from *S. alata* and *S. pannucea* in the smaller size, more fragile texture, and the very much shallower notch at the upper termination of the outer lip. It is a far smaller species than *S. nicoleti* Shuttl. or *S. hidalgoana* Dall. I do not know of any description of "*S. minima* Pfr.," figured by Strebel on Pl. 3, fig. 6, of the *Beitrag Mex. Land- und Süsswasser-Conchylien*, Heft IV, but the figures, though insufficient for identification in the absence of text or locality, look considerably like *S. fragilis*. About twenty specimens were collected, part of them quite fresh, but without opercula.

**Schazicheila vanattai** n. sp.

Shell thick lens-shaped, rather low conoid above, convex below the strong peripheral carina, reddish brown, rather thin. Whorls

4, the first red or corneous, somewhat projecting, the rest but slightly convex, more or less encrusted, but showing no cuticular fringes, merely very fine spiral lines in well-preserved specimens: the last whorl keeled throughout, somewhat impressed in the center below. Aperture slightly oblique, semioval; peristome thin, slightly expanded, with a small, moderately deep sinus above. Umbilical callus thin. Operculum unknown.

Alt. 5.5, diam. 6.8 mm.

Alt. 4.3, diam. 6 mm.

Diente, near Monterey, with *S. fragilis*.

Distinct by its strong peripheral keel. Named in honor of Mr. E. G. Vanatta, whose assistance in the identification of the present collection is hereby acknowledged.

**Valvata humeralis**, var. **patzcuarensis** n. v.

This name is applied to the form from Lake Patzcuaro, noticed in my paper on the shells of the Academy Expedition, these *Proceedings*, 1891, p. 326. It is larger, far more robust and elevated than *V humeralis;* there is no angulation or shoulder on the upper surface of the whorls; and the umbilicus is decidedly smaller. *V. strebeli* C. and F., based upon *V. humeralis* Strebel, differs in the less elevated and robust form, larger umbilicus, and judging from Strebel's figures, the greater interruption of the circular aperture by the penultimate whorl. A specimen of var. *patzcuarensis* measures: Alt. 5, diam. 5, length of aperture 2.5, width 2.4 mm.

**Polygyra rhoadsi** n. sp.

Shell depressed, with very low conic, almost flat spire, and small, cylindrical umbilicus which at the last whorl opens widely in an arcuate rimation; last $1\frac{1}{3}$ whorls rib-striate, the ribs strong, narrow, separated by smooth intervals wider than themselves, continuing on the base; spire smoother, the first $1\frac{1}{2}$ whorls smooth. Whorls slightly more than 5, moderately convex above, slowly widening, the last whorl decidedly wider, very convex, having the convex periphery situated above the middle of the whorl, convexly slanting below the periphery, subangular at the margin of the umbilicus, within which there is a groove parallel to the rimation. Behind the lip the suture is abruptly and rather deeply deflexed, and the whorl is deeply constricted. Aperture small, subcircular, nearly closed by the large teeth ; peristome reflexed, continuous in a raised callus across the parietal wall. Teeth: parietal fold a large, sinuous tongue-like process, the lower ramus of which is erect, the upper one rising in a point where it joins the upper termination of the lip, the space between the branches concave; outer lip bearing a strong, concave, callous rib, ending below in a compressed tooth; basal margin bearing a similar compressed tooth, extending outward on the lip, and separated from that on the outer lip by a deep sinus.

Alt. 4, diam. 10 mm. ; greatest width of the umbilicus 3 2 mm.

Topo Chico, near Monterey, State of Nuevo Leon, Mexico.

Closely allied to *P. implicata* Beck, with which it agrees in the general form and the armature of the aperture. It differs from *implicata* in the strongly ribbed surface, less convex base, decidedly narrower central umbilical opening and greater deviation of the last whorl, which differentiates the median opening from the rimation much more sharply than in *P. implicata.*

*P. rhoadsi* differs from *P. oppilata* in being larger, with different sculpture and narrower umbilicus.

**Polygyra suprazonata** n. sp.

Shell depressed subglobose with low conoid spire and very narrow though deeply perforating umbilicus, somewhat enlarged at its opening; glossy, slightly wrinkle-striate, finely malleated in places; reddish brown, paler around the umbilicus and with a wide whitish band above the periphery. Whorls 5½, those of the spire slowly increasing, the last wider, double the width of the preceding whorl, abruptly deflexed in front, rounded at the periphery and beneath, deeply constricted behind the lip. Aperture oblong, very oblique, with reflexed, white peristome; parietal fold a rather small oblique lamina recurved in a very short branch above; outer lip with a small tooth, above which there is a strong concave rib; basal lip bearing a small compressed tubercle and a slight thickening to the left of the tubercle.

Alt. 6.5, diam. 12 mm. ; width of umbilicus 1.5 mm.

Alt. 5.7, diam. 10.2 mm. ; width of umbilicus 1 mm.

Tzintzuntzan, State of Michoacan.

This is one of the largest Mexican species. It is allied to *P. chiapensis* (Pfr.) and *P. matermontana* Pils., differing from the former in the distinct basal tooth, bi-ramose parietal lamina, coloration, etc., and from *P. matermontana* it differs in being more robust with far less open umbilicus and different coloration. *P. nelsoni* Dall (*Nautilus*, xi, p. 74), of which I have seen the types, is another species of the same group.

**Praticolella strebeliana** n. sp.

Shell narrowly umbilicated, rather depressed, thin; uniform, pale corneous, having a dull sheen as if frosted, caused by an excessively minute roughening of the surface. Spire low conic; whorls $4\frac{3}{4}$, the first one glossy, obtuse, the rest slowly widening until the last, which is decidedly wider, moderately deflexed in front, the periphery obtusely angular on the first half, becoming rounded on the latter portion; scarcely any constriction behind the lip, but opaque there. Aperture oblique, wider than high, shortly elliptical, moderately excised by the parietal wall; peristome expanded, narrowly reflexed, with a slight rib-like thickening within; margins approaching, the basal regularly arcuate, columellar margin a little dilated at the insertion, slightly impinging on the narrow umbilicus.

Alt. 7.5, diam. 12 mm.; aperture, oblique alt. 5.7, width 7.2 mm., including peristome (type).

Alt. 6.5, diam. 10.2 mm. (smallest adult specimen).

Diente, near Monterey, State of Nuevo Leon, Mexico.

*Praticolella ampla* (Pfr.), which is the nearest to this species, differs in being far more globose, with a rounded-lunate aperture and more deeply arcuate basal lip, somewhat as in *Eulota similaris*, while this species has a transversely elliptical, smaller aperture, with far less arcuate basal lip, and much more depressed body-whorl. *P. berlandieriana* and *griseola* are not closely allied to the present species.

*Praticolella strebeliana* is named in honor of Hermann Strebel, one of the ablest investigators of the Mexican molluscan fauna.

Numerous fresh specimens were collected, but only one was found living.

**Thysanophora proxima** n. sp.

Similar to *T. conspurcatella* (Morel.), but with more elevated spire, narrower umbilicus and far wider spaced oblique cuticular riblets. Whorls $4\frac{1}{2}$, very convex, the last well rounded. Aperture somewhat oblique, subrotund.

Alt. 2.8, diam. 3.7 mm.

Uruapam, State of Michoacan, Mexico.

About twenty specimens were collected at the above locality by Mr. and Mrs. Rhoads. Several immature shells of the same species were taken at Morelia, Michoacan, and a few occurred at Patzcuaro and Huingo in the same State. In Michoacan it seems to replace *T. conspurcatella* of the more tropical region eastward.

*T. impura* (Pfr.) and *T. hornii* (Gabb) are closely allied species, the former differing in the absence of oblique cuticular laminæ.

A *Thysanophora* similar to *T. cæca*, but more elevated, was collected at Morelia, Michoacan. If the high contour is constant, it probably indicates another subspecies at least; but only one specimen was obtained.

**Omphalina montereyensis** n. sp.

Shell about the size and general contour of *O. inornata*, depressed, umbilicated, the umbilicus about one-twelfth the diameter of the shell. Surface glossy, smooth, with slight growth-wrinkles, but no other sculpture. Whorls $5\frac{1}{2}$, rather flattened, and slowly increasing, the last whorl very much wider, more than double the width of the preceding one, rounded at the periphery; rather flattened beneath. Aperture oblique, broadly lunate oval.

Alt. 6, diam. 12; oblique height of aperture 5, width 6 mm.

Diente, near Monterey, State of Nuevo Leon, Mexico.

Numerous specimens were collected. It somewhat resembles *O. paradensis* Pfr., but is much more depressed.

**Glandina rhoadsi** n. sp.

Shell oblong-fusiform, rather thin, glossy, reddish brown, with some slightly darker longitudinal streaks and whitish lines. Surface weakly and rather unevenly striated longitudinally, the striæ stronger near the suture; no spiral sculpture. Spire elongated, with slightly convex outlines; apex obtuse; whorls $7\frac{1}{2}$ to 8, the earlier ones regularly widening, the later two or three more rapidly increasing; sutures moderately impressed, very slightly crenulated by the fold-striæ; not margined. Last whorl somewhat compressed, tapering below. Aperture small, rather narrow, a little less than one-half the total length of the shell, in adult shells; columella only weakly concave.

Alt. 52, diam. 18, length of aperture 24 mm.

Alt. 45, diam. 16½, length of aperture 23 mm.

Alt. 42, diam. 14, length of aperture 21½ mm.

Diente, near Monterey, State of Nuevo Leon, Mexico.

The last measurements are of a specimen not quite mature, with 7⅓ whorls.

It is somewhat like *G. longula* or *G. singleyana*, but lacks any trace of spiral striation; the suture is only weakly crenulated, and not marginate. It is smoother than *G. liebmanni* and *G. audebardi*, especially at the sutures, and is of a more slender form.

**Glandina dalli** n. sp.

Shell thin, slender, turreted and slowly tapering above, broadest near the base, which is rather "saccate." Brownish corneous, slightly translucent, smooth and glossy throughout, except for rather separated, very short impressed grooves below the sutures forming a series of very short, low, broad folds there; and there are a few impressed, sinuous, longitudinal grooves, reminiscent of former peristomes, on the last whorl or two. Spire long, with very slightly convex lateral outlines and quite obtuse apex. Whorls 8½, slightly convex, the last one compressed laterally and decidedly full below. Aperture small, very narrow above, broad and slightly squarish below, the outer lip thin, vertical, bent forward in the middle, strongly retracted below, giving the basal lip an effuse aspect. Columella short, strongly concave and conspicuously truncated below.

Alt. 20, diam. 6.2, length of aperture 9.5 mm.

Alt. 18, diam. 6.3, length of aperture 9.5 mm.

Alt. 19, diam. 6.2, length of aperture 9.8 mm.

Diente, near Monterey, State of Nuevo Leon, Mexico.

*Glandina dalli* belongs to a small group of Mexican species of small size and smooth, glossy surface, but seems abundantly distinct from any hitherto described. Compared with *G. bellula* C. and F., this species differs in being of narrower form, with longer, narrower aperture, the posterior portion of which is more prolonged and much narrower; also in the comparatively simple suture. It is more lengthened than *G. oblonga* Pfr., and less plaited at the sutures. *G. ambigua* Pfr. is stouter in form; and *G. conularis* Pfr. has a wider aperture and far more arcuate outer lip.

**Glandina michoacanensis** n. sp.

Shell obesely fusiform, rather thin, of a rather dark dull reddish color, with an irregular, pale sutural border. Surface slightly shining, coarsely and irregularly plicate and finely plicatulate longitudinally, the foldlets conspicuously decussated, cut into oblong grains, the spirals becoming obsolete at the extreme base. Spire rather thick, continuing stout above, the apex obtuse. Whorls 7 to 7½, the earlier 2½ smooth, the next one evenly rib-striated, the last whorl oblong, rather obese, tapering below. Suture well impressed, coarsely and irregularly denticulate. Aperture rather small, its length (measured obliquely) a little exceeding half that of the shell; outer lip gently convex; columella quite concave in adult, straighter in immature specimens, strongly truncated at base.

Alt. 48.5, diam. 20.5, longest axis of aperture 25.7, greatest width 9.5 mm.

Uruapam, State of Michoacan, Mexico.

This species belongs to the first (*Plexæ*) of the several sections formed by Dr. von Martens in his excellent account of the genus in the *Biologia Centrali-Americana.* It might reasonably be supposed that so large a species from central Mexico would be known, but a thorough search through the literature, with the considerable collection of the Academy as a basis for comparison, fails to locate the specimens within any of the numerous Mexican species hitherto described. The dark, reddish color and conspicuous sculpture are its more striking features.

**Streptostyla novoleonis** n. sp.

Shell cylindric-oblong, blunt at the ends, dark reddish brown, very glossy, almost smooth, the growth-wrinkles being inconspicuous. Spire short, conic, the apex obtuse. Whorls 6½, slowly increasing, the latter half or three-fourths of the last one very rapidly descending, the last whorl generally suddenly deflexed at its termination. Aperture very long and narrow; columella short, rather thin, moderately twisted.

Alt. 17.2, diam. 7, length of aperture 12 mm.

Alt. 16, diam. 6.7, length of aperture 11.8 mm.

Diente, near Monterey, State of Nuevo Leon, Mexico.

Smaller than *S. shuttleworthi* and the varieties subordinated thereto by Dr. von Martens, short in the spire, markedly cylindrical, with the columella only weakly twisted. The region around Monterey is very different in physical characteristics from that inhabited by *S. shuttleworthi*. It is considerably further north than *Streptostyla* has heretofore been found.

**Salasiella pfeifferi** n. n.

This name is proposed for *Achatina pulchella* Pfr., *P. Z. S.*, 1856, p. 379, not *Achatina pulchella* Spix, 1827.

Dr. E. von Martens has figured the type, *Biologia Centrali-Americana*, Mollusca, p. 83, pl. 5, f. 9.

**Pseudosubulina berendti,** var. **occidentalis** n. v.

Numerous specimens collected at Uruapam, State of Michoacan, represent a variety of the East Mexican *P. berendti*, distinguished by the weaker, less crowded rib-striæ and wider aperture. Alt. 15, diam. 3.2, oblique length of aperture 3 mm.; whorls 12. Alt. 12.7, diam. 2.8, oblique length of aperture 2.8 mm.; whorls 11½.

**Pseudosubulina texoloensis** n. sp.

Shell turreted, imperforate, faintly greenish yellow tinted, composed of numerous short, wide whorls, sculptured with close-set rib-striæ separated by smooth, slightly wider intervals; outlines of spire decidedly concave above. Whorls 10½, convex, the ribs subobsolete on the base of the last one. Apex obtuse, the first whorl rapidly widening, smooth, the second becoming very finely rib-striate, the next three whorls more coarsely ribbed, scarcely increasing in width or in the diameter of the spire; following whorls gradually widening and increasing the diameter of the spire; last whorl short, moderately convex, abruptly contracting below. Aperture ovate-trapezoidal; columella moderately concave, abruptly truncated, Achatina-like, below.

Alt. 9.2, diam. 2.5, length of aperture 2 mm.

Texolo Falls, State of Vera Cruz, Mexico.

The shortness of the whorls and contraction of the upper part of the spire (as in the young of many species of *Urocoptis*), are the more prominent features of this species. The columella is much more strongly truncated than in *P. berendti*. Generic position not verified.

**Spiraxis uruapamensis** n. sp.

Shell turreted-conic, decidedly tapering, the lateral outlines a little concave above; corneous, with white riblets; apex obtuse.

Whorls 7½, very convex, separated by deeply impressed sutures; first half whorl smooth, following whorl very finely lamellose-striate; succeeding whorls with numerous, delicate, raised riblets, about 42 in number on the penultimate whorl. Aperture short-oval, somewhat trapezoidal; columella thick, strongly sinuous.

Alt. 5.2, diam. 2 mm.

Uruapam, State of Michoacan, Mexico.

This species is more obtuse than *S. sulciferus* and its variety *berendti;* has more convex whorls than *S. tenuecostatus* Streb., and is stouter than *S. miradorensis* Streb., with closer riblets. *S. tenuis* is an allied form, which should be compared.

**Opeas patzcuarense** n. sp.

Shell minute, slender, obtuse at the apex, slowly tapering, rather cylindric or rod-shaped. Whitish corneous, glossy and smooth, showing slight, sparse growth wrinkles under a lens. Whorls 7½, moderately convex, the last tapering at base. Aperture long, irregularly ovate; columella straight, vertical.

Alt. 3, diam. 0.8 mm.

Patzcuaro, State of Michoacan, Mexico.

A very small species, unlike any other Mexican form known to me. Numerous specimens were collected.

**Opeas odiosum** n. sp.

Shell slender, turreted, completely imperforate, corneous, sufficiently translucent to show the columella faintly through. Surface glossy, irregularly scored by unequally spaced longitudinal grooves and some slight wrinkles. General outlines of the spire straight; apex obtuse. Whorls 8½, the earlier strongly convex, the last two slightly flattened. Aperture ovate; outer lip thin, moderately arched forward, columella slightly concave, forming a distinct angle with the parietal wall. Alt. 6.9, diam. 2, longest axis of aperture 1.5 mm.

Patzcuaro, State of Michoacan, Mexico.

The impressed grooves are similar in character to those of *Vitrea indentata* and other species of *Glyphyalinia*. About forty specimens were collected.

**Opeas rhoadsæ** n. sp.

Shell slender, subulate, wholly imperforate, corneous and sufficiently translucent to show the internal axis through the shell in places. Surface glossy, sculptured with unequally spaced longitudinal grooves, and showing a few slight growth-wrinkles in places. General outlines of the spire straight. Apex obtuse. Whorls 9 to $9\frac{1}{2}$, the earlier ones quite convex, the later four or five somewhat flattened. Aperture small, ovate, the outer lip a trifle curved forward in the middle; columella slender, concave.

Alt. 7, diam. 1.9, longest axis of aperture 1.6 mm.

Alt. 7, diam. 1.7, longest axis of aperture 1.6 mm.

Diente, near Monterey, State of Nuevo Leon, Mexico.

Similar in sculpture and color to *Opeas odiosum*, but perceptibly more slender in the spire, with smaller apex. These two species have the general form of *Opeas subula*, but differ totally in sculpture; they are also more brilliant and more transparent. The columella is not at all twisted, and there is no trace of a basal notch or truncation. This species, of which about fifteen specimens were obtained, is named in honor of Mrs. Mary C. Rhoads.

**Bifidaria prototypus** n. sp.

Shell small, subcylindrical, somewhat tapering above, brownish corneous, thin. Whorls 5, convex; apex obtuse. Aperture truncate-oval; peristome expanded. Teeth: the parietal bifid, composed of two laminæ, that on the right running outward to the posterior termination of the outer lip, more or less united at its inner end with the left lamina, which is more deeply seated, and enters deeply; a rather high tooth at the middle of the columella; and a similar but smaller and short denticle moderately remote from the lip-edge, at the junction of the outer with the basal walls of the aperture. Usually there is a minute denticle above the last-described denticle.

Alt. 2.5, diam 1 mm.

Huingo, State of Michoacan, Mexico.

This species has the general appearance of *Pupa rupicola*, but differs markedly in dentition. There are only two denticles within the outer lip, none at the base of the columella. The parietal armature illustrates clearly the origin of the bifid fold of the *Bifidariæ* of the United States, retaining the ancestral form more than any American species I have examined. There are two folds, one to the right and more emerging, the other to the left and more deeply entering; the two more or less connected by a callus at the inner termination of the right tooth.

**Succinea tlalpamensis** n. sp.

Shell pointed-oblong fragile, honey yellow or reddish, somewhat translucent; *strongly, finely and rather irregularly, closely wrinkled.* Spire slender, acuminate; whorls $2\frac{1}{2}$, very obliquely convoluted, the last scarcely convex above. Aperture very large, ovate, somewhat effuse at the base; columella with a white thread-like edge.

Alt. 15, diam. 8, longest axis of aperture 11.8, greatest width 7 mm.

Alt. $14\frac{1}{2}$, diam. $8\frac{1}{2}$, longest axis of aperture 12, greatest width $7\frac{1}{2}$ mm.

Near Tlalpam, State of Mexico, Mexico.

Allied to *S. retusa* Lea (*ovalis* Gld. *non* Say) and *S. salleana* Pfr. Compared with the former, *S. tlalpamensis* has a decidedly larger aperture in proportion to the last whorl, as viewed from the front. The spire is longer and more slender than in *S. salleana.*

At Lake Cuitseo, near Huingo, State of Michoacan, a much smaller form was collected, in which the aperture is not so ample, and less effuse below. Two specimens measure:

Alt. 10.8, diam. 5.5, longest axis of aperture 8, greatest width 4.7 mm.

Alt. 9.6, diam. 5.8, longest axis of aperture 7.7, greatest width 4.3 mm.

This may be called var. *cuitseana.* It has the same number of whorls as the type.

**Physa osculans rhyssa** n. var.

Smaller than typical *P. osculans,* pale yellow corneous, transparent and fragile, with *numerous slight longitudinal folds* on the last whorl.

Saltillo, State of Coahuila, Mexico.

**Sphærium martensi** n. sp.

A moderately large, thin species, showing no distinct prodissoconch at the beaks; ovate, moderately convex, with median, slightly prominent beaks, the surface lusterless, yellowish corneous, finely and irregularly striated, nearly smooth toward the beaks; anterior end narrower, symmetrically rounded; posterior end wider, obscurely truncated obliquely; hinge line slightly convex; basal margin moderately convex. Interior whitish in clean shells; hinge delicate, the left valve with a small, erect, compressed cardinal tooth, with a lower, very thin one above it and slightly more posterior; anterior lateral short, erect, thin and triangular; posterior lateral short and low. Right valve with two subequal, erect, squarish cardinals, one behind the other, separated by a deep V-shaped notch; laterals double, the anterior very short, the posterior longer, low.

Length 15.5, alt. 11, diam. 7.6 mm.

Tzintzuntzan, Lake Patzcuaro, State of Michoacan, Mexico.

This is a rather large species, more fragile than those of the non-calyculate group in the United States. Compared with *S. subtransversum* Prime, which has the same general outline, this species differs in the broader beaks, which do not show the prominent "caps" or prodissoconch of *S. subtransversum;* the cardinal teeth are much thinner, more compressed, and the lateral laminæ are less elevated. It does not seem closely allied to any of the American species I have been able to compare with it.

## NEW SPECIES AND VARIETIES OF MOLLUSKS FROM MIAMI, FLORIDA.

BY HENRY A. PILSBRY.

**Bifidaria rhoadsi** n. sp., figs. 1 and 2.

Shell rimate, very minute, cylindrical, blunt at the ends, especially above, glossy brown, somewhat translucent ; obliquely, delicately striated. Whorls nearly five, the third and fourth extremely convex, the last less so, somewhat compressed laterally behind the lip, marked there with a slight furrow extending from the lip-edge to about the position of the upper palatal lamella. Aperture rounded, truncate above, obstructed by five teeth or lamellæ : two upon the parietal wall, one slightly connected with the right termination of the lip, the other more deeply placed ; columellar lamella strong, spirally entering, outer lip with two short lamellæ. Peristome broadly expanded, the outer lip somewhat incurved about the middle. Alt. 1.92, diam. 0.92 mm.

Fig. 1.

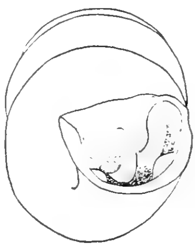

Fig. 2.

Miami, Dade county, Florida. Collected by S. N. and M. C. Rhoads, February, 1899.

This very minute species is somewhat allied to certain forms of Mexico, New Mexico and Arizona, remarkable for the partial or complete separation of the two parietal lamellæ, which in the ordinary *Bifidariæ,* such as *contracta, rupicola* or *armifera,* are united to form a single bifid lamella. The disposition of the lamellæ is best shown by fig. 2, the shell being viewed obliquely from the base.

In this separation of the two parietal folds, *B. rhoadsi* somewhat resembles *B. ashmuni*, *B. dalliana* and *B. prototypus*, but in none but the first of these is the separation so complete. *B. ashmuni*, however, has the folds stronger and the latter part of the last whorl contracted as in *B. contracta*. *B. dalliana* is a whitish species with the parietal folds distinctly united and a basal denticle developed, while *B. prototypus* is a larger form, with smaller and united parietal folds.

In having the parietal folds quite separated, *B. rhoadsi* resembles several east Asian representatives of *Bifidaria*, which are more primitive than most of the American species.

The figures are from *camera lucida* drawings.

**Strobilops hubbardi stevensoni** n. var.

Shell similar to *S. hubbardi* A. D. Brown, but darker, smoother, more widely umbilicated and constantly with three lamellæ within the basal wall.

Dark reddish chestnut, very glossy; sculptured with very fine striæ above, the base smoother with microscopic spirals. Whorls 4, quite convex, the last well rounded at the periphery which is above the middle; umbilicus wide, the latter third of the last whorl deviating tangentially, somewhat as in many Polygyras. Through the base at the last fourth of the body-whorl may be seen three lamellæ, the outermost below the periphery, rather long, and somewhat oblique; the others shorter. Parietal wall showing one strong, emerging lamella above, and a much weaker one below (the latter emerging only in fully mature shells), both of them running inward about one-third of a whorl. Aperture broadly lunate-oval, oblique, with whitish, expanded and subreflexed lip.

Miami, Florida.

This form differs from *S. hubbardi* chiefly in its wider umbilicus and smoother surface, though the darker color and smaller number of lamellæ visible through the base are further distinguishing features. Mr. Webster (*Nautilus*, vii, pp. 84, 94) has shown *hubbardi* to vary in the number of lamellæ. At Mr. Rhoad's request, it is named in honor of Mr. James Stevenson, an energetic naturalist of Miami, Florida.

**Glandina truncata minor**, n. var.

Similar to the typical form, but constantly much smaller. Whorls $5\frac{3}{4}$.

Alt. 31, diam. 13, longest axis of aperture 18½ mm.

Alt. 32, diam. 13, longest axis of aperture 17 mm.

Alt. 30½, diam. 11, longest axis of aperture 16 mm.

Miami (type locality) and Lemon City, Dade county, Florida.

Very large series collected by Mr. Rhoads as well as the specimens taken by myself are constantly far smaller than the typical form, although they occur in a region where the country rock is limestone. I found only the typical *G. truncata* at Palm Beach. The small variety seems to be confined to the calcareous region in the extreme South.

SEPTEMBER 5.

MR. CHARLES MORRIS in the Chair.

Seven persons present.

SEPTEMBER 12.

MR. BENJAMIN SMITH LYMAN in the Chair.

Twelve persons present.

Papers under the following titles were presented for publication:

"Contributions to a Knowledge of the Hymenoptera of Brazil. No. 7. Eumenidæ," by William J. Fox.

"Notes on the Geology of Southeastern Pennsylvania," by Theodore D. Rand.

SEPTEMBER 19.

MR. CHARLES MORRIS in the Chair.

Eight persons present.

SEPTEMBER 26.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Eighteen persons present.

The death of Dr. Adolf Ernst, a correspondent, was announced.

Charles B. Penrose, M.D., and Carl V. Vischer, M.D., were elected members.

The following was ordered to be printed:

## CONTRIBUTIONS TO A KNOWLEDGE OF THE HYMENOPTERA OF BRAZIL, No. 7—EUMENIDÆ (GENERA ZETHUS, LABUS, ZETHOIDES, EUMENES, MONTEZUMIA AND NORTONIA.)

BY WILLIAM J. FOX.

The present paper, the seventh of the series dealing with Mr. H. H. Smith's collections, relates to the solitary wasps, and is presented in incomplete form in consequence of the want of available time for entomological work on the part of the writer. These pages were written almost a year ago, and laid by with the hope of soon working out the material of the genus *Odynerus* thereby completing the Eumenidæ of the collection, which hope, however, has not been realized, beyond the drawing up of several descriptions of new species which will be included in a separate paper on that genus.

A. Pedicel of second segment shorter than width of first segment at apex.

a. Postscutellum entire.

**Zethus cæruleopennis** Fabr.

Chapada, February, March, December; Santarem. Seven ♀, five ♂ specimens.

**Zethus recurvirostris** DeG.

A large series of both sexes. Chapada, January, March, December.

The color of petiole and legs varies from entirely red to black. The swelling of the petiole is much greater in some specimens than in others.

**Zethus gigas** Spin.

Chapada, February, March. Twenty-five ♀, three ♂ specimens.

There is a remarkably abnormal specimen of this species in the collection. It is a ♂, and has the petiole produced into two long acute spines on the ventral surface laterally, that on the right side placed some distance in advance of the other. The occiput is emarginate medially, and that portion of the front filling the emargination of eye is pushed out, distorting the eye, so that when viewed from the side it appears to be sharply angulate, or subdentate on its inner margin.

**Zethus prominens** n. sp.

Black, shining; middle segment, petiole, base of second segment, legs, clypeus except base, mandibles and scape beneath, red; apex of petiole with a yellow line on each side, extending a little along sides; wings violaceous.

♀.—Clypeus about one-third broader than long, obtusely angular at sides, with shallow punctures, fore margin broadly incurved, obtusely dentate medially; mandibles long, equalling the width of clypeus in length; front and vertex with tolerably strong, but not deep, scattered punctures, becoming obsolete on cheeks posteriorly; space between hind ocelli slightly less than that between them and eyes; first joint of flagellum fully as long as two following united; pronotum with a strong tooth on each side, and sharply margined anteriorly; dorsulum sparsely punctured, with an impressed line anteriorly in the middle, on each side of which are two feebler, curved impressions, and posteriorly in the middle are two parallel strong impressions, with a feebler longer one on each side; scutellum flat, scarcely impressed; postscutellum subconvex, entire; middle segment concave medially, the lateral surface separated from the upper and posterior by a sharp ridge, running from base to apex; enlarged portion of petiole with sparse punctures, broadest and rounder at base, the sides gradually converging to apex, not rounded, the slender basal portion not as long as hind coxæ; second segment with a short, thick pedicel whose length does not equal the width of petiole at apex, microscopically punctured above, the ventral moiety with large punctures, very sparse toward base; dorsals 3–6 rather compactly punctured, ventrals 3–6 with strong, separated punctures; second submarginal with a distinct radial side, which is, however, a little less than the distance between the recurrent nervures on the cubital nervure. Length 28–29 mm.

Chapada, March, April. Four specimens. In coloration this species resembles *recurvirostris*, but it is quite distinct. The straight, not rounded or convex, sides of petiole and sharp lateral carina of middle segment are salient features of this insect.

**Zethus striatifrons** n. sp.

Black; clypeus anteriorly and at sides, mandibles medially, greater part of scape, outer margin of tegulæ and legs except coxæ, red; petiole with a narrow yellow line at apex, extending a little along sides; wings violaceous.

♀.—Clypeus nearly twice as broad as long, strongly angulate laterally, striato-punctate, the fore margin subemarginate; mandibles short, broad, their width equalling half their length, with coarse, elongate punctures; front striated, the vertex with separated punctures; space between hind ocelli distinctly less than that between them and eyes; first joint of flagellum fully as long as next two joints united, the length of scape about equalling the pedicel and first four joints of flagellum; pronotum margined anteriorly, but not dentate, strongly punctured; dorsulum strongly punctured, sparsely so posteriorly with a strong impression anteriorly in middle, and two rather parallel, less strong ones posteriorly; scutellum rather flat, not or slightly impressed, post-scutellum entire; middle segment with rather dense pale pubescence, strongly impressed, or subconcave in middle, with transverse, coarse striations extending a little on sides, but not evident at base laterally, the extreme base in addition has some coarse punctures and there is a sharp ridge (not extending to apex) separating the sides from the rest of segment; swollen portion of petiole ovate, about twice as long as broad, with large sparse punctures, basal cylindrical portion about as long as hind coxæ, transversely ridged at base above; second segment with a short, thick pedicel, dorsally with shallow punctures, sparse at base, and in addition a fine, microscopic punctuation, ventrally with coarse irregular punctures; remaining dorsals closely punctured, the ventrals more strongly; second submarginal cell with a radial side not equal to more than one-third of the distance between the recurrent nervures on the cubital nervure; third submarginal fully one-third broader above than beneath, the outer nervure almost straight. Length 22–23 mm.

♂.—Clypeus longer, not angulate laterally, with shallow punctures, the fore margin with a strong tooth on each side; front finely rugoso-granulate, a slender raised line running down from the anterior ocellus; scape dilated apically; antennæ terminating in a hook, not coiled; impressions of dorsulum less distinct, the dorsulum distinctly impressed; ventral abdominal segments without appendages. Length 19–21 mm.

Chapada, March, October, December. Seven ♀, two ♂ specimens. *Striatifrons* comes closer to *chalybeus* than to *cæruleopennis* and *recurvirostris*, both of which have the clypeus rounded at sides, and their ♂ abdomen is provided with leaf-like appendages beneath.

**Zethus chalybeus** Sauss.

Chapada, April; Santarem. Four ♀ specimens.

**Zethus sessilis** n. sp.

Black; abdomen with a grayish pile; mandibles medially, spot on tegulæ, legs more or less, and sides of petiole dark reddish or reddish brown; wings fuscous as far as stigma, darkest in costal cell, otherwise clear.

♀.—Head with strong even punctures not close, the front with some rugæ in addition; clypeus longitudinally rugose or rugoso-punctate, subrounded at sides, about one-third broader than long, truncate anteriorly and with two widely separated teeth; space between hind ocelli equal to more than half that between them and eyes; scape shining, in length equal to the pedicel and following four joints united; pronotum very sharply and highly margined or crested, but scarcely dentate; dorsulum coarsely punctured with an impressed line anteriorly in middle, and four feebler ones posteriorly, the two medial impressions strongest and farther apart than they are from the exterior ones; scutellum subconvex, impressed; postscutellum entire; middle segment rugose except medially, where it is concave or broadly depressed and like the sides finely punctured, a faint trace of a carina between the upper surface and sides; swollen portion of petiole short, campanulate, with dense shallow punctures, the basal stem longer than hind coxæ; second segment practically sessile with first, the pedicel being exceeding short; dorsal surface of abdomen with a fine dense punctuation, that on ventral surface quite as fine, but not so dense. Length 13–14 mm.

♂.—Head not or scarcely striated as in ♀, coarsely punctured; clypeal teeth stronger; space between hind ocelli less; apical antennal joint exceedingly minute, not one-third the size of the preceding one, and so placed as to form a small hook. Length 13–14 mm.

Chapada, February, March. Fifteen ♀, five ♂ specimens. The almost sessile second segment, and minute apical antennal joint of male, readily distinguish this species. The male clypeus is sometimes marked anteriorly with yellow.

**Zethus fraternus** Sauss.

Chapada, February to April, December; Pedra Branca and Corumba, April; Santarem. Twenty-three ♀, six ♂ specimens. The yellow dots above insertion of antennæ are frequently entirely absent.

**Zethus rufipes** n. sp.

Black; mandibles medially, anterior margin of clypeus, base of antennæ, spot on scape at apex beneath, and legs except coxæ, ferruginous; a dot on front behind each antennæ and line at apex of petiole (not extending on sides), yellow; wings dark violaceous throughout.

♂.—Head with strong but not deep punctures, closest and smallest on front; a faint carina connects the bases of the antennæ; clypeus with separated punctures, about one-third longer than broad, its fore margin truncate, and armed with two widely separated teeth; space between hind ocelli equal to about two-thirds the distance between them and eyes; antennæ rather long, the scape not much longer than the pedicel and following two joints united, first joint of flagellum distinctly longer than joints two and three united, ultimate joint as long as, or longer than, the two preceding, the tip of antenna not curled, but hooked; pronotum sharply margined anteriorly, not dentate laterally, strongly punctured; dorsulum similarly punctured, with a smooth, slightly raised line anteriorly in the middle, and posteriorly with two strongly impressed lines which diverge anteriorly; scutellum impressed; postscutellum entire; middle segment rugoso-punctate except the nearly smooth sides and two areas on upper surface laterally, broadly and deeply sulcate down middle, the upper surface separated from the sides by an indistinct carina; stem of petiole about as long as first hind tarsal joint, stout, the swollen portion elongate-ovate, with large, widely separated punctures; pedicel of second short, its length not equal to width of apex of petiole, the body of the segment gradually dilated very much as in *fraternus*, with sparse shallow punctures above, and an oblique linear impression on each side near base; remaining dorsals more strongly punctured, the second ventral with coarse irregular punctures; wings dark violaceous; second submarginal triangular, with a very small radial side, the first and second transverso-cubital veins nearly uniting above; third submarginal broadest above, the outer nervure gently bowed. Length 13–14 mm.

Chapada, January and March. *Z. rufipes* is very similar to *Z. fraternus* in general appearance, but is quite distinct.

**Zethus cristatus** n. sp.

Black; thorax and abdomen with thin silky pile; a dot behind the base of each antenna, a linear spot on each side of pronotum anteriorly, dot on tegulæ anteriorly, line on postscutellum interrupted medially, spot at tip of fore femora, one at base of four anterior tibiæ, and a fascia at apex of abdominal segments 1–5 (that on segment 1 extending a short distance along sides), yellow; wings subhyaline, fuscous along costa, nervures black.

♀.—Head with strong deep punctures, running into striæ on front and becoming sparse on cheeks which are shining; clypeus fully twice as broad as long, coarsely striato-punctate, angulate at sides, the fore margin slightly incurved, with two strong widely separated teeth; antennæ with flagellum short, clavate, its first joint much shorter than the following two united, the scape fully as long as the combined length of pedicel and following four joints; space between hind ocelli equal to a little more than half of that between them and eyes; pronotum strongly cristate, slightly dentate laterally, deeply punctured; dorsulum coarsely punctured, confluently so anteriorly, more sparsely posteriorly, strongly impressed anteriorly in the middle, and with two impressions, nearly parallel, posteriorly; scutellum impressed; middle segment impressed, concave, the convex portions rugoso-striate, the rugæ extending a little on the sides, which are nearly smooth and are separated from the upper surface by a carina; basal stem of petiole about as long as hind coxæ and trochanters, the swollen portion elongate-ovate, but not much narrowed posteriorly, with scattered shallow punctures; second segment with pedicel short and thick, shorter than the width of apex of petiole, finely and very closely punctured, except a few shallow punctures along the apical margin, the ventral surface with the punctures larger and less close, but not strong; remaining segments very finely punctured; second submarginal cell with a radial side about equal to half the distance between the recurrent veins on the cubital vein; third submarginal rhomboidal, the outer nervure nearly straight. Length 15 mm.

Chapada, April. One specimen. The coloration of wings is similar to *Z. fraternus*. The short flagellum and wide laterally angulate clypeus, cristate pronotum, and markings, distinguish *Z. cristatus*.

aa. Postscutellum carinated, dentate, or emarginate.

**Zethus imperfectus** n. sp.

Black, with thin silky pile, most evident on thorax on sides and beneath and second segment; lateral margins of clypeus, line on inner margin of mandibles, spot in each eye emargination and at bases of antennæ spot on cheeks above, line on pronotum anteriorly, dot on tegulæ at base and apex, line on postscutellum, stripe on fore femora behind, and on all the tibiæ, and apical margins of all segments, including the sixth dorsal, yellow, that at apex of petiole continued a short distance along sides; flagellum beneath reddish yellow, except basally; wings subhyaline, slightly brownish in costal cell.

♀.—Head with deep separated punctures, sparse on cheeks; clypeus rounded at sides, its length equal to considerably more than half its width, closely and finely punctured and in addition with some larger, shallow, sparse punctures, its fore margin subemarginate, indistinctly dentate at each side; an indistinct T-shaped carina between antennal bases; flagellum short, clavate, the scape slender, cylindrical, scarcely dilated apically, in length not quite equal to pedicel and following four joints united; space between hind ocelli equal to nearly two-thirds of that between them and eyes; pronotum cristate, not dentate, with very coarse punctures; dorsulum with the punctures more separated, anteriorly with a shallow impressed line medially, the usual posterior impressed lines or furrows, entirely wanting; scutellum scarcely impressed, with shallower punctures; postscutellum very indistinctly dentate laterally; middle segment concave, medially sulcate, the concavity smooth, that portion between the concavity and sides, rugose, bounded externally by a carina, sides finely punctured, subcarinate obliquely in middle; basal stem of petiole stout, about as long as joints 2–4 of hind tarsi, the swollen portion elongate, cylindrical, narrowed posteriorly, strongly punctured, its anterior and upper surface forming a distinct angle at their junction; pedicel of second segment rather slender, its length not equalling the width of apex of petiole, the dorsal and ventral moieties closely and finely punctured, except along apical margins; second submarginal with a distinct radial side which equals the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal enlarged above, the outer nervure a little sinuous. Length 12 mm.

Santarem. One specimen. Resembles *Z. cristatus*, but the clypeus is differently shaped, etc.

**Zethus cylindricus** n. sp.

Black; abdomen with sericeous pile; three spots on clypeus (one at each side and anteriorly), line on mandibles, dot behind base of each antenna, scape beneath, dot in eye emargination and at top of cheeks, line on pronotum anteriorly, dot at base and apex of tegulæ, line on postscutellum interrupted medially, two lines on middle segment, and apical margin of all abdominal segments (including sixth dorsal), yellow; wings subhyaline, slightly discolored in costal cell.

♀.—Head with coarse, deep, close punctures, the cheeks less punctured, but not shining; clypeus at base medially with a short carina extending up between bases of antennæ, barely one-third broader than long, rounded at sides, truncate anteriorly; antennæ with flagellum strongly clavate, the first joint much shorter than the two following united, the scape not quite as long as pedicel and following four joints united; space between hind ocelli greater than that between them and eyes; pronotum cristate anteriorly, subdentate laterally, with coarse separated punctures; dorsulum with confluent punctures forming longitudinal rugæ, with a raised line anteriorly in the middle, and two longitudinal impressions posteriorly; scutellum punctured like dorsulum, scarcely impressed; postscutellum slightly prominent at sides, but not dentate; middle segment concave and sulcate medially, transversely rugose, the rugæ slightly running over the ridge which separates the sides from upper surface, sides nearly smooth, apex furnished with two pale, lamellæ or teeth; petiole elongate, stem stout, hardly as long as hind coxæ and trochanters, the enlarged portion cylindrical, broadest basally, its narrowest point is a little before the apex where it is contracted, with deep separated punctures above at base, those toward apex shallower and sparse, ventral surface sharply carinated down middle; second segment finely and closely punctured, except along apical margins. the pedicel quite short, much shorter than the apex of petiole is wide; radial side of second submarginal cell distinctly greater than the distance between the first transverso-cubital vein and first recurrent nervure on the cubital nervure; third submarginal slightly broader above, somewhat rhomboidal, the outer nervure gently sinuous. Length 11–12 mm.

♂.—Clypeus about twice as broad as long, entirely yellow, obliquely truncate at sides, subemarginate anteriorly; antennæ hooked at tip, the last two joints minute, the penultimate the longer, third joint about one-third longer than second, the tenth subspinose beneath at apex; middle segment with an additional carina on each side bounding the concavity. Length 8–10 mm.

Chapada, December; Corumbá, April. Three ♀, four ♂ examples. In the shape of petiole this species approaches *Z. carinatus* Smith, but in that species it is not contracted before base, and is rugosely punctured and sharply carinate above.

**Zethus campanulatus** n. sp.

Black; legs brownish; a medially interrupted yellow fascia at apex of petiole; abdomen and thorax more or less with sericeous pile; wings fuscous on basal two-thirds especially in the costal cell, otherwise subhyaline.

♀.—Head above with even, deep, separated punctures, running into longitudinal rugæ on front and becoming sparser on cheeks which are shining; no carina between bases of antennæ; clypeus fully three times broader than long, angulate at sides, coarsely rugoso-punctate, fore margin truncate, with a tooth at each side and sometimes medially; flagellum short, the first joint not as long as the two following united, the scape fully as long as the pedicel and following four joints united; space between hind ocelli equal to a little more than half of that between them and eyes; pronotum subcristate, sharply angular at sides with coarse confluent punctures; dorsulum with larger separated punctures, with an impressed line anteriorly in middle, two impressed lines posteriorly; scutellum with shallow punctures, scarcely impressed; postscutellum prominent or subcarinate laterally, middle segment concave medially, the concavity bounded outwardly by a more or less distinct carina, the two convexities irregularly rugose, separated from sides by a comparatively indistinct carina; petiole short, campanulate, stem slender fully as long as hind coxæ and trochanters, the enlarged portion with large separated punctures; second segment finely and closely punctured throughout, the pedicel short and stout, much shorter than apex of petiole is wide, the body of the segment more suddenly dilated than in *cylindricus, imperfectus;* radial side of second submarginal cell much less than the distance between the first transverso-cubital vein and the first recurrent vein on the cubital nervure; third submarginal somewhat rhomboidal slightly larger above, the outer nervure gently sinuous. Length 13–14 mm.

*Var.*—Legs more or less dark ferruginous, the base of first or second segments sometimes brownish.

♂.—Front and clypeus without rugæ; clypeus longer, rounded at sides subemarginate between the lateral teeth; tip of antennæ hooked, the last two joints of antennæ quite small, the penultimate the smaller, as to length; middle segment supplied with two additional carinæ which border the concavity outwardly; second segment with larger, sparse, shallow punctures. Length 12 mm.

Chapada, March. Five ♀, one ♂ specimens.

**Zethus dubius** Sm.

Corumbá, April. In the two specimens which I refer to this species the postscutellum is tuberculate medially, and there is a T-shaped carina between the insertion of antennæ. The ♂ antennæ are hooked, with the last joint as long as preceding two united.

**Zethus hexagonus** n. sp.

Black; dot behind each antenna, one at each side of postscutellum and a line (a little continued along sides) at apex of petiole, yellow; legs from tips of femora reddish brown, which color sometimes extends obscurely to the coxæ; wings fuscous, slightly cæruleous, quite dark in the costal cell.

♀.—Head above with strong separated punctures, on the front striato- or rugoso-punctate; clypeus forming a nearly exact hexagon, coarsely striato-punctate, the fore margin rather broadly and evenly truncate; space between hind ocelli about equal to two-thirds of that between them and eyes; pronotum cristate, obtuse at sides, irregularly rugoso-punctate; dorsulum with rather shallow, separated punctures, with a feeble impressed line anteriorly in the middle, and four impressed lines posteriorly, the two inner ones strong and deep, the outer ones shallow, and indistinct; scutellum more closely punctured, impressed; postscutellum subemarginate, that is to say the lateral angles are quite prominent, subdentate; middle segment not broadly concave, broadly furrowed, rather densely pubescent with pale hairs, the convexities rugose but not coarsely, carina between sides and upper surface indistinct except toward base, sides finely punctured; stem of petiole rather long, slender, longer than hind coxæ and trochanters, the enlarged portion of segment a little more than twice as long as broad, rounded at base, with large punctures, the sides rounded out; second segment above finely and closely punctured at base, the punctures becoming larger and shallow toward apex, the ventral surface with tolerably large punctures, sparsest medially, and entirely wanting at base, which is smooth and shining, pedicel very short and stout at least one-third broader than long; radial side of second submarginal cell barely equalling half the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal cell widened almost one-third above, the outer nervure nearly straight. Length 14–15 mm.

Chapada, March and October. Three specimens. The petiole, compared with *Z. fraternus*, has a long stem, the enlarged portion short and broad.

**Zethus bicolor** n. sp.

Head, antennæ, dorsulum, scutellum anteriorly, mesosternum, and body of abdomen, black; otherwise the body red; two dots on front, pronotum anteriorly sometimes, spots on tegulæ rarely, two dots on postscutellum and line at apex of petiole, yellow; wings fusco-violaceous.

♀.—Head with strong separated punctures, the front striato-punctate; clypeus hexagonal, broader than long, striato-punctate, the fore margin truncate, with a slight tooth on each side; space between hind ocelli equal to slightly more than half of that between them and eyes; pronotum cristate, obtuse at sides, with coarse more or less confluent punctures; dorsulum with separated punctures, anteriorly with an impressed line medially and four impressed lines posteriorly, the inner two of which are deep, the others indistinct; postscutellum prominent, or subdentate at sides; middle segment broadly furrowed, the convexities rugose but not coarsely, the carina between upper and lateral surface distinct; petiole as in *Z. hexagonus*, as are also the pedicel and sculpture of dorsal surface of second segment, the punctures of the ventral surface of the latter segment present on the base; first and second transverso-cubital veins uniting above; third submarginal cell widened nearly one-quarter above. Length 17–18 mm.

♂.—Front closely striato-punctate; antennæ hooked at apex, the ultimate joint as long as the two preceding united, the penultimate quite small, flagellum short, the first joint fully as long as the following two joints united; clypeus about twice as broad as long, the anterior teeth more distinct. Length 13 mm.

Chapada, March and February. Eight ♀ and one ♂ specimens. Seems to resemble *Z. rufinodus* in coloration, but judging from the figure of that species given by Saussure (Pl. vi, f. 3, *Vespides*, iii), the petiole is of an entirely different shape.

**Zethus pallidus** Sm.

Santarem. One example. This species has the postscutellum strongly bidentate, almost bispinose and the dorsulum has two smooth raised lines; the petiole campanulate. The entire insect is rather densely covered with short brownish or yellowish hairs.

**Zethus productus** n. sp.

Rufous and black; body of abdomen with brown pile; clypeus, mandibles, antennæ except scape beneath, thorax except beneath, legs and abdomen from and inclusive of apex of second segment rufous; dot behind each antenna, scape beneath and line at apex of petiole, yellow; otherwise the insect black; wings fusco-violaceous.

♀.—Head above and on cheeks rugoso-punctate, the front coarsely striato-punctate; clypeus somewhat hexagonal, broader than long, obtuse at sides, with large rather shallow punctures, the fore margin broadly subtruncate, indistinctly or subdentate laterally; a T-shaped carina between the bases of antennæ; first joint of flagellum about as long as the following two united, the scape not longer than pedicel and following three joints united; space between hind ocelli greater than that between them and eyes; pronotum cristate, acute and produced at sides, with coarse confluent punctures; dorsulum rugoso-punctate with a shallow impressed line anteriorly in middle, the usual posterior impressed lines absent; scutellum not impressed; postscutellum broadly emarginate, dentate at sides; two short indistinct carinæ originate near sides of postscutellum, and extend down on middle segment, the latter broadly furrowed or depressed down middle, the two convexities obliquely striated, the striæ overrunning the sharp lateral carina a short distance upon the sides, which are otherwise quite smooth; petiole with stem long, nearly as long as first hind tarsal joint, stout, the enlarged portion ovate, broadest at apex, gradually and evenly enlarged from its junction with the stem to somewhat behind its middle, whence it is gradually and slightly narrowed to apex, the punctures strongest at sides, and down the middle there is a distinct, but not sharp, carina, which, while not continuous, is found also on the stem; second segment finely and closely punctured above, much more strongly so beneath, the pedicel very short and thick; radial side of second submarginal cell about equal to the distance between the first transverso-cubital and the first recurrent nervures on the cubital nervure; third submarginal widest above, the outer nervure nearly straight. Length 16–17 mm.

♂.—Colored like ♀, except that the red is more widely diffused over the abdomen, and the mandibles are yellowish; flagellum stout, hooked at tip the ultimate joint thick, obtuse at tip, longer than the penultimate which is minute, and together with the eleventh joint is nearly twice as long as the ultimate; middle segment rugose, the carinæ originating near each side of postscutellum quite strong; stem of petiole shorter and thicker, carina obscure, the enlarged portion more robust and coarsely punctured. Length 14 mm.

Chapada, January, March, April, December. Fifteen ♀, one ♂ specimens. The strongly produced pronotal angles, rugosity of head, and carinated petiole are peculiarities of this species.

**Zethus thoracicus** n. sp.

Black; head (except front and a line across vertex), pronotum entirely, tegulæ, two spots on scutellum and postscutellum, two lines on middle segment, spot beneath wings, anterior legs almost entirely, medial legs in front, line at apex of petiole, interrupted medially, narrow line before apex of second and third dorsals, and of second ventral, yellow; antennæ fulvous, darkest above, the fore femora in front and a spot on tegulæ, reddish; medial legs dark brownish behind; wings dark subhyaline, darkest along costal margin.

♀.—Head finely and closely punctured above, the front striato-punctate, but not coarsely; cheeks impunctate; clypeus rather finely striato-punctate, barely one-third broader than long, somewhat hexagonal, with the side lying between the lateral angle and anterior margin strongly incurved, anterior margin obtusely truncate, not at all dentate; flagellum subclavate, the first joint shorter than the two following united, the scape about as long or slightly longer than the pedicel and following three joints united; space between hind ocelli about equal to half that between them and eyes; thorax elongate, narrowed anteriorly, the distance between the anterior margin of tegula and pronotal angle greater than the width of dorsulum at widest part; pronotum sharply margined, subangulate at sides, with separated punctures; dorsulum and scutellum finely striated longitudinally; postscutellum indistinctly carinated at sides; middle segment concave or depressed medially, rugose but not coarsely, with a carina originating near each side of postscutellum and diverging toward sides, which are smooth except in the region of the obtuse lateral carina where there are some coarse punctures; stem of petiole short and thick, not equalling hind coxa and trochanter in length, the enlarged portion of petiole broadly ovate, widest toward base, finely punctured medially and coarsely so at sides; second segment above with fine compact punctures, beneath with large separated ones, the pedicel short and thick; the third dorsal is margined apically with a thin membrane which is emarginate near each side; radial side of second submarginal cell slightly greater than the distance between the first transverso-cubital and the first recurrent nervures on the cubital nervure; third submarginal cell somewhat rhomboidal, the outer nervure sinuous. Length 12½ mm.

Chapada. One specimen. In coloration this species is quite similar to *Z. miniatus*, but it is not closely related to that insect. The peculiarly shaped accessory membrane of third dorsal segment is similar to that described and figured by de Saussure as occurring on the second segment of *Z. lobulatus;* and the coloration of *Z. thoracicus* and *lobulatus* seems to be very similar. But the fact that *lobulatus* has the pronotum spinose laterally, and with a short, coarsely punctured thorax, shows that they are not closely related. In the length of thorax, *Z. thoracicus* differs from all the other species in the present collection.

**Zethus ferrugineus** Sauss.

Four specimens from Santarem. These specimens differ from the description in some points of coloration, and as no structural characters whatever are given by de Saussure, I am not certain that these specimens really represent *Z. ferrugineus.*

**Zethus chrysopterus** Sauss.

A single specimen from Santarem. *Z. sculpturalis* Smith is probably identical with this species.

**Zethus rugosiceps** n. sp.

Black; spot at sides of clypeus, dot behind each antenna, in emargination of eye, short stripe on mandibles near base, scape beneath, pronotum anteriorly, base and apex of tegulæ, line on postscutellum; spot near apex of four anterior femora beneath, stripe on their tibiæ, line at apex of petiole and a slender one before apical margin of segments 2 and 3, yellow; wings subhyaline, darker in marginal cell, and slightly stained with yellow.

♀.—Head coarsely rugoso-punctate including cheeks and front; clypeus a little less coarsely punctured, convex, not quite twice as broad as long, the fore margin smooth, broadly subtruncate or incurved; flagellum clavate; scape about as long as pedicel and following three joints united; space between hind ocelli equal to or a little greater than that between them and eyes; pronotum cristate, spinose at sides, rugoso-punctate; dorsulum with coarse separated punctures with a raised line anteriorly in the middle, and two short, indistinct, impressed lines posteriorly; postscutellum sharply carinated at sides and with a short tooth-like carina medially; middle segment concave, the concavity smooth and bounded externally by a sharp carina, beyond which the middle segment is rugose as far as and slightly beyond the sharp lateral carina; stem of petiole fully as long as hind coxa and trochanter, the enlarged portion elongate-ovate with large separated punctures; the petiole much as in *Z. fraternus*, but with a longer stem and narrower enlarged portion; second segment above finely and closely punctured, beneath with large separated punctures, smooth at base, the pedicel short and stout; no distinct radial side to the second submarginal cell, the first and second transverso-cubital veins almost coalescing above. Length 16 mm.

Santarem. One specimen.

**Zethus proximus** n. sp.

Black; dot behind each antenna, line on pronotum anteriorly, dot at base and apex of tegulæ, at each side of scutellum and postscutellum, a stripe on four anterior tibiæ, line at apex of petiole emarginate anteriorly and continued a little along sides, and a line on segments 2–4, that on the dorsal segments emarginate anteriorly in the middle, yellow; in ♂ a line on mandibles, clypeus anteriorly and scape beneath, yellow; head and thorax with thin hoary pile, that on second segment brownish in certain lights; wings pale subhyaline, slightly brownish in costal cell.

♀.—Head coarsely rugoso-punctate including cheeks and front; clypeus with large shallow punctures, about or nearly twice as broad as long, its fore margin broadly subtruncate, subdentate laterally; a tolerably distinct T-shaped carina between antennæ; space between hind ocelli about equal to that between them and eyes; scape slender, but barely as long as pedicel and following three joints united; pronotum cristate, spinose laterally, rugoso-punctate; dorsulum with large separated punctures, sparse medially, with an impressed line anteriorly in the middle and two indistinct ones posteriorly; postscutellum carinated and subdentate laterally, not carinated or tuberculate medially; middle segment concave, the concavity nearly smooth and bounded externally by a carina, between which and the lateral carina the segment is rugose, the rugæ not extending on sides, but the lateral carina is margined externally by a row of foveæ; stem of petiole shorter than hind coxa and trochanter, stout, the enlarged portion elongate-ovate, scarcely narrowed apically, with coarse separated punctures; second segment finely and closely punctured, beneath the punctures large and sparse, the pedicel short and thick; second submarginal cell with a radial side nearly equalling the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal cell rhomboidal higher than long, not widened above, the outer nervure nearly straight. Length 13 mm.

♂.—Much more coarsely sculptured than ♀; clypeus anteriorly, scape beneath, line on mandibles also yellow; clypeal teeth distinct; space between hind ocelli distinctly greater than that between them and eyes; first joint of flagellum a little shorter than following two united; the two terminal joints minute, the ultimate joint but little if anything longer than the penultimate. Length 11 mm.

Corumbá, April; Uacarizal, February. Two specimens. This species is very close to *Z. rugosiceps*, but is smaller, the head less ornate with yellow, the clypeus a little broader, the dorsulum with an impressed line anteriorly, and the petiole is broader and more coarsely punctured.

**Zethus diminutus** n. sp.

Black, with tolerably distinct hoary pile; dot behind each antenna, in the emargination of eye, a small one on cheeks, pronotum anteriorly, dot at base and apex of tegulæ, two spots on scutellum and postscutellum, anterior tibiæ in front, line at apex of petiole bidentate or emarginate anteriorly, and a line on apical margin of segments 2–5, emarginate anteriorly in middle, yellow; second dorsal somewhat brownish at each side near base, with brownish pile; wings subhyaline, fuscous along costal margin.

♀.—Head with shallow, separated punctures; cheeks subcarinate down middle; clypeus similarly punctured, convex, barely twice as broad as long, its fore margin with three widely separated teeth, the medial one smallest; an indistinct T-shaped carina between antennæ; space between hind ocelli if anything slightly greater than that between them and eyes; pronotum cristate, angularly produced or subdentate at sides, rugoso-punctate; dorsulum with large rather shallow punctures, anteriorly with a shallow impression in middle, posteriorly with two indistinct ones; postscutellum carinated laterally, depressed medially; middle segment concave medially, the concavity bounded outwardly by a carina, the space beyond this carina roughened and with some shallow punctures (but it can scarcely be called rugose); sides near lateral carina with distinct shallow punctures; petiole with basal stem a little longer than hind coxa and trochanter, the enlarged portion elongate-ovate, rather narrowed and scarcely narrowed to apex with large punctures strongest on sides; second segment above compactly punctured, beneath with large separated punctures, smooth at base, the stem short, not as long as the width of apex of petiole, but still it is more evident than in *proximus* or *rugosiceps;* radial side of second submarginal cell shorter than the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal higher than long, the outer nervure gently sinuous. Length 12 mm.

Corumbá, April. One specimen. Resembles *proximus* and *rugosiceps* in coloration, but the sculpture of head is different.

**Zethus coriarius** n. sp.

Black; abdomen with sericeous pile; a linear spot at each side of apical margin of petiole, yellow; wings subhyaline, with anterior half of costal cell black.

♀.—Head with large, close, shallow punctures; clypeus convex about twice as broad as long, fore margin broadly subtruncate, subdentate laterally, an indistinct T-shaped carina between antennæ; flagellum strongly clavate, the first joint distinctly shorter than the following two united; space between hind ocelli equal to or slightly greater than the distance between them and eyes; pronotum cristate, subdentate or angularly produced at sides; rugoso-punctate; dorsulum with coarse separated punctures with a shallow impressed line anteriorly in the middle, the usual posterior impressions entirely wanting; scutellum and postscutellum coarsely punctured, dentato-carinate laterally; middle segment not rugose, tolerably smooth, coriaceous, concave medially with two converging carinæ running from postscutellum and quite sharp at base, lateral carina distinct; petiole subcampanulate, stem longer than hind coxa and trochanter, slender, enlarged portion with large separated punctures, a little narrowed to apex; second segment above with shallow punctures except toward base which is smooth or finely punctured, ventral surface with larger punctures, smooth and shining at base, pedicel short and stout; radial side of second submarginal cell about equal to the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal cell higher than long, rhomboidal, the outer nervure nearly straight. Length 12 mm.

Chapada, March and November. Two specimens. The almost smooth, leatherlike surface of middle segment is characteristic of this species.

**Zethus notatus** n. sp.

Black; abdomen with pale sericeous pile; mandibles except tips, broad line surrounding the anterior and lateral portions of clypeus, spot at each side of face, behind each antenna, in the eye-emargination, at summit of eyes, stripe on posterior orbits, spot at each side of pronotum anteriorly, beneath wing and at each side of scutellum, outer margin of tegulæ, large spot on fore femora near apex, their tibiæ in front, stripe on medial tibiæ, line at apex of petiole and a slender one at apex of segments 2 and 3, yellow; wings subhyaline, a fuscous cloud in the costal cell anteriorly.

♀.—Head flat, the front and vertex finely striato-punctate; clypeus subtilely striato-punctate, shaped as in *Z. thoracicus*, about one-third broader than long, the fore margin broadly produced, subtruncate or subrounded, the side lying between the lateral angle and anterior margin incurved; no carina between antennæ; the latter with flagellum subclavate, the first joint a little shorter than the following two united; space between hind ocelli somewhat depressed, a little less than that between them and eyes; thorax elongate, the prothorax lengthened, narrowed and sharply margined anteriorly, subdentate laterally, with strong separated punctures; dorsulum nearly one-third longer than broad, rather subtilely striato-punctate; suture between dorsulum and scutellum coarsely foveolate, the latter impressed; postscutellum subcarinate laterally; middle segment depressed or subconcave medially with two sharp slightly diverging carinæ beginning one at each side of postscutellum, the depressed surface lying between them with not very strong transverse rugæ, the surface between them and the feeble lateral carina covered with deep rounded holes, somewhat resembling reticulations, sides smooth at base, coarsely punctured above and posteriorly; enlarged portion of petiole subtruncate anteriorly, its junction with the basal stem forming an angle when viewed from side and transversely carinated, the enlargement is stout, widest at base, strongly contracted just before the apex, the upper surface very coarsely punctured especially basally, carinated down middle, and with a strong depression before apex, the ventral surface bearing a large Y-shaped carina; second segment with pedicel short and stout, the dorsal surface finely and closely punctured, ventrally with larger separated punctures, sparse toward base; second submarginal with no radial side, the first and second transverso-cubital veins uniting above. Length 9 mm.

♂.—Very much like ♀; flagellum fulvous beneath and at tip, the first joint about one-third longer than second, apical joint truncate, stout, about twice as long as the penultimate, the eleventh joint broader, but still smaller than tenth; pronotum sharply dentate; sculpture a little coarser than in ♀. Length 9 mm.

Santarem. Two specimens. This species and *Z. thoracicus* are clearly allied in the shape of thorax and fine sculpture of head and dorsulum, shape of clypeus, etc. The postscutellum and middle segment are not strongly carinate in *thoracicus*, however.

**Zethus inconstans** n. sp.

Black; line on pronotum anteriorly, twice interrupted, spot at apex of fore femora, broad stripe on fore and medial tibiæ, line at apex of petiole, and a narrow line before apex of dorsal segments 2 and 3; wings subhyaline fuscous along anterior half of costal and marginal cells.

♀.—Head with large punctures, the front having the appearance of being reticulate; clypeus convex, silvery pubescent, with shallow punctures, about one-third broader than long, the fore margin polished, dentate at each side; flagellum strongly clavate, the first joint considerably shorter than the two following united; space between hind ocelli about equal to that between them and eyes; pronotum cristate, sharply dentate at sides, rugoso-punctate; dorsulum with coarse punctures, anteriorly in middle with a raised line, and medially with two somewhat parallel, longitudinal carinæ or folds, the usual posterior impressions absent; postscutellum carinate laterally and dentato-carinate medially; middle segment depressed or subconcave medially with a sharp carina beginning at the sides of postscutellum, the surface between this carina and the very sharp lateral one, rugose, sides with some coarse striæ posteriorly; petiole with stem about as long as hind coxa and trochanter, the enlarged portion elongate, narrow, barely narrowed apically, with large sparse punctures; second segment finely and compactly punctured above, beneath with large separated punctures, except the base which is smooth, stem almost as long as the apex of petiole is wide, more slender than in allied forms; second submarginal cell with no radial side in consequence of the union of the first and second transverso-cubital veins above; third submarginal widest above, the outer nervure nearly straight. Length $11\frac{1}{2}$ mm.

*Var.*—Much more coarsely sculptured; no yellow on legs; a small radial side on second submarginal cell, the third submarginal but little widened above. Length 12 mm.

Santarem; Mararu. Two specimens, that representing the variety coming from the latter locality.

**Zethus miniatus** Sauss.

Uacarizal, February; Chapada, March; Corumbá, April. Three ♀, four ♂ specimens.

**Zethus carinatus** Sm.

Twenty-four specimens; Chapada, January, February, November; Corumbá and Pedra Branca, April. This insect is evidently very similar to *Labus Sichelianus* Saussure. Both sexes have 4-jointed labial palpi.

AA. Pedicel of second segment longer than width of first segment at apex.

**Zethus punctatus** n. sp.

Black; spot on each side of face, dot on pronotum laterally, line on postscutellum, two stripes on middle segment, short line on sides of petiole at apex, and two dots at base of pedicel of second segment; an extremely narrow line at apex of dorsals 2–5, and two dots on segment 6 sometimes, yellow; stripe on all the tibiæ, and fore femora anteriorly on the tibiæ and tarsi entirely, yellow or fulvous; wings cæruleous. The abdominal maculation is variable.

♀.—Front with coarse confluent punctures, becoming more separated and shallow on the vertex; cheeks smooth or finely punctured posteriorly, coarsely punctured near base of mandibles, and less coarsely along the eye margin; clypeus not quite twice as broad as long, with coarse, shallow punctures, the fore margin broadly truncate medially, not dentate; flagellum subclavate, the first joint about as long as the two following united; space between hind ocelli about equal to that between them and eyes; pronotum cristate, not dentate; dorsulum with strong, separated punctures throughout, with a raised line anteriorly in middle, the posterior impressions indistinct; scutellum rather flat, impressed, punctured about like dorsulum; postscutellum entire; middle segment, concave or depressed medially, finely striated except in depressed middle, the lateral carina very short only present at base; stem of petiole short and stout, the enlarged portion fusiform, strongly punctured except toward apex where the punctures are finer and quite dense; second segment finely and closely punctured above, the ventral surface smooth at base, and with large sparse punctures apically, stem long and slender, about as long as first hind tarsal joint, with distinct separated punctures; second submarginal cell with a radial side which is fully equal to the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal rhomboidal, higher than long, scarcely broadened above, the outer nervure gently sinuous. Length 19–21 mm.

♂.—Colored like ♀, but with a yellow stripe on anterior margin of clypeus and on mandibles; sculptured more coarsely than in ♀; antennæ hooked at tip, the ultimate joint obtusely pointed, much longer than the penultimate, the two together not much longer than the eleventh joint. Length 18 mm.

Chapada, January, March, November, December; Corumbá, April. Thirteen ♀ and two ♂ examples. In this species, which may be the same as *Z. Smithii* Sauss., the male has the fourth joint of labial palpi distinct, whereas in the ♀ it is rudimentary. This peculiarity seems to exist in several species of the section *Didymogastra.*

**Zethus simillimus** n. sp.

Very close to *punctatus* in coloration; but having all the femora more or less reddish, and there is no yellow on hind tibiæ, while abdominal segments 3–6 are broadly margined with, or entirely, yellow; otherwise colored as in *punctatus.*

♀.—Front rather closely striato-punctate, the vertex finely and closely punctured; clypeus twice as broad as long, with strong shallow punctures becoming deeper anteriorly, the fore margin dentate, or subdentate at each side, and very indistinctly so medially; dorsulum with strong punctures becoming sparse and weaker medially; dorsulum convex; impressed; middle segment as in *punctatus* but more strongly striated; petiole practically the same as in *punctatus*, the pedicel of second segment a little longer and more slender; outer nervure of third submarginal cell strongly sinuous. Length 21 mm.

Chapada, January and March. Two specimens. May be but a variety of *Z. punctatus* notwithstanding the difference of sculpture.

**Zethus emarginatus** n. sp.

Black; short line on scape beneath at base, crescent-shaped mark at apex of clypeus, inner orbits near base of clypeus, dot behind each antenna and on cheeks near top, one on tegulæ anteriorly, line on postscutellum, two spots on middle segment near insertion of petiole, line on each side of petiole on apical half, dot at each side of base of pedicel of second segment, a short line on its sides, and a narrow on the apical margin of segments 2–6, yellow; tibiæ and the femora except hind pair, more or less reddish; antenna beneath toward apex fulvous, joints 8–11 margined with pale yellow apically; wings dark subhyaline, fuscous along costal margin.

♂.—Head deeply punctured, closest and smallest on vertex and occiput, confluently so on front; cheeks except along the eye margin and near base of mandibles, smooth; clypeus with separated shallow punctures, covered with pale pubescence, fully twice as broad as long, the fore margin armed with two widely separated teeth; a T-shaped carina between antennæ; the latter with the flagellum robust, tolerably long, the first joint a little shorter than the two following united, the apical joint obtusely pointed, if anything, shorter than the two preceding joints united, joints 9 and 10 emarginate beneath at apex, especially the tenth; a raised line runs back from the anterior ocellus; hind ocelli margined outwardly by a furrow or pit, the space between them if anything slightly greater than that between them and eyes; pronotum cristate, not dentate or angulate, strongly punctured; dorsulum strongly punctured, closest anteriorly, with an impressed line medially in front, the usual posterior impressions indistinct; dorsulum similarly punctured, impressed; postscutellum entire; middle segment sulcate medially, rugoso-striate, finely striate on sides, the lateral carina only present at base; stem of petiole about as long as hind coxa, the enlarged portion somewhat fusiform, but broadest basally, with fairly strong, separated punctures; second segment above with fine close punctures basally, those apically becoming larger and sparser, the ventral with strong, separated punctures except toward base which is smooth, pedicel slender, nearly as long as one-third the length of segment, shorter than first hind tarsal joint; radial side of second submarginal cell nearly as great as the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal cell distinctly broadened above, the outer nervure gently sinuous. Length 14 mm.

Corumbá, April. One specimen.

**Zethus Hilarianus** Sauss.

Five ♀, one ♂, specimens. Chapada, March and December; Uacarizal, February.

**Zethus coloratus** n. sp.

Rufous in greater part; the following parts black: front, tips of mandibles, cheeks on lower part, flagellum above from apex of third joint, sutures of thorax and its ventral surface entirely, a blotch on the enlarged portion of petiole, second segment except base and apex, and base of third segment; otherwise the insect rufous, the coloration varying but little; wings fuscous, with purplish effulgence.

♀.—Head with strong, shallow, confluent punctures, the front longitudinally rugose; clypeus more than twice as broad as long, more strongly punctured than the rest of head, the fore margin armed with a tooth laterally; a small tubercle between the bases of antennæ, flagellum subclavate, the first joint as long as the second, third and about half of fourth joints united; space between hind ocelli distinctly less than that between them and eyes; pronotum cristate, with coarse, close punctures indistinctly subdentate laterally; dorsulum rather closely punctured at base and apex, otherwise more sparsely, with an impressed line anteriorly and medially with two longitudinal swellings or raised lines, the posterior impressed lines tolerably distinct; postscutellum transversely compressed, with a small tubercle medially; middle segment depressed medially rather coarsely striated transversely, indistinctly or finely so on sides, the lateral carina only evident at base; stem of petiole a little longer than hind coxa, the enlarged portion broadest and rounded basally, strongly punctured, contracted just before apex; second segment above compactly punctured, beneath with large sparse punctures, smooth at base, and covered with short hairs, the pedicel rather thick, distinctly shorter than the first hind tarsal joint; radial side of second submarginal cell distinctly shorter than the distance between the first transverso-cubital and first recurrent nervures on the recurrent nervure; third submarginal cell enlarged above, the outer nervure gently sinuous. Length 20–21 mm.

♂.—Sculpture coarser than in ♀; clypeus about twice as long as broad, its teeth acute; first joint of flagellum but slightly longer than the following two joints united, the ultimate joint quite minute, much smaller than the penultimate, the two together scarcely longer than the eleventh joint, which is deeply emarginate beneath at apex. Length 16 mm.

Chapada, January and March. Five ♀, one ♂ specimens.

**Zethus aurulens** Sauss.

Four ♀, one ♂ specimens. Chapada, March and April; Santarem.

**Zethus peculiaris** n. sp.

Black; abdomen polished; front, clypeus, vertex and thorax above clothed with thick, long, yellowish-brown hairs; round spot at each side of clypeus, dot behind the insertion of each antenna, small one at summit of cheeks, line on pronotum anteriorly and on four anterior tibiæ, spot at base of tegulæ and at apex of four anterior femora, and a small one at each side of apex of petiole, yellow; scape and following three joints entirely and a spot on all the remaining joints beneath rufous; wings subhyaline, a little brownish along costal margin.

♀.—Head with strong separated punctures; clypeus rather long, but little more than one-third broader than long, the fore margin broadly truncate, unarmed; flagellum rather long, subclavate, the first joint a little longer than the following two joints united; space between hind ocelli about equal to that between them and eyes; pronotum cristate, with a few subtile, indistinct punctures, sharply dentate laterally; dorsulum with fine punctures except at extreme apex where they are large and coarse, anteriorly in middle with a raised line, the usual posterior impressions absent; scutellum punctured posteriorly; postscutellum entire its hind margin angular medially; middle segment scarcely depressed, coarsely striated transversely, the sides likewise striated; stem of petiole fully as long as hind coxa and trochanter, the enlarged portion impunctate, shining, subfusiform, strongly depressed its entire width just before apex, beneath before apex with a shallow pyriform depression which is transversely rugose; second segment above punctured along apical margin only, beneath the punctures more distributed but quite sparse, pedicel slender, distinctly shorter than first hind tarsal joint; remaining segments distinctly punctured; radial side of second submarginal cell slightly greater than the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal cell nearly as long as high, rhomboidal, the outer nervure distinctly but not strongly sinuous. Length 16 mm.

Rio de Janeiro, November. One specimen. Quite remarkable by the densely pubescent head and thorax, sculpture of middle segment and dorsulum and polished, impunctate, petiole and most of second segment.

**Zethus geniculatus** Spin.

Two ♀, two ♂ specimens. Santarem. In the males of the specimens I have referred to *geniculatus,* the ultimate antennal joint is long and remarkably slender and acute, spinelike; it is quite as long as the two preceding joints united.

### *Table of New Species of Zethus.*

Pedicel of second segment shorter than width of first segment at apex . . . . . . . . . . . . . . . . 2

Pedicel of second segment longer than width of first segment at apex . . . . . . . . . . . . . . . . 19

2. Postscutellum entire, not emarginate, carinate, or dentate . 3

   Postscutellum emarginate, dentate or carinate . . . . 6

3. Petiole campanulate; wings dark basally, pale apically; pedicel of second segment scarcely evident. . . *sessilis* ♀♂.

   Petiole not campanulate . . . . . . . . . . . 4

4. Shining black, with middle segment, legs and petiole red, *prominens* ♀.
Otherwise colored . . . . . . . . . . . . . . . 5
5. Front and clypeus striated . . . . . . . *striatifrons* ♀♂.
Front and clypeus not striated, simply punctured *rufipes* ♂.
6. Middle segment not sharply carinate, nor indeed carinate, unless the angular crest of the two faces of the middle segment be called a carina . . . . . . . . . . . . 7
Middle segment distinctly carinated on each face . . . 14
7. Postscutellum carinate, but not very distinctly, at sides . 8
Postscutellum emarginate or dentate . . . . . . . . 12
8. Dorsulum finely striated longitudinally . . . *thoracicus* ♀.
Dorsulum sculptured otherwise . . . . . . . . . . 9
9. Enlargement of first segment slender, elongate *cylindricus* ♀♂.
Enlargement of first segment shorter, robust . . . . 10
10. Front and clypeus striated . . . . . . . . . . . 11
Front and clypeus punctate . . . . . . *imperfectus* ♀.
11. Enlargement of petiole broadest anteriorly, sides converging apically, not rounded outwardly. . . . . . *cristatus* ♀.
Enlargement of petiole ovate or subcampanulate, sides strongly rounded . . . . . . . . . . . . *campanulatus* ♀♂.
12. Ornamented with rufous . . . . . . . . . . . . 13
Not at all rufous (front and clypeus striated) . *hexagonus* ♀.
13. Front rather finely striated . . . . . . . . *bicolor* ♀♂.
Front coarsely striated . . . . . . . . *productus* ♀♂.
14. Enlargement of petiole very coarsely punctured, subtruncate anteriorly . . . . . . . . . . . . *notatus* ♀♂
Enlargement of petiole strongly, but not coarsely punctured, rounded anteriorly . . . . . . . . . . . . . 15
15. Pronotum not spinose laterally . . . . . . . . . . 16
Pronotum spinose or subspinose . . . . . . . . . 17
16. Only the apex of petiole maculated with yellow. *corirarius* ♀.
Thorax and abdomen at apex of all segments, yellow *diminutus* ♀.
17. Body of petiole tolerably stout, ovate . . . . . . . 18
Body of petiole narrow, elongate, fusiform . *inconstans* ♀.

18. Clypeus punctured like front; dorsulum with a slender, raised line anteriorly in middle; sides of clypeus yellow *rugosiceps* ♀.
    Clypeus with deep, separated punctures, front rugoso-punctate; clypeus not yellow, except anterior margin in ♂. *proximus* ♀♂.
19. Head and thorax above without yellowish-brown hair . 20
    Head and thorax above with dense yellowish-brown hair; petiole smooth, shining . . . . . . . . *peculiaris* ♀.
20. Head and thorax black . . . . . . . . . . . . 21
    Head and thorax rufous . . . . . . . . . *coloratus* ♀♂.
21. Apical abdominal segments yellow; tibiæ black, the medial pair striped with yellow . . . . . . . . *simillimus* ♀.
    Apical abdominal segments narrowly margined with yellow; tibiæ more or less reddish . . . . . . . . . . . 22
22. Wings blue-black. Length 18–21 mm. . . *punctatus* ♀♂.
    Wings subhyaline, costal margin fuscous. Length 14 mm. *emarginatus* ♂.

**Labus brasiliensis** n. sp.

Head black, clypeus except medially, transverse spot behind the antennæ, the eye emarginations, mandibles except apex, scape except a line above, broad stripe on cheeks, a large spot beginning at summit of eyes and extending toward middle of occiput, bright yellow; thorax black, pronotum entirely, two lines on dorsulum, two spots on scutellum, and postscutellum, tegulæ, large spot beneath wings, middle segment except sides and in medial sulcus, all the coxæ and trochanters more or less, the four anterior femora except basally, the hind pair except a stripe above, all the tibiæ and tarsi, except a stripe on hind tibiæ, bright yellow; petiole except a medial and lateral stripe, second segment beneath except two spots beyond middle laterally, and above except base and greater part of disc, and the remaining segments more or less, bright yellow; in the male the black spots of second ventral segment are spread out so as to cover most of the segment; flagellum rufous beneath, black above; wings pale fulvo-hyaline, stigma yellowish.

♀.—Head with strong, separated punctures, those on cheeks finer; clypeus rather small, almost as long as broad, the fore margin tridentate, the medial tooth indistinct; a strong carina divides the bases of antennæ and extends slightly on the clypeus; flagellum clavate, the first joint about as long as the two following united; space between hind ocelli less than that between them and eyes; pronotum cristate, rather square anteriorly in consequence of the strongly angulate sides; dorsulum longitudinally rugoso-striate, with two longitudinal raised lines or swellings medially, anteriorly in the middle with a fine raised line, and with a polished tubercle at each side close to the tegula; scutellum broadly sulcate down middle, on each side of which it is polished; post-scutellum broadly and angularly emarginate; middle segment rugose, but rather finely, with a deep, rather broad medial furrow which is bounded by a high crista on each side, the lateral carina sharp, foveolate externally, sides with some coarse striæ; petiole elongate, linear, not swollen or nodose, narrowed toward base on its anterior third, in length longer than thorax, subdentate on each side before middle, beneath strongly carinate down middle, at apex with a broad shallow depression; second segment above finely and closely punctured, beneath shining with larger, sparse, punctures, pedicel rather robust, long, but barely half as long as first hind tarsal joint, the segment gradually dilated; radial side of second submarginal cell about equal to the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal cell a little narrowed above, rhomboidal, the outer nervure sinuous. Length 14 mm.

♂.—More coarsely sculptured. Clypeus entirely yellow, more than twice as broad as long, with two acute teeth anteriorly; first joint of flagellum shorter than the two following united, the ultimate joint obtuse at tip, longer than the penultimate, the two together nearly as long as joints 10 and 11 united; lateral angles of pronotum acute and prominent; middle segment above with coarse rugæ. Length 12 mm.

Chapada, September; Santarem. The ♀ specimen comes from the former, the ♂ from the latter locality.

Saussure's suggestion[1] that the genera *Elimus* and *Labus* might be united is worthy of further thought. In fact it is difficult to understand why *Elimus* and *Labus* should be considered distinct from *Zethus*.

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[1] *Synopsis American Wasps*, p. 56.

**ZETHOIDES** gen. nov.

Allied to *Zethus* which it greatly resembles superficially, and seems to differ only in the following points: Middle tibiæ one-spurred; labrum broadly truncate; mandibles elongate, with four large teeth reaching from apex half way to base on inner margin. In the only species known, the clypeus is armed with two large prongs, between which it is broadly incurved, and all the tarsi are flattened and short; but these are probably sexual characteristics. Female unknown.

In the shape of mandibles this genus would fall in Saussure's "Legion II. The Odynerites,"[2] while the shape of abdomen, with its pedicellated second segment indicates its affinities with "Legion I. The Zethites." As it stands, *Zethoides* must be considered a connecting link between these two Legions. The palpi agree with those of *Zethus* in the number of joints, those of the labial palpi in length are as follows: the first longest, the second shorter, but longer than the two following united, the last smallest, quite minute.

**Zethoides Smithii** n. sp.

Black; antennæ entirely, cheeks, base of clypeus, most of pronotum, outer margin of tegulæ and legs more or less, fulvous; clypeus, scape beneath, mandibles, eye emargination, dots at summit and behind eyes, anterior margin of pronotum, spot under wing, two dots on scutellum and postscutellum, stripe on four anterior tibiæ and medially interrupted line at apex of petiole, yellow; wings subhyaline, brownish along costal margin.

♂.—Head with strong, not coarse, sparse punctures; clypeus finely and closely punctured the fore margin armed with two huge spines or teeth, between which the clypeus is roundly emarginate; antennæ curled at tip, the ultimate joint robust, broadened and truncate apically, fully as long as the two preceding ones united, penultimate joint smallest, the ninth emarginate so that the apical one in consequence of the rolling up of the tip of antenna fits into the emargination, first joint shorter than the two following united; space between hind ocelli much less than that between them and eyes; parted by a furrow which extends back on the occiput; pronotum cristate, dentate at sides, with shallow punctures; dor-

[2] *Synopsis American Wasps*, p. 59.

sulum with larger shallow punctures, with a slender raised line anteriorly in middle, the usual posterior impressions indistinct or wanting, on each side near the tegula there is a short, fine, raised line; scutellum convex, impressed; postscutellum carinate laterally, with a small tubercle medially; middle segment concave medially, the concavity bounded outwardly by a sharp carina, beginning at each side of postscutellum in the shape of a lamella and gradually decreasing to a slender ridge, space between these and the sharp lateral carina rugoso-punctate, sides a little roughened apically, lateral carina reaching to the insertion of abdomen gradually increasing in height from base until it is almost laminate at apex; tarsi flattened, unusually short, hind tibiæ more or less distorted, the outer margin being strongly sinuate; petiole with stem short and thick, the enlarged portion strongly punctured, rounded at base, the sides only narrowed to apex from their apical fourth, and then only slightly; second segment above with shallow punctures, beneath with large sparse punctures, the stem short and thick; second submarginal cell with a radial side a little shorter than the distance between the first transverso-cubital and first recurrent nervures on the cubital nervure; third submarginal cell subquadrate, oblique, broadened above, the outer nervure angulate medially. Length 16 mm.

Chapada, March. Two specimens.

A. Petiole of abdomen with a long slender base, swollen at apex, more or less campanulate.

a. Head from front as long as broad.

**Eumenes chrysothorax** Sauss.

One specimen. Corumbá, April.

**Eumenes sericea** Sauss.

Same locality and month as the preceding; also Santarem. Four specimens.

**Eumenes bipartita** n. sp.

♀.—Black, with sericeous pile; mandibles yellow, black within basally, reddish at apex; flagellum beneath near apex, four anterior tibiæ and tarsi more or less, and a ring on petiole near base, reddish; front subconvex with indistinct, shallow punctures, medially impressed; ocelli in a curved line; clypeus feebly punctured, pyriform, bicarinate apically, the carinæ terminating in sharp teeth separated by a notch; thorax except scutella and middle segment impunctate; pronotum margined; middle segment broadly and shallowly channelled, with rather strong distinct punctures except on sides which are nearly smooth; petiole campanulate, about as long as that portion of thorax posterior to dorsulum, with tolerably strong separated punctures, furrowed transversely before apex and above with a broad shallow, rather indistinct furrow; remainder of abdomen elongate-ovate, above densely punctured, beneath almost impunctate; wings on basal half blackish with purplish reflection, apically subhyaline; stigma brownish. Length 15 mm.

Corumbá, April. One specimen.

**Eumenes testacea** n. sp.

♂.—Testaceous yellow, the first and second segments except apices, brownish; flagellum reddish; a semicircular mark on vertex terminating at each side at a point opposite the eye-emargination and curving backward so as to include the hind ocelli, and being connected by a narrow line to a similarly colored curved line on occiput, a spot in front of the anterior ocellus, three stripes on dorsulum, spot on pronotum at each side and spot on scutellum, black; middle segment with a brownish mark on each side; front convex, medially impressed; with strong separated punctures; clypeus elongate, subacuminate, impunctate, much longer than broad, apically with two carinæ terminating in short approximate teeth; ocelli forming a triangle; flagellum long, scarcely thickened; pronotum margined, not angulate; dorsulum, scutellum and postscutellum more strongly punctured than front; scutellum subconvex, not impressed; middle segment less strongly punctured than dorsulum, feebly so on sides, the medial furrow deep; petiole campanulate, short, about as long as that portion of thorax posterior to base of scutellum, feebly punctured, and just before apex above with a deep pit; dorsal surface of remainder of abdomen with feeble shallow punctures, the ventral surface nearly impunctate; wings subhyaline, slightly yellow along costa; nervures and stigma yellow testaceous. Length 12 mm.

♀.—Colored and sculptured like ♂, but the wings with a yellowish cast and darkened apically; flagellum shorter, subclavate.

Santarem. One ♀, two ♂ specimens. The clypeus is much longer and narrower than in *E. sericea* Sauss., and the black markings of vertex and reddish flagellum are good superficial characteristics.

**Eumenes lævis** Sauss.

Corumbá, Pedra Branca and Mararú, April; Santarem. Nine specimens.

**Eumemes novaræ** Sauss.

Chapada, December; Santarem. Six specimens. Strongly resembles *E. lævis,* from which it may be readily separated by distinctly punctured abdomen and want of maculation on middle segment.

**Eumenes insignis** n. sp.

♀.—Deep black, covered with sericeous gray pile especially on abdomen; spot behind base of antennæ, in the emargination of and behind summit of eyes, narrow interrupted line on pronotum both anteriorly and posteriorly, dot behind tegulæ, two spots on post-scutellum, a mark near the base of petiole above, in the shape of an inverted U, and a narrow line at apical margin, yellow; remaining segments entirely black, the petiole beneath reddish; flagellum at base beneath, tibiæ and tarsi, more or less marked with blackish, reddish; front with distinct, though not coarse separated punctures, medially impressed; ocelli in a curved line; clypeus elongate pyriform, flattened, finely punctured with two long carinæ anteriorly, equalling at least one-half its length, and terminating in two large acuminate teeth; thorax densely punctured, especially on middle segment where the punctures are strongest; pronotum margined anteriorly; dorsulum with a slender smooth line anteriorly in middle; scutellum with a short feeble longitudinal carina at base, which is followed by a shallow sulcus reaching to apex; sulcus of middle segment not very broad; petiole shorter than thorax, gradually broadened from its basal third to apex, not impressed, but transversely depressed before apex, with widely separated punctures above; remainder of abdomen rather fusiform but broadest toward base, impunctate; anterior wings fuscous on basal two-thirds, and along anterior margin of hind wing, otherwise subhyaline; nervures black, the stigma brown medially. Length 14–15 mm.

♂.—Basal half of flagellum beneath, and terminal joint, reddish yellow; clypeal carinæ almost obsolete barely evident except on apical teeth; punctuation coarser than in ♀; petiole above slightly longitudinally impressed medially; wings darkened along costal margin only; clypeus, except apex line on scape and apical margin of sixth ventral segment, yellow; seventh ventral smooth, broadly rounded at apex. Length 13 mm.

Chapada, March, October, November. Two examples of each sex.

**Eumenes læviventris** n. sp.

♀.—Black, clothed with sericeous gray pile; a spot in the sinus of eye, short line on orbits behind and at sides of face, dot at summit of eye, posterior margin of pronotum medially, dot behind tegulæ, two spots on scutellum, spot on four hind coxæ and at tips of four anterior femora, stripe on all tibiæ and narrow line at apex of petiole, yellow; flagellum beneath except medially, fulvous; petiole ringed with reddish near base; front with distinct separated punctures; ocelli in curved line; clypeus broad, subcordate, finely punctured, convex, not carinate, terminating in two acute teeth; pronotum with shallow, subtile punctures, very finely margined; dorsulum with stronger, scattered punctures, anteriorly in middle with an impressed line, and at apex with four short, stronger impressions, of which the two inner are most approximate; scutellum subcarinate basally, impressed apically; middle segment with strong, separated punctures, broadly depressed or concave, the medial furrow distinct, foveolate; petiole almost or quite as long as thorax, more rapidly enlarged than in *E. insignis*, impunctate, transversely depressed before apex; remainder of abdomen ovate, smooth; wings broadly fuscous along costal margin as far as stigma, the latter brownish or blackish as well as nervures. Length 13–15 mm.

♂.—Clypeus entirely, inner orbits of eye from base of clypeus to within the emargination, scape beneath, spot behind base of antennæ, two spots on pronotum anteriorly, and rarely two spots on middle segment, yellow; on the legs this color is much more widely distributed than in ♀; clypeus smaller, roundly emarginate at apex, the carinæ almost obsolete; seventh ventral segment furrowed down middle. Length 13–15 mm.

Corumbá, April. Two ♀, eight ♂ specimens. This species bears a strong resemblance to *E. insignis*, with which I had at first confused it, but they differ in the shape of clypeus in female, and in the punctate petiole of *insignis*, the abdomen of *læviventris* being entirely smooth.

**Eumenes convexa** n. sp.

♂.—Black, with sericeous pile, that on second segment golden; spot in eye-emargination, behind base of antennæ, scape beneath, clypeus entirely, base of mandibles, anterior and posterior margins of pronotum, outer margin of tegulæ, dot behind them, anterior margins of scutellum and postscutellum, spot on mesoplurae above, four anterior femora beneath except at base, all tibiæ except inner stripe, petiole above except at base and an elongate medial stripe, and apical margins of remaining segments broadly, especially the second, bright yellow; flagellum on basal half and tarsi reddish or fulvous; front with strong separated punctures; ocelli in triangle; clypeus impunctate, terminating in two rather widely separated teeth which are preceded by feeble carinæ; antennal hook large; thorax strongly punctured, the dorsulum sparsely in middle; pronotum margined, the antero-lateral angles somewhat developed, scutellum convex, impressed; middle segment depressed or concave, especially toward apex; medial femora unusually broadened toward base; petiole longer than thorax, gradually broadened from beyond its basal third, impunctate, transversely depressed before apex; remainder of abdomen somewhat pyriform, smooth, with exception of a few large punctures before apex of dorsal segments; seventh ventral with a triangular depressed area; second segment evenly convex when viewed from side; wings subhyaline, fuscous in costal and marginal cells; nervures and stigma black. Length 11–12 mm.

Santarem, November. Two specimens.

**Eumenes superficialis** n. sp.

♀.—Black, with sericeous pile longest on middle segment and golden on abdomen; inner orbits from base of clypeus to within eye-emargination, dot behind insertion of antennæ, dot on each side of clypeus basally and at summit of eyes, short line on posterior orbits, posterior margin of pronotum, dot at apex of tegulæ, one behind these, line basally on scutellum and postscutellum, tips of all femora, stripe on all tibiæ (tarsi dark), line at apex of petiole, and remaining segment broadly, bright yellow, that on second dorsal covering at least one-third its surface and angularly produced anteriorly in middle, and produced anteriorly along sides of segment; flagellum fulvous beneath; front strongly punctured, prominent on each side, so that it possesses apparently two diverging carinæ originated at each side of fore ocellus; clypeus with fine dense punctures, but little longer than broad, terminating in two rather approximate, short teeth, not carinate, evenly convex; thorax with deep punctures, those on pronotum closest; the latter margined anteriorly; scutellum having the largest punctures, impressed; middle segment depressed down middle, but hardly concave; petiole about as long as thorax, evenly dilated from about middle, the enlarged portion sparsely punctured, not distinctly transversely depressed before apex, but with a fovea or pit at its summit; second segment, seen from side, elongate, above and beneath between base and apex apparently subangulate, the contour of the second ventral is decidedly sinuous as the segment is depressed medially; second dorsal densely punctured; wings pale fusco-hyaline, the costal and marginal cells pale yellow; stigma brown; nervures darker. Length 11 mm.

♂.—Base and sides of clypeus yellow; flagellum more fulvous beneath; a dot sometimes on mesopleuræ and line on each side of fore margin of pronotum, yellow; antennal hook very slender, spine-like, the preceding six or seven joints minutely dentate beneath; medial femora slender, not unusually widened at base; seventh ventral segment small, smooth. Length 10½ mm.

Corumbá, April; Chapada, December. One ♀, two ♂ specimens. The resemblance borne by this species to *convexa* is only superficial.

**Eumenes usitata** n. sp.

♀.—Black; head and thorax rather densely clothed with pale sericeous pile; spot in emargination of eye, behind base of antennæ, an angular line on clypeus laterally, scape beneath, hind orbits above, interrupted line on pronotum anteriorly, its posterior margin, two spots, or a line, on anterior margin of scutellum and postscutellum, spot beneath wing, and on four hind coxæ, narrow interrupted line on sides of petiole, line at apex and a line just before apical margins of segments 2–5, yellow; flagellum beneath basally fulvous; four anterior femora beneath, the hind pair at apex, tibiæ and tarsi entirely, outer margin of tegulæ, reddish; mandibles reddish, black at base with a yellow dot; front distinctly punctured; clypeus elongate, somewhat pyriform, finely and closely punctured, with two carinæ anteriorly terminating in two well-separated teeth; thorax strongly punctured especially the middle segment, the punctures finest on pronotum, which is barely margined; scutellum indistinctly impressed; middle segment but little depressed, its punctures more or less confluent; petiole fully as long as thorax, gradually dilated from its basal third, almost impunctate or very subtilely punctured, transversely depressed before apex; remainder of abdomen somewhat pyriform, indistinctly punctured; wings subhyaline, the costal margin narrowly and the marginal cell fuscous; nervures and stigma black. Length 12 mm.

♂.—Clypeus entirely, and two spots at extreme base of middle segment laterally, yellow, in addition to the parts mentioned in description of female; the spot behind base of antennæ is continued down to base of clypeus, and the reddish of legs is more widely distributed; clypeal carinæ almost obsolete; tegulæ fulvous or reddish; medial femora a little widened basally; petiole longer than thorax; seventh ventral crossed by a carina some distance beyond base, before this carina the surface is dull, opaque, beyond it shining, punctate; wings a little darker throughout than in ♀, stigma dark brown. Length 11–12 mm.

Corumbá, April, May; Santarem. One ♀, twelve ♂ specimens. Related to *E. incerta* and *lævis* Saussure; the petiole is longer and more slender than in the latter, and the thorax is more maculated than in *incerta*, in which species the clypeus is broader with the carinæ (comparing females) stronger.

**Eumenes incerta** Sauss.

One ♀, two ♂ specimens. Rio de Janeiro, November. The female, which has not been described, is very close to *E. usitata*, but the punctures of middle segment are more separated and less coarse; other differences are pointed out in the note accompanying the description of *usitata*. The seventh ventral of ♂ is bituberculate near base.

**Eumenes callimorpha** Sauss.

Mararú, April; Santarem. Seven specimens, all females.

**Eumenes picturata** n. sp.

♀.—Yellow and black; head yellow, with the front and face, except a triangular spot between insertion of antennæ, and occiput black; clypeus sometimes with an elongate black mark; scape above and joints 2–8 of flagellum above black, the flagellum otherwise fulvous; thorax yellow, a dot on each side of pronotum, the dorsulum except two lines, spot on scutellum, black; tegulæ brownish medially; legs entirely yellow; petiole yellow, except the black base, and a brown blotch above, yellow; remaining segments black, with apical margins broadly yellow, as well as sides of second dorsal, the second ventral brownish; front with strong, separated punctures; ocelli in curved line; clypeus convex, microscopically punctured, almost as broad as long, terminating in two large teeth, not carinated; pronotum with shallow punctures, very finely margined; dorsulum with stronger, deeper punctures, which are closest at apex; scutellum strongly punctured, deeply impressed; middle segment concave posteriorly, with rather large shallow, separated punctures, closest toward base; petiole a little shorter than thorax rather gradually enlarged from a point just before its middle, elongate campanulate, impunctate, transversely depressed before apex; remainder of abdomen fusiform, impunctate, with sericeous pile; wings subhyaline, yellowish along costal margin, the nervures and stigma reddish brown. Length 14–15 mm.

♂.—Coloration like that of ♀, with second ventral segment yellow; clypeus narrow, triangularly notched at apex; medial femora not widened basally; petiole fully as long as thorax; seventh ventral segment deeply and narrowly sulcate down middle, the sides of the furrow raised so that two parallel carinæ are present. Length 14 mm.

Pedra Branca and Corumbá, in April. Two ♀, one ♂ specimens.

**Eumenes consobrina** Sauss.

Corumbá, March, April; Rio de Janeiro, November. Fourteen specimens. In the ♂, the seventh ventral is sulcate down middle.

**Eumenes parvula** Sauss.

Corumbá, April, May; Chapada, January, April, December; Rio de Janeiro, November. Fourteen specimens.

**Eumenes suffusa** n. sp.

♀.—Black, variegated with rufous; head black, a rufous spot between antennæ and on clypeus medially; sides of clypeus, dot in eye-emargination, hind orbits above, spot near base of clypeus, pale yellow; scape except above at apex, and flagellum beneath reddish; thorax with glittering pile, longest on middle segment; pronotum except a spot on each side, two lines on dorsulum, scutellum and postscutellum entirely, middle segment except medially and sides, greater part of mesopleuræ and coxæ and legs except femora above, petiole at sides and apically, second and third dorsals apically, two large blotches on second ventral, and segments 4–6, dull rufous; a yellow line at apex of petiole and just before apex of second segment; front with rather strong, separated punctures, covered in certain lights with silky pile pertaining slightly to golden; clypeus flat, sparsely punctured, pyriform, not or indistinctly carinate, terminating in two triangular teeth; ocelli in curved line; flagellum clavate; thorax strongly punctured, most closely on pronotum, the latter distinctly margined; punctures of dorsulum quite coarse posteriorly as are those of scutellum which is indistinctly impressed; middle segment broadly depressed or subconcave; petiole hardly as long as thorax, narrowly campanulate, strongly punctured, gradually enlarged from a point before terminus of its basal third, narrowly transversely depressed before apex; second dorsal more closely punctured, the remaining dorsals more finely, ventrals impunctate; wings subhyaline, broadly dark fuscous along costal margin and in marginal cell; stigma brownish; nervures dark. Length 9 mm.

♂.—Clypeus entirely yellow, longer than broad, widely and triangularly notched at apex; petiole fully as long as thorax; seventh ventral plate with a basal carina which terminates in a tooth or sharp tubercle medially. Length 9 mm.

Corumbá, April; Chapada, November, December. Eleven ♀, three ♂ specimens. Compared with *E. uruguayensis* Sauss., with which *suffusus* is closely related, the clypeus is a little longer and narrower, the front has sericeous pile, the petiole is stouter with the swollen portion larger though less convex and punctuation of second dorsal is stronger. The coloration of both species is remarkably similar, but in *uruguayensis* there is no black on pronotum and no red on scutellum and the apical segments are dark.

**Eumenes uruguayensis** Sauss.

Chapada, November, December. One of each sex. The male which is not yet described closely resembles *E. suffusa*, with the pronotum entirely rufous; clypeus black, marked with yellow on each side, armed at apex with two widely separated teeth, almost as broad as long; scutellum red, distinctly impressed; as in the ♀, the petiole is much smaller than in *suffusa;* base of second dorsal impunctate; seventh ventral not carinate, smooth; third submarginal cell shorter than in *suffusa*. Length 8 mm.

**Eumenes compacta** n. sp.

♀.—Black; head, thorax on sides and posteriorly, and abdomen with thin silky pile, that on middle segment brightest and longest; spot between antennæ, in the emargination of eye, on base of mandibles, on sides of clypeus sometimes, short line on hind orbits above, line at apex of petiole and before apex of second segment, yellow; antennæ beneath, greater part of mandibles, pronotum except a blotch on each side, sides of scutellum and postscutellum sometimes, two comparatively small blotches on middle segment, spot at top of mesopleuræ (sometimes wanting), tips of femora, except posteriors, tibiæ except a stripe internally, tarsi, and petiole at apex beneath and on sides slightly, rufous; apical segments margined with testaceous; front strongly punctured; ocelli in a curved line; clypeus apparently very finely striato-punctate longitudinally, almost as wide as long, terminating in two sharp teeth preceded by a carina which becomes gradually obsolete toward middle of clypeus; thorax deeply punctured, the pronotum most closely, the latter margined and with the lateral angles prominent, though obtuse; dorsulum with three parallel impressions posteriorly; scutellum indistinctly impressed; middle segment depressed or subconcave posteriorly; petiole elongate campanulate, gradually enlarged from its basal third, the enlargement strongly punctured and highly convex, transversely depressed before apex; second dorsal closely punctured except at base, the third and fourth dorsals less closely; wings subhyaline, broadly fuscous along costa and in marginal cell; stigma and nervures blackish. Length 9 10 mm.

♂.—Colored like ♀, with the rufous of thorax more diffused, the hind margin of pronotum and a spot at each antero-lateral angle, and a line on dorsals 3–6 before apex, yellow; sculpture coarser; clypeus with the teeth widely separated, the carinæ only evident on them; medial femora not widened basally; seventh ventral segment smooth, or finely punctured, slightly emarginate on each side before apex, so that it appears produced in middle at apex. Length 9 mm.

Corumbá, April; Chapada, November, December. Four ♀, one ♂ specimens. This is a more robust species than *suffusa* or *uruguayensis*.

aa. Head from front broader than long.

1. Second segment evenly convex above and beneath.

**Eumenes colorata** n. sp.

♀.—Head yellow, the front, vertex and occiput black; mandibles except base, a central longitudinal line on clypeus and flagellum beneath ferruginous; thorax, except the black dorsulum, yellow, a ferruginous stain on each side of pronotum, scutellum apically except a small black spot, and sides of thorax and middle segment indistinctly; coxæ and femora above pale ferruginous; basal one-fifth of petiole black, the remainder pale ferruginous-yellow, with a yellow apical border; remaining segments black, margined with yellow; front with strong separated punctures with golden pile; ocelli in a curved line; clypeus subquadrate, sparsely punctured, with two sharp approximate teeth at apex; flagellum subclavate (?), (joints 9–11 missing); thorax much longer than broad, with strong punctures, those on scutellum largest; pronotum scarcely margined; middle segment broadly depressed or shallowly concave posteriorly, with thin golden pile, sides sparsely punctured; petiole a little longer than thorax, with sparse punctures, narrow, somewhat clavate, being gradually broadened from a point beyond its basal third, transversely impressed before apex; remainder of abdomen short ovate with brownish sericeous pile; second dorsal with shallow separated punctures; wings subhyaline, faintly tinged with yellowish in costal cell; nervures and stigma brownish. Length $11\frac{1}{2}$ mm.

♂.—Colored like ♀, except that the black of front extends as far as base of clypeus on each side of insertion of antennæ; the ferruginous more pronounced on thorax, forming the background for the yellow which appears as maculations; flagellum almost entirely reddish; medial femora not enlarged basally; seventh ventral segment elongate, truncate, depressed, except at sides and base; stigma yellowish. Length 11 mm.

Chapada, September; Santarem. One of each sex.

**Eumenes tinctura** n. sp.

♀.—Black; pronotum, mesopleuræ, the scutella, postero-lateral angles of middle segment, four anterior femora except base, tibiæ, petiole medially, and antennæ, except flagellum above from second and third joints, rufous; sides of clypeus, spot between insertion of antennæ, one almost filling the eye-emargination, hind orbits above, hind margin of pronotum, line on both scutella anteriorly, and a rather broad apical band on segments 1 and 2 emarginate anteriorly in middle, yellow; remaining segments margined with testaceous; front with tolerably strong, separated punctures, with silvery sericeous pile; ocelli in curved line; clypeus convex, impunctate, but slightly longer than broad, with two short, approximate teeth at apex separated by a rounded notch; flagellum clavate; thorax with strong, separated punctures, those on scutellum largest; pronotum finely margined; middle segment broadly depressed posteriorly; petiole distinctly longer than thorax, broadened from just before its middle, strongly punctured, basal stem slender, a rounded pit in the middle before apical margin, before which on each side of pit is a transverse depression; remainder of abdomen ovate, second dorsal less strongly and more closely punctured than petiole; wings subhyaline, fuscous in costal and marginal cells, but this clouding does not fill them completely; nervures and stigma black. Length 8 mm.

Corumbá, April. One specimen. A male specimen from Chapada (January), I refer doubtfully to this species; it is similarly colored, but the red of mesopleuræ is confined to the top, the petiole is rufous apically, the clypeus entirely yellow with the abdominal segments all margined with that color, which is also commingled with the rufous on mesopleuræ, middle segment, femora and tibiæ; postero-lateral angles of middle segment somewhat compressed; seventh ventral segment rounded at apex, indistinctly depressed or furrowed medially. Length 10 mm.

**Eumenes invenusta** n. sp.

♀.—Black, with thin cinereous pile; spot between insertion of antennæ, in emargination of eye, sides of clypeus narrowly, scape beneath, hind orbits, posterior margin of pronotum, tips of all femora, especially the anteriors, fore tibiæ except internally, stripe on medial tibiæ externally, a narrow medially interrupted line at apex of petiole, and a line before apex of following segments, yellow; apex of segments testaceous; flagellum fulvous beneath; front with strong, rather even punctures, indistinctly impressed; ocelli forming a curved line; clypeus indistinctly punctured, convex, a little longer than broad, with two small approximate teeth at apex; thorax longer than broad; punctures of pronotum somewhat stronger than those of front, while those of dorsulum are still stronger than on pronotum; the latter finely margined anteriorly; scutellum not impressed, strongly punctured; middle segment with strong deep punctures rather evenly separated, posteriorly shallowly depressed, with a short strong carina on each side of insertion of petiole; the latter a little longer than thorax gradually enlarged from a point before its middle, sparsely and rather indistinctly punctured, the enlargement convex, but not highly so, transversely depressed before apex, stem slender; remainder of abdomen ovate, the second dorsal closely and distinctly punctured; other segments not distinctly punctured; wings subhyaline, the anterior portion of costal and marginal cells slightly darker; nervures and stigma black. Length 10 mm.

Santarem. One specimen. Related to *confluenta* and *proxima*, differing from both in its longer thorax and petiole.

**Eumenes confluenta** n. sp.

♀.—Black, clothed with grayish sericeous pile; sides of clypeus, spot between antennæ, in the eye-emargination, hind orbits, scape beneath, anterior and posterior margins of pronotum rather broadly, both scutella anteriorly, spot on petiole before middle, and apical margins of segments 1–5, yellow, that on segments 1 and 2 brightest; flagellum beneath, femora and tibiæ more or less, outer edge of tegulæ, and petiole beneath on apical half reddish yellow; front with strong more or less confluent punctures; clypeus convex, finely punctured, medially produced at apex, the production marked by two short carinæ which give it the appearance of being bidentate; thorax but little longer than broad, strongly punctured, most strongly on scutellum; the latter impressed; pronotum finely margined; middle segment with the punctures finer and perhaps closest, posteriorly depressed; petiole longer than thorax, narrowly elongate campanulate, enlarged from about middle, with strong separated punctures, transversely depressed before apex, basal stem rather slender; remainder of abdomen ovate; second dorsal finely and closely punctured; wings subhyaline, the costal margin narrowly and the marginal cell in part fuscous; nervures and stigma blackish. Length 9 mm.

♂.—Clypeus, except apex, yellow; otherwise colored like female, with the maculation, if anything, less marked; no yellow on scutellum; sculpture stronger, especially evident on second dorsal segment; wings darker; seventh ventral segment rounded apically; punctures of front well separated, not confluent. Length 9 mm.

Santarem. One of each sex. That which I have described as the ♂ will perhaps prove to be a different species; it is referred here with much doubt.

**Eumenes proxima** n. sp.

♀.—Black; clothed with grayish sericeous pile, that on head in front and middle segment silvery; clypeus at sides, spot between antennæ, in emargination of eye, hind orbits narrowly, scape beneath, broadly interrupted line on pronotum anteriorly, posterior margin, dot behind tegulæ, short line or spot at tips of femora beneath, line on all tibiæ, first joint of tarsi except apically, spot on petiole above near bases, and line at apex of segments 1–5, pale yellow, that on petiole extended a short distance anteriorly along sides; scape beneath fulvous; front with strong, separated, even punctures, scarcely impressed; ocelli in curved line; clypeus convex, fully as broad as long, with indistinct scattered punctures, produced medially at apex, the production depressed medially, so as to appear bicarinate, the apex scarcely notched (the clypeus may be said to be indistinctly bidentate at apex); flagellum clavate; thorax but little longer than broad; pronotum with strong close punctures, very short medially, finely margined; dorsulum with larger separated punctures, those on scutellum, which is indistinctly impressed, still larger; middle segment short, almost vertical, broadly depressed posteriorly, with punctures about as strong as on dorsulum, but they are more rounded; petiole narrowly campanulate, distinctly longer than thorax, less gradually widened than in *confluenta*, the widening commencing at about or behind middle, longitudinally impressed slightly above and transversely though not strongly before apex; second dorsal with close, rather strong punctures, much stronger than in *confluenta*; wings subhyaline, fuscous brown in interior half of costal cell; nervures and stigma dark brown. Length 9 mm.

Santarem. One specimen.

**Eumenes cribrosa** n. sp.

♀.—Deep black; a narrow line on each side of apical margin of petiole, a twice interrupted broader line on second dorsal, at apex, and a continuous one on segments 3 and 4, or 3–5, and fore tibiæ in front, yellow; flagellum fulvous beneath toward tip; head in front with thin silvery pile; front with close, large deep punctures, not impressed; ocelli almost in a straight line, the middle one placed slightly anterior to the others; clypeus convex, subcordate, about as broad as long, with two small approximate teeth at apex separated by a small triangular notch, with sparse shallow punctures; thorax almost square, cribrose, especially the mesopleuræ; pronotum in middle as long as first two joints of flagellum, finely margined, more closely punctured than rest of thorax; middle segment short, almost vertical, broadly though not deeply depressed posteriorly, its punctuation having a reticulate appearance; petiole at most as long as thorax, the stem tolerably stout, the enlargement beginning at about middle, strongly punctured, more or less impressed longitudinally, and distinctly so in a transverse manner before apical margin; second dorsal with tolerably large shallow punctures; second ventral slightly prominent medially, sparsely punctured toward sides, together with rest of abdomen clothed with pale sericeous pile; wings subhyaline, the costal cell anteriorly and a spot in base of marginal cell fuscous; nervures and stigma black. Length 9 mm.

*Var.* (?) ♀.—Smaller; punctuation of front more separated; clypeus slightly shorter, more strongly punctured; stem of petiole more slender; a yellow spot in middle of hind margin of pronotum and at base of medial tibiæ. Length 7½ mm.

Mararú, April, and Santarem. Six specimens, three of each form, both of which occur at the two localities.

**Eumenes globicollis** Spin.

Mararú, April; Santarem. Three specimens. These differ from the allied species in the collection by the shining impunctate abdomen. The thorax is almost square.

**Eumenes gracilis** n. sp.

♀.—Black; spot between antennæ, in the eye-emargination, hind orbits above, posterior margin of pronotum medially, anterior margin of scutellum and postscutellum sometimes, anterior tibiæ in front and line on segments 1–6 apically, yellow; antennæ beneath, pronotum posteriorly (sometimes anteriorly), two obscure spots on middle segment, and spot on petiole near base, reddish; body tolerably pruinose with pale pile, that on head in front, and thorax on sides and posteriorly, silvery; front with large, well-separated punctures, not impressed; ocelli forming a gently curved line; clypeus convex, longer than broad, sparsely punctured, terminating in two short approximate teeth (the head is not so much broader than long as in allied species); thorax longer than broad, with strong, deep, separated punctures, those on middle segment widest apart and more regular; pronotum with a distinct medial surface, margined anteriorly; punctures of dorsulum largest posteriorly; scutellum not impressed; middle segment but slightly depressed posteriorly; petiole very long and slender, longer than head and thorax, gradually enlarged from a point behind middle, impunctate, transversely depressed before apex; remainder of abdomen impunctate; wings dark subhyaline, darker along costa; nervures and stigma black. Length 7 mm.

Santarem. Two specimens. The long slender petiole, smooth abdomen, deep sieve-like punctures of front and thorax, and small size distinguish this species.

**Eumenes fornicata** n. sp.

♂.—Black; with pale sericeous pile, that on face and clypeus dense and silvery; spot behind insertion of antennæ, line in the eye-emargination, line on hind orbits above, spot on pronotum anteriorly at each side (sometimes absent), its posterior margin, narrow line at apex of petiole, and a broader one before the apex of segments 2–6, yellow, these latter segments brownish testaceous at apex; flagellum beneath, except medially, and tibiæ and tarsi more or less especially those of the four anterior legs, reddish;

head but little wider than long; front with strong nearly confluent punctures, distinctly impressed; ocelli forming a low curved line; clypeus convex, slightly longer than broad terminating in two stout widely separated teeth each of which is preceded by a short carina; thorax longer than broad, strongly punctured, the pronotum most closely; the latter sharply margined anteriorly, and with the antero-lateral angles prominent, though obtuse; punctures of dorsulum largest posteriorly; scutellum impressed, with large sparse punctures posteriorly and closer ones posteriorly; middle segment with large deep punctures, slightly depressed at base, broadly and shallowly so posteriorly, rather densely pilose; petiole longer than thorax, basal stem tolerably stout, the enlargement beginning a little before middle and continuing gradually, deeply and sparsely punctured and highly convex, transversely impressed before apex; remainder of abdomen ovate, with rather strong close punctures above, much closer and finer than those of petiole; seventh ventral segment emarginate on each side near apex, or in other words the apical margin is medially produced or lobate; wings subhyaline, fuscous in costal and marginal cells: nervures and stigma blackish brown. Length 9 mm.

Santarem, November. Two specimens. From the several allied species known by the female only, these specimens seem to be distinct, by the head almost as long as broad. In this respect it is allied to *E. gracilis*, the two standing as connecting links between the species with head at least as broad as long and those with head broader than long.

2. Second segment either angulate, subangulate or tuberculate on either or both surfaces.

**Eumenes deforma** n. sp.

♀.—Black; clypeus, antennæ except flagellum above, pronotum, mesopleuræ, both scutella, two large blotches on metathorax, petiole along sides and above anterior to middle, and second segment on both surfaces at sides and apically, rufous; sides of clypeus, spot behind insertion of antennæ, in the eye-emargination, posterior orbits above, base of clypeus, posterior margin of pronotum, spot on each side anteriorly, dot behind tegulæ and an apical or subapical band on segments 1–5, yellow, the band on segments 3–5 more or less obscure; apical segments (3–6) testaceous brown; legs brownish, tibiæ and tarsi lighter, the four anterior tibiæ more or less obscurely testaceous yellow; front with coarse, rather close, almost confluent, punctures, impressed; ocelli forming a low curved line; clypeus subquadrate, about as broad as long, with sparse, shallow punctures, terminating in two acute teeth separated by a triangular emargination; flagellum clavate; pronotum coarsely, finely margined; dorsulum more strongly punctured, especially posteriorly; scutellum more sparsely punctured, impressed; middle segment with large, coarse punctures, almost reticulate, the posterior surface deeply depressed or subconcave; petiole as long as head and thorax, the stem rather robust, and medially carinated longitudinally, the enlargement beginning behind middle, evenly convex above, and with large separated punctures, not depressed transversely before apex, but with a distinct dimple-like fovea at summit; second dorsal segment, when viewed laterally, elongate, subangulate anterior to middle, with fine, distinct punctures; second ventral segment with a transverse fold or tubercle near base, a little depressed medially; wings subhyaline, the costal cell (and marginal slightly) fuscous; third submarginal cell much longer than high. Length 9 mm.

Corumbá, April. Three specimens. The shape of second segment is very similar to that of *E. superficialis*, which belongs, however, to the group of species having the head about as long as broad.

**Eumenes pilosa** n. sp.

♀.—Black, with distinct pale brownish pile, especially on second dorsal segment, that on middle segment and petiole above longest; antennæ beneath fulvous; tips of mandibles ferruginous; line in eye-emargination bordering the orbit beneath, line on posterior orbit above, posterior margin of pronotum medially, tips of anterior femora and anterior tibiæ in front, spot at each side of apical margin of petiole, and subapical band on second segment, yellow; the remaining segments margined with testaceous; fore tibiæ posteriorly testaceous brown; front with deep, separated punctures, indistinctly impressed; ocelli forming a very low curved line; clypeus convex, broader than long medially, with large shallow punctures, and terminating in two acute teeth separated by a tolerably large rounded notch; pronotum with deep punctures, stronger than those of front, finely margined, its medial surface very short; dorsulum punctured anteriorly like pronotum, more strongly behind; tegulæ strongly punctured except basally; scutellum more sparsely punctured, impressed; middle segment with punctures about as strong as those on pronotum, deeply concave medially, presenting two strongly convex surfaces, the sides at base with a series of coarse folds, which are separated from similar folds on metapleuræ by an elongate, narrow, raised, smooth area; petiole longer than thorax, but hardly equalling the length of head and thorax, the enlargement beginning behind middle, with strong separated punctures, transversely depressed before apex, the depression preceded by a dimple-like fovea; second dorsal with finer, closer punctures, the second ventral swollen or subtuberculate near base; wings subhyaline, costal cell fuscous anteriorly; costa brownish ; nervures blackish ; third submarginal cell much longer than broad. Length 9 mm.

Rio de Janeiro and Chapada, November. Two specimens.

**Eumenes tegularis** n. sp.

♀.—Black; antennæ (flagellum darker above), prothorax, mesopleuræ, tegulæ except base, scutellum, postscutellum, in part, middle segment on sides, tibiæ, tarsi, femora in part, petiole at sides apically, second dorsal at sides and apically, second ventral apically, rufous; spot behind insertion of antennæ, in eye-emargination, posterior orbits above, hind margin of pronotum, dot behind tegulæ, hind margin of postscutellum and apical margin of petiole, yellow; segments 3–5 with testaceous margins and a testaceous yellow subapical band, the second segment without yellow; front with strong rather irregular punctures, indistinctly impressed; clypeus convex, broader than long, terminating in two approximate teeth, with sparse, shallow punctures ; pronotum with a distinct medial length, with deep punctures, scarcely margined anteriorly; dorsulum with large more separated punctures, with a distinct furrow anteriorly in middle, and with two parallel longitudinal impressions apically; tegulæ coarsely punctured; scutellum deeply punctured, impressed; middle segment short, coarsely and confluently punctured in depressed portion, on the sides rather reticulate, and above on each side of middle the punctures are deep and sparse; petiole about as long as thorax, basal stem stout and rather short, the enlargement beginning before middle, with strong separated punctures, transversely depressed before apex, and depressed above in the shape of a fovea; second dorsal with shallow, separated punctures, those at base deeper; second ventral with a prominent tubercle in middle, punctured laterally; wings fusco-hyaline, darker in costal cell; nervures and stigma dark; third submarginal higher than long. Length 8 mm.

Corumbá, March; Chapada, April. Two specimens.

**Eumenes tuberculata** n. sp.

♀.—Black; scape, flagellum beneath, mandibles, pronotum except two dark blotches, mesopleuræ, two stripes on dorsulum, scutellum, postscutellum in part, two blotches on middle segment, sides of petiole apically, second dorsal at sides and apex, and apical half or more of second ventral, rufous; tegulæ externally and apical segments testaceous brown; the legs from apex of femora reddish or testaceous-brown; spot behind insertion of antennæ, in eye-emargination, hind orbits above, posterior margin of pronotum, dot behind tegulæ, hind margin of postscutellum and apical margin of petiole, yellow; the extent of rufous on abdomen is variable, and sometimes there is a yellow subapical line on second dorsal; front with deep, rather evenly separated punctures, faintly impressed; clypeus convex about as long as broad, with large, shallow, scattered punctures, terminating in two approximate teeth; thorax with large, deep, separated punctures, largest on dorsulum and scutellum, the latter rugoso-punctate; pronotum with a distinct medial surface, finely carinated; middle segment depressed posteriorly, above laterally with large deep punctures, otherwise reticulato-punctate, finest on sides which at base are marked by a series of short folds which are separated from similar folds on metapleuræ by an elongate, narrow, smooth area; tegulæ impunctate; petiole tolerably stout, about as long as thorax, the enlargement beginning at about middle (the stem therefore longer than in *E. tegularis*), with strong separated punctures, transversely impressed before apex, but with the fovea or pit at summit as in *E. tegularis;* punctuation of second dorsal varying, either shallow or deep; second ventral with a prominent tubercle medially; wings subhyaline, broadly fuscous along costal margin to apex; nervures and stigma black; third submarginal higher than long. Length 7–8 mm.

*Var.* (?). Coloration darker; punctuation more even; petiole with stem slender.

♂.—Colored like ♀, and similarly punctured; petiole a little longer than thorax, the enlargement beginning behind middle, with an indistinct pit or fovea before apex; ventral tubercle larger; flagellum clavate; seventh ventral plate rounded at apex, smooth; wings paler, much less strongly fuscous along costa. Length 7 mm.

Corumbá, April, May. Twenty-four females; one male.

AA. Petiole of abdomen with a short thick base, the apical portion lengthened, with its sides more or less parallel.

a. Second segment not or but little compressed.

**Eumenes chalicodomæ** Sauss.

Ten specimens. Chapada, February, March; Corumbá, April; Santarem. The amount of rufous on head and thorax is variable, and the apical yellow fascia of petiole is sometimes wanting.

**Eumenes canaliculatus** Oliv.

A large series of both sexes, from various localities. The wings vary from fuscous to yellow fuscous, and the thorax from dark brown to light rufous; the dorsulum may be entirely reddish or maculated with black. The varieties in the collection before me are as follows:

I. Wings dark fuscous.
1. Dorsulum entirely red.
2. Dorsulum with a black median stripe and lateral spot.

II. Wings fuscous, tinged with yellow, especially along costa.
1. Dorsulum entirely red.
2. Dorsulum with a median black stripe.
3. Dorsulum with a black median stripe and lateral spot.

aa. Second segment compressed.

**Eumenes filiformis** Sauss.

Santarem. One specimen.

**Eumenes rufomaculata** n. sp.

♀.—Black; clypeus except medially, scape, pedicel, pronotum, mesopleuræ, two large spots on dorsulum, scutellum, postscutellum except base, outer margin of tegulæ broadly, middle segment except medially, four anterior femora except above, the hind pair at tip, tibiæ, tarsi, sides of petiole, second segment, except medially on basal two-thirds, rufous; remaining segments brownish or reddish brown apically; head and thorax above with dense short brownish hairs; sides of thorax with pale pile; spot between insertion of antennæ and hind orbits above yellowish; front with deep separated punctures, depressed on each side before the eye-emargination; clypeus elongate, about as long as scape and pedicel, not carinate, its fore margin broadly but not deeply notched, or bilobate; flagellum rather long, subclavate; pronotum with deep, rather close punctures, finely margined, obtuse laterally; dorsulum a little less deeply punctured, with an impressed line anteriorly in middle; scutellum, postscutellum and middle segment with larger, more separated punctures, the former not impressed, the middle segment deeply, though not broadly, concave posteriorly, petiole linear, much longer than head and thorax, strongly punctured and longitudinally impressed above, gradually, and but little, widened from very near base, the sides almost parallel, transversely depressed before apex, basal stem short; remainder of abdomen compressed, especially the second segment, which has brownish pile and is deeply and compactly punctured above, beneath depressed a little on each side and longitudinally raised down middle; wings fusco-hyaline; nervures and stigma black. Length 14–15 mm.

Pedra Branca and Corumbá, April. Two specimens.

**Eumenes fulvomaculata** n. sp.

♀.—Black; clypeus, spot between insertion of antennæ, hind orbits, pronotum except a dot on each side, a triangular spot, varying in size, on each side of dorsulum close to pronotum, scutellum except posteriorly, postscutellum, middle segment except medially and sides, mesopleuræ above, a stripe on its lower moiety, sides and apical margin of petiole, large spot on each side of second dorsal from which a narrow line of the same color extends around the sides and apical margin of the segment, and second ventral except basally, pale yellow; tips of mandibles, flagellum beneath, scape beneath at base, tips of femora, the anteriors beneath, tibiæ, tarsi, except posteriors which are dark, rufous or reddish yellow; apical segments yellowish testaceous; front as in *rufomaculata*, but not quite so strongly punctured; clypeus if anything slightly longer and narrower; pronotum with shallow punctures, finely margined, rounded laterally; dorsulum with deep separated punctures, the medial impression of base not very strong; scutellum with large sparse punctures, fewest basally; middle segment deeply and narrowly concave medially, the concavity narrower than *rufomaculata*, with its walls steeper; punctures of middle segment rather shallow, those on sides deeper, but not larger; petiole almost linear, longer than head and thorax, medially impressed and strongly punctured above, the gradual enlargement beginning very near base, and then slightly contracted at about middle, so that the sides are somewhat sinuous, a transverse depression before apex; second dorsal segment compressed, with strong dense punctures becoming feeble and sparse on sides; wings fusco-hyaline, nervures and stigma black. Length 14–15 mm.

Santarem. Two specimens.

*Table of New Species of Eumenes.*

1. Petiole of abdomen with a long slender base, swollen at apex, or campanulate . . . . . . . . . . . . . . . . 2
   Petiole of abdomen with a short thick base, the enlarged apical portion usually lengthened, with its sides more or less parallel . . . . . . . . . . . . . . . . . . 24
2. Head from front at least as long as broad, the clypeus longer than broad. . . . . . . . . . . . . . . . . 3
   Head broader than long, the clypeus broader than long, or its width equalling its length . . . . . . . . . . . 12
3. Petiole short, campanulate . . . . . . . . . . . 4
   Petiole at least as long as thorax . . . . . . . . . 5
4. Black; mandibles reddish yellow; wings fuscous on basal half, apically subhyaline . . . . . . . . . *bipartita* ♀.
   Testaceous yellow, variegated with black; wings subhyaline, yellowish along costa . . . . . . . . . . . *testacea* ♀♂.
5. Greater part of thorax black . . . . . . . . . . 6
   Greater part of head, thorax and legs yellow; wings subhyaline yellowish along costa . . . . . . . *picturata* ♂.

6. Abdomen with petiole alone maculated with yellow . . . 7
More than one segment maculated with yellow . . . . 8
7. Petiole distinctly punctured, remainder of abdomen impunctate; petiole with a U-shaped yellow mark near base *insignis* ♀♂.
Abdomen entirely smooth; petiole with a reddish spot near base . . . . . . . . . . . . *læviventris* ♀♂.
8. Second dorsal segment apically with a broad yellow band covering one-third or nearly half the segment . . . 9
Fascia of abdomen narrow . . . . . . . . . . . 10
9. Viewed laterally the second segment is evenly convex above and beneath; wings darkened along costa and in marginal cell *convexa* ♂.
Viewed laterally the second segment is elongate, subangulate above and beneath between base and middle *superficialis* ♀♂.
10. Thorax more or less variegated with rufous; form stout . 11
Thorax not rufous, maculated with yellow; sides of petiole usually yellow . . . . . . . . . . *usitata* ♀♂.
11. Clypeus longer than broad, maculated distinctly in both sexes; greater part of thorax suffused with rufous; vertex with distinct though not strong punctures . *suffusa* ♀♂.
Clypeus almost as long as broad, maculated in ♂ only; rufous on pronotum only, though sometimes marking either or both scutella; vertex strongly punctured . . . *compacta* ♀♂.
12. Viewed from side the second segment is evenly convex above and beneath . . . . . . . . . . . . . . 13
Viewed from side the second segment is either angulate, subangulate, or tuberculate on either or both the upper or under surfaces toward base . . . . . . . . . . 21
13. Yellow and black, the greater part of thorax and petiole yellow tinged with brown or reddish; legs yellow and light brown . . . . . . . . . . . . *colorata* ♀♂.
Black: at the most maculated with yellow, or suffused with rufous; legs dark basally . . . . . . . . . 14
14. Pronotum, scutella, two stripes on middle segment (and petiole apically in ♂) rufous, and maculated with yellow as well *tinctura* ♀♂.
Without rufous . . . . . . . . . . . . . . . 15

15. Thorax short, almost square . . . . . . . . . . 16
    Thorax distinctly longer than broad . . . . . . . . 19
16. Thorax strongly punctured, the punctures neither very deep nor coarse; pronotum with scarcely any medial surface 17
    Thorax cribrose; pronotum with a distinct medial surface . 18
17. Punctures of vertex irregular and somewhat confluent ; both scutella yellow anteriorly . . . . . . *confluenta* ♀.
    Punctures of vertex even, separated; scutella entirely black *proxima* ♀.
18. Petiole with basal stem tolerably stout . . . *cribrosa* ♀.
    Petiole with basal stem slender . . . *cribrosa* ♀ Var. (?).
19. Punctures of thorax very deep and widely separated; petiole unusually slender, longer than head and thorax, and with second dorsal, impunctate . . . . . . . . *gracilis* ♀.
    Punctures of thorax closer and less deep; petiole and second dorsal punctured . . . . . . . . . . . . . . 20
20. Petiole less distinctly punctured than second dorsal, the enlarged portion, seen from the side, evenly and not very highly, convex. . . . . . . . . . . . *invenusta* ♀.
    Petiole more strongly punctured than second dorsal, the enlarged portion, seen from the side, highly convex or arched *fornicata* ♂.
21. Second dorsal segment, viewed laterally, subangulate toward base, its upper surface appearing flat, having a straight contour (insect marked with rufous) . . . . *deforma* ♀.
    Second dorsal segment convex . . . . . . . . . . 22
22. Thorax or abdomen not marked with rufous; abdomen with short, thin, brownish hairs, especially on second dorsal *pilosa* ♀.
    Thorax or thorax and abdomen more or less reddish . . 23
23. Clypeus broader than long; petiole rather stout; dorsulum entirely black; tegulæ punctate . . . . . *tegularis* ♀.
    Clypeus about as long as broad; petiole more slender; dorsulum with two red stripes; tegulæ impunctate *tuberculata* ♀♂.
24. Thorax maculated with rufous . . . . *rufomaculata* ♀.
    Thorax maculated with yellow . . . . *fulvomaculata* ♀.

**Montezumia chalybæa** Sauss.

One specimen. Santarem.

**Montezumia brunnea** Sauss.

Three specimens. Chapada, February, April.

**Montezumia Leprieurii** Spin.

Chapada, January; Santarem, February. Four specimens.

**Montezumia cærulea** Sauss.

Numerous specimens of both sexes. Chapada, March, April; Santarem. *M. azureipennis* Saussure I regard as a mere variety of *cærulea*.

**Montezumia infundibuliformis** Fabr.

Santarem. Eight specimens.

**Montezumia cortesia** Sauss.

Rio de Janeiro, November. *M. sepulchralis* is, no doubt, a distinct species, and not a variety of *cortesia*, as intimated by Saussure.

**Montezumia analis** Sauss.

Two specimens. Santarem.

**Montezumia Spinolæ** Sauss.

Numerous examples from various localities.

**Montezumia sparsa** n. sp.

♀.—Black; mandibles, margin of tegulæ, middle segment, post-scutellum sometimes (more rarely both scutella), metapleuræ, mesopleuræ beneath, legs except part of coxæ, and first abdominal segment ferruginous; wings blue-black; two dots on postscutellum and line at apex of first segment, yellow; clypeus with sparse, shallow, punctures, its fore margin broadly incurved, subdentate laterally; pronotum scarcely margined, with deep, confluent though not close, punctures; dorsulum with punctures well separated, with a narrow, smooth line anteriorly in middle; middle segment more broadly, therefore less deeply, depressed than in *Spinolæ;* first abdominal segment a little narrower, more rounded at sides, less pilose; second dorsal with sparse shallow punctures medially, the second ventral shining with much larger, sparse punctures. Length 19–22 mm.

Chapada, March. Six specimens. I had at first considered these as a mere variety of *M. Spinolæ*, but the differences in sculpture of thorax and abdomen, as well as the different coloration of the former, induced me to describe it as distinct. The clypeal teeth are much more distinct than in *Spinolæ,* and the clypeus seems longer.

**Montezumia ferruginea** Sauss.

Corumbá, February, April; Pedra Branca, April. Four specimens. These represent the entirely ferruginous form mentioned by Saussure. In one example the abdomen, except first segment, tends to brownish or subfuscous.

**Montezumia anceps** Sauss.

Rio de Janeiro, November; Uacarizal, February. Two specimens probably represent this species.

**Montezumia macrocephala** Sauss.

Fifteen males, eight females. Chapada, March, April, October.

*Montezumia carinulata* (Spin.) Sauss. has maxillary palpi six-, the labial palpi four-jointed. I have therefore transferred it to *Nortonia.*

**Monobia angulosa** Sauss.

Numerous specimens.

**Monobia funebris** Grib.

Four specimens. Corumbá and Mararú, April; Santarem. I am inclined to regard this as a variety of *M. apicalipennis* Sauss.

**Monobia curvata** n. sp.

♀.—Black; head except part of front, scape, pedicel and base of first flagellum joint, thorax above almost entirely including the upper portions of meso- and metapleuræ, fore legs except base, the medial and hind femora and tibiæ in front, rufous; the dorsulum and scutella are more or less blackish, sometimes these parts are entirely black; inner orbits beneath and spot at base of mandibles, yellow; wings blue-black, with a narrow pale apical margin; clypeus subpyriform, with large rather shallow punctures, its fore margin subtruncate, subdentate laterally; front coarsely punctured; space between hind ocelli equal to or slightly less than that between them and eyes; thorax with tolerably deep, close punctures, more separated on dorsulum; middle segment above with much larger punctures, the concave area smooth, sides roughly angulate or subdentate, but not spinose; dorsal surface of abdomen with fine, close punctures, those on second segment sparse medially, the ventral surface with larger, shallow, separated punctures. Length 16–17 mm.

♂.—Colored like female but more coarsely sculptured; clypeus shorter, finely punctured, and in addition with a few shallow punctures, its fore margin more incurved ; flagellum rufous apically; space between hind ocelli slightly greater than that between them and eyes; first joint of median tarsi stout, curved, clothed with pale hairs within, not much, if anything, longer than half its tibia.

Chapada, March, November. Five females, two males. Seems to be close to *M. anomala* Sauss. There is quite a distinction between the males of this species and *angulosa* Sauss., in the shape of the first joint of middle tarsi.

**Nortonia carinulata** Spin. (= *Montezumia carinulata* (Spin.) Sauss.).

One specimen. Chapada, November. In the six-jointed maxillary -, and four-jointed labial palpi, this insect differs from *Montezumia*, in which genus de Saussure placed it, founding therefor the division *Parazumia*, which name will probably take precedence over *Nortonia*, which was not described until twenty-five years later.

## October 3.

Mr. Uselma C. Smith in the Chair.

Nineteen persons present.

The deaths of Carl Edelheim and W. G. A. Bonwill, members, were announced.

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## October 10.

The President, Samuel G. Dixon, M.D., in the Chair.

Thirty-three persons present.

Papers under the following titles were presented for publication:

"On the Summer Molting Plumage of Certain Ducks," by Witmer Stone.

"Notes on Chilean Fishes, with Descriptions of New Species of Sebastodes," by James Francis Abbott.

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## October 17.

J. Cheston Morris, M.D., in the Chair.

Twenty-five persons present.

A paper entitled "A New Species of Thersites," by Henry A. Pilsbry, was presented for publication.

A paper entitled "Dynamic Evolution, or Form as the Result of Motion," by the Rev. W. F. C. Morsell, presented for publication April 11, 1899, was withdrawn by the author.

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## October 24.

The President, Samuel G. Dixon, M.D., in the Chair.

Twenty-four persons present.

October 31.

The President, Samuel G. Dixon, M.D., in the Chair.

Eighteen persons present.

Francis Ralston Welsh and Mrs. Ellen M. Dallas were elected members.

The following were elected correspondents: Raphael Blanchard, of Paris; Carl Chun, of Königsberg; Carl Gegenbaur, of Heidelberg; Richard Lydekker, of London; H. Mitsukuri, of Tokyo; Gustav Retzius, of Stockholm; Wilhelm Roux, of Halle; G. O. Sars, of Stockholm; Otto Zacharias, of Plön; Oldfield Thomas, of London.

The following were ordered to be printed:

## THE SUMMER MOLTING PLUMAGE OF CERTAIN DUCKS.

BY WITMER STONE.

Of all our ducks I believe there is but one, the Old Squaw, in which the adult male has a distinct nuptial and winter plumage.

That is to say the old males of all our other ducks remain in the same plumage from the time they arrive in the autumn until their departure northward in spring.

Judging by what occurs in other birds we should say since these ducks show no tendency toward a change of plumage when they leave us in spring, that they must retain the same feathers that covered them during the winter, until the end of the breeding season, when a complete molt occurs and a new dress exactly like the one just shed, is assumed. In other words the plumage remains the same at all seasons, except for such changes as are effected by wear, tear and bleaching, and there is one annual molt at the close of the breeding season.

That this is not the case, however, has long been known, and a peculiar summer plumage of the adult males of several of our ducks has been described.

This has been variously termed "summer plumage," "molting plumage," "plumage after the breeding season," etc., but its true character seems not to be generally understood.

The first record of this peculiar summer plumage of male ducks, with which I am acquainted, occurs in the supplement to Montagu's *Ornithological Dictionary*, 1813, under head of the Pintail (*Dafila acuta*).

He here describes the molting of some domesticated individuals and states: "In the month of June or beginning of July these birds commenced their change of plumage, and by degrees after making a singular, mottled appearance, especially on the part of the body which was white before, became by the first week in August, entirely of a brown color. The beautiful bronze on the head, the white streak on each side of the neck, and all the white beneath, as well as the elegant scapulars had entirely vanished, and to all appearance a sexual metamorphosis had taken place. But this change was of short duration, for about the latter end of September one of the males began to reassume the masculine attire . . . . and by the middle of October this bird was again in full plumage."

In 1838, Waterton[1] described a similar molt in the male Mallard, and later on many other species were found to have the same habit of molting, so that in Ridgway's *Manual* we find the following species given, largely on the authority of Dresser, as having a peculiar summer plumage resembling the female:—Mallard, Blue-Wing and Cinnamon Teal, Gadwall, Widgeon, Pintail and Scaup. Additional species are mentioned in the British Museum catalogue.

Notwithstanding this, however, only a few of the above are mentioned in Elliot's *Wild Fowl* as having a peculiar summer plumage, and other works have ignored the question entirely.

A study of the magnificent collection of arctic birds made by Mr. E. A. McIlhenny, at Point Barrow, has shown conclusively that the various Eider ducks, the Pacific, Spectacled, King, and Steller's Eiders all assume a peculiar summer plumage, and further investigation adds the Red-breasted Merganser to the number.

With all these facts before us it seems not unreasonable to predict that in all ducks where the plumages of the male and female are markedly different we may expect to find this double molt and dull summer plumage in the male. So unexpected are some of the laws governing molts, however, that there may be exceptions.

As regards the reason for this double molt, Montagu was unable to furnish any explanation. He says: "The double molting in so short a time, peculiar to some species of birds, is a most curious and extraordinary circumstance that seems to bid defiance to all human reasoning. That some birds change their plumage with the season is evidently a gift of nature to accommodate their color to their habits, as in the Ptarmigan, which changes his mottled plumage in the autumn for that of white, in order that he may rest secure upon the bosom of the snow during winter. But there is no such evident reason for a double change in the short space of two or three months in the same season."

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[1] *Essays.*

An examination of Mr. McIlhenny's series of Eiders sheds a great deal of light upon this subject.

In the first place this summer plumage is in no sense a nuptial plumage; while it may begin to appear before the young birds are hatched it does not appear until the mating season is over and is distinctly a post-nuptial dress. It is mainly restricted to the head, neck, breast and scapulars, as already pointed out by Montagu; that is, to those parts which are most conspicuously colored.

The most important point in connection with this summer plumage is that the annual molt of the flight feathers does not begin until this dull plumage has been fully acquired, and as soon as the new flight feathers have become functional the dull plumage as well as the rest of the old plumage is lost and the annual molt of the body feathers progresses normally.

It will thus be seen that this dull plumage lasts only during the period when the bird is unable to fly, for, as is generally known, ducks molt their flight feathers all at once and temporarily lose the power of flight.

At such a time a dull blended plumage would naturally be important in rendering the bird inconspicuous and thereby protecting it, and such I think is the explanation of this curious summer molt.

Of the various names that have been suggested for it, "summer molting plumage" seems the best, as it is different in character from any plumage known among other birds, and, as has been already shown, has nothing to do with the nuptial season, but is entirely related to the annual molt.

I may further state that the feathers of this plumage are very poor and loosely constructed, like those of the "post-nidal" or "first" plumage of young birds, which is also a mere temporary summer dress.

In connection with the summer molting plumage of the Eiders it is interesting to note that Dresser, in his *Birds of Europe*, gives an excellent description of this plumage in the King Eider, but regards it as the "young male." In the same article he quotes from Mr. G. Gillett,[2] who saw several of these birds in Matthew's Strait, August 6, "all apparently immature males," though two specimens that were shot were found to be "entirely destitute of

[2] *Ibis.*, 1880, p. 309.

quill feathers, so that they could not fly." Mr. L. Lloyd in *Game Birds and Wild Fowl of Norway* states also "that the old male of the common Eider loses his brilliant dress toward autumn and becomes in a great part black," but neither he nor Mr. Dresser seem to have understood the significance of these changes.

I can hardly realize that the question has not been satisfactorily explained heretofore, but a somewhat extended research has so far failed to discover such explanation and I have therefore prepared an outline of this peculiar molt.

Descriptions of the molting plumages of the several Eider ducks found in Alaska are appended, taken from specimens in the collection of Mr. McIlhenny, to whom I am under obligation for allowing me to make use of this material, and to whose energy and perseverance science is indebted for one of the finest collections of Arctic birds yet obtained.

**Somateria spectabilis** (Linn). King Eider.

Breeding males up to June 1, are in full nuptial plumage. The next specimens obtained were on August 24 and 30, and these illustrate the change to the molting plumage. The breast is speckled all over with new brown, white and black barred or mottled feathers, the interscapulum is largely speckled with black and the head and neck are being covered with dull brown feathers with black tips. The pattern of the green and pale bluish areas on the head as well as the black V on the throat are still clearly apparent, though they are being rapidly replaced by dull brown feathers and the bright plumage that remains is but lightly attached and easily dislodged.

Another specimen taken August 24, but further advanced, has lost all trace of the bright plumage and is dull colored all over the head, neck and breast. In none of these are the flight feathers molted though they are exceedingly worn and bleached.

**Somateria v-nigra** (Gray). Pacific Eider.

The series of this species includes males in nuptial plumage up to June 3, after which none were secured until August 20. This specimen is a little more advanced than the first King Eiders described above; the dull molting plumage is nearly complete but traces of the bright feathering of the head remain; the old worn flight feathers have not been shed. The next specimens taken

September 17 (1) and September 23 (5) are in full molting plumage : belly and wings as in nuptial dress, head and neck dull brown, streaked with black, and with indistinct lighter areas on the head; breast mottled, feathers generally white in the centre, black at the tip and barred with brown; some are all brown and some all white, scapulars blackish or brownish varied with white. In all six specimens the flight feathers have been molted and the new ones are about half grown. The last specimen of this interesting series was taken October 6; it shows a full grown set of new flight feathers while the new winter plumage is supplanting the temporary molting plumage and the remains of the nuptial dress.

The breast plumage is almost completely renewed but is still flecked with brownish feathers, while the new green feathers of the head may be seen just bursting from the pin-feather sheaths, though still concealed by the brown feathers of the molting plumage.

**Arctonetta fischeri** (Brandt). Spectacled Eider.

Males in nuptial plumage were obtained as late as July 27, while one specimen, taken September 17, represents the molting plumage. No similar bird has, I believe, ever been described.

The new flight feathers are nearly full grown; the head and neck are gray, streaked with black, front and cheeks whitish, eye area gray, centre of throat white, more or less brown, barred feathers on the breast, back and scapulars largely gray.

**Eniconetta stelleri** (Pall). Steller's Duck.

Adult males in nuptial plumage were secured by Mr. McIlhenny up to July 2, but none after that date. Fortunately a specimen secured by Dr. Benj. Sharp, at St. Lawrence Island, July 24, 1895, No. 34,520, Coll. Acad. Nat. Sci., supplies the desired plumage for this species. It is as follows :

Belly, back and wings as in the nuptial plumage, entire head and neck dull brown, with a few of the green and white feathers still unshed, plumage of breast very ragged in appearance with new brownish feathers everywhere replacing those of the nuptial dress.

As would be supposed from the condition of the plumage the flight feathers have not yet been shed.

**Merganser serrator** (L). Red-breasted Merganser.

Two males secured July 27 at Pt. Barrow are acquiring the molting plumage, the first instance I have seen of the existence of this plumage among the Mergansers.

They resemble the nuptial plumage, except the head, neck and breast, exactly as in the Eiders. The neck is like that of the female, but browner, head and crest dull brown, the breast is becoming dull gray. Many of the black feathers of the head and pink and black feathers of the breast still remain from the nuptial plumage, but they are very easily brushed loose. The flight feathers have not yet been molted.

## A NEW SPECIES OF THERSITES.

BY HENRY A. PILSBRY.

**Thersites Webbi**, n. sp. Figs. 1, 2

Shell obliquely umbilicate, dome-shaped above, moderately convex below the carinated periphery; strong and solid. White under a dense olive brown cuticle above, with some yellowish streaks, becoming dirty flesh-tinted on the earlier four whorls, which are partially denuded of the thin cuticle; the base darker, chestnut colored, being dull red under the cuticle. Surface rather glossy, more so beneath, showing moderate, irregular growth-wrinkles; the upper surface of the last whorl sculptured with oblique, forwardly descending fine wrinkles, very low and inconspicuous. Spire dome-shaped, the apex obtuse. Whorls $6\frac{1}{2}$, slowly widening, those of the spire flat, the suture not impressed; the last whorl strongly carinated at the periphery, the keel blunted behind the lip, slightly swollen below the suture, abruptly and deeply deflexed in

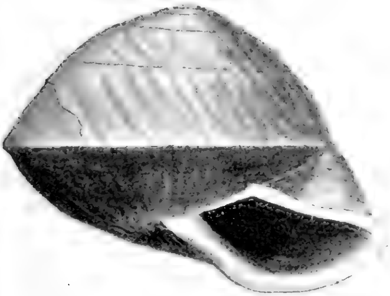

FIG. 1.

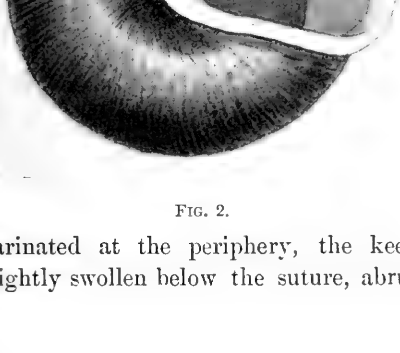

FIG. 2.

front; the latter half of the base becoming greatly swollen, the umbilicus passing into a large excavated area behind the columellar lip. Aperture very oblique, squarish oblong, white within; peristome well expanded, the upper and baso-columellar margins straightened and subparallel, the latter reflexed, dilated and quite vaulted over the umbilicus at the insertion; parietal callus bluish white, strong.

Alt. 48; greater diam. 51, lesser 45 mm.

A single specimen was found in a collection obtained by Mr. Walter F. Webb, of Albion, N. Y., in whose honor the species is named. It bore the label "*Helix*, Solomon Is.;" but I regard this locality as open to grave suspicion. It is probably from northern Queensland, though one would scarcely expect a new Helix over two inches in diameter from that region, after the labors of Dr. Cox, Messrs. Brazier, Hedley and others in the elucidation of the Queensland fauna.

*T. Webbi* belongs between the *Hadra* section of *Thersites* and the typical group of the genus, but is nearer the former. It resembles *T. bipartita* in the bicolored shell substance, readily seen by looking in the aperture with the shell held toward a light, in the structure and color of the lip, and the form of the latter part of the base of the shell and the umbilicus. It differs from *T. bipartita* in the strong peripheral keel, flat whorls of the dome-shaped instead of conic spire, the greater anterior deflection of the last whorl, the less rotund aperture and the darker color of the cuticle above. *T. Webbi* resembles *Thersites richmondiana* in being keeled, and in the flatness of the whorls of the spire, separated by merely linear sutures; but it differs in other particulars of form, color, etc., so much that a comparison is needless.

## NOTES ON CHILEAN FISHES, WITH DESCRIPTION OF A NEW SPECIES OF SEBASTODES.

BY JAMES FRANCIS ABBOTT.

In the spring of 1897, Rear Admiral L. A. Beardslee, U. S. N., then in command of the U. S. man-of-war "Philadelphia," secured in the harbor of Valparaiso, Chile, a small collection of fishes which he presented to the museum of Leland Stanford Junior University. Through the courtesy of Dr. C. H. Gilbert, the writer was offered the opportunity of examining them. The following species were noted:

1. *Potamalosa notacanthoides* (Steindachner).
2. *Clupanodon fimbriatus* (Kner and Steindachner).
3. *Isacia conceptionis* (Cuv. and Val.).
4. *Genypterus chilensis* (Gay).
5. *Prolatilus jugularis* (Cuv. and Val.).
6. *Hippoglossina macrops* Steindachner.

The last-mentioned species has heretofore been known only from Steindachner's original description and excellent plate and from Günther's single allusion unaccompanied by description. The specimen at hand agrees with the description of *H. macrops* so exactly in every detail as to leave no doubt whatever of its identity. But the extension of the range of the species through such a very great distance as that from Mazatlan to the Strait of Magellan is hardly probable, and it is more than likely that the fish described by Steindachner did not come from Mazatlan at all, but from far down the South American coast. This idea will be accepted the more readily when we recall the remarkable jumble of species attributed to the fauna of Mazatlan by the same author,[1] the result of a collector's transposition of labels, and later corrected by him. We may also consider the fact that in all the extensive collecting that has been done on the Mexican and Central American coast in recent years, no specimen of this well-marked species has been found.

[1] *Ichthyologische Notizen*, ix.

The single specimen we have examined is noteworthy in that it is dextral, while the type specimen is sinistral. Probably the species is indifferently one or the other. The gillrakers are short, 6 + 11. The antrorse preanal spine is well developed.

The species is readily separated from *Hippoglossina stomata* by the much larger mouth of the latter. It differs from *H. bollmanni*, its nearest relative, in the somewhat greater number of dorsal and anal rays, and especially in the number of gillrakers, which are 3 + 9 in that species. The interorbital ridge is continued upon the side of the head in the type of *bollmanni*, so as to form a doubly curved lateral ridge; in *macrops* the interorbital ridge is flatter and fades away at the border of the upper orbit.

*Hippoglossina macrops* Steindachner, Ichthyologische Beiträge, v. 13, Pl. III, 1876 [? Mazatlan]; Günther, Voyage of H. M. S. Alert, 1881. Trinidad Channel [Strait of Magellan].

**Sebastodes jenynsi** Abbott, new species.

This species belongs to the *rosaceus* group, and resembles very closely its East Pacific relatives, *Sebastodes oculatus* and *S. darwini*. It is easily distinguished from *S. rosaceus* by the much larger eye of the latter as well as by its lower spinous dorsal and slightly greater depth. From *oculatus* it is separated especially by its considerably greater depth and fewer anal rays, and from *darwini* by its longer pectoral and much shorter second anal spine. The arrangement of the four spots of color also differs markedly from that in the other species sharing this character, *rosaceus, constellatus, rhodochloris, chlorostictus* and *oculatus*.

Mr. Cramer[2] remarks that in view of the fact that fifty species of the genus are known to inhabit the north temperate waters of Pacific North America, it is not improbable that the species will be found equally numerous on the temperate South American coast. Heretofore but two species have been described from this region, although Jenyns mentions the drawing of another in the possession of Darwin with the spinous development less marked and approaching in some of its characters *S. ciliatus* (*S. variabilis* Cuv. and Val.). This may or may not be the same as the specimen in hand, but ours has little affinity with *ciliatus*.

*Description.*—Head $2\frac{2}{3}$; depth $3\frac{1}{8}$; eye moderately large, $4\frac{1}{4}$ in

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[2] *Proc. Calif. Acad. Sciences*, vi, 241, 1896.

head. D. XIII, 13; A. III, 6. Pores in lateral line 45. Body as in *Sebastodes rosaceus*, perhaps a trifle heavier in appearance, head somewhat blunter. Jaws subequal, the lower with a small knob. Maxillary 2 in head, reaching past middle of pupil. Gill-rakers thin, $2\frac{1}{2}$ in eye, 7 + 22 in number, the last seven on lower arch much reduced. Nasal, preocular, supraocular, postocular, tympanic, and parietal spines present. The entire spinous development is somewhat heavier than in *rosaceus*, but the spines are blunter and a trifle lower. Interorbital $\frac{2}{3}$ of eye, with two parallel ridges as in that species, but these are a little lower and the groove between is somewhat shallower. Preopercle with five rather broad and flat spines, the two upper being the strongest. Opercle with two similar ones. Scapular and suprascapular spines present, but not prominent.

Head finely scaled above, up to nasal spines. Snout sparsely scaled, with exception of the region bounded by the nasal spines. A few scales on maxillary; mandible naked. Dorsal considerably lower than in *rosaceus*, fourth spine $3\frac{1}{8}$ in head ($2\frac{1}{2}$ in *rosaceus*), a deep emargination between soft and hard parts. Second anal spine heavy, barely exceeding third spine, $2\frac{2}{3}$ in head; first anal ray 2 in head. Pectoral reaches past ventrals, almost to first spine of anal. Ventral $1\frac{5}{6}$ in head.

Coloration (in alcohol) dark, marbled and mottled above lateral line, pectorals bluish (probably deep blue in life). Dorsal very dark; ventrals dark. Four radiating dark bands on side of head. A dark streak down middle of maxillary. Four pale spots as in related species; one under last ray of dorsal, one under last spine, one on lateral line under ninth spine, and one just under the fin under eighth spine—this last differing in position from the corresponding mark in other species. Branchiostegal membrane bluish, traces of salmon pink under jaws.

Length 205 mm. Common name, *Cabrilla*. Hab. Valparaiso.

The type is numbered 11,925 in the Leland Stanford Junior University Museum.

NOVEMBER 7.

The President, SAMUEL G. DIXON, M.D., in the Chair.

Thirty-five persons present.

Papers under the following titles were presented for publication:

"Description of Ameiurus lacustris okeechobeensis," by Henry W. Fowler.

"Observations on Fishes from the Caroline Islands," by Henry W. Fowler.

*A New Race of Short-eared Owl.*—MR. WITMER STONE exhibited a series of Short-eared Owls from Pt. Barrow, Alaska, from the collection of Mr. E. A. McIlhenny. These birds are very much paler than specimens from Pennsylvania and have the tawny tints largely replaced by white. The lower surface is white with a slight buff suffusion in some examples, while the dark stripes on the breast average narrower than in more southern specimens. The females are slightly darker than the males.

In measurements they agree pretty well with examples from the United States, the wing of eight males ranging from 11.75 to 12.25 ins. (average 11.95 ins.) and of three females from 12 to 12.30 ins. (average 12.15 ins.).

Notwithstanding the individual variations exhibited by this genus, Mr. Stone regarded these Pt. Barrow specimens as representing a distinct geographic race, probably ranging southeastward over the arctic barren grounds, and proposed to separate it as *Asio accipitrinus McIlhennyi* (Type 958 Coll. E. A. McIlhenny, Pt. Barrow, June 2, 1898, ♂).

NOVEMBER 14.

The President, SAMUEL G. DIXON, M.D., in the Chair.

One hundred and forty-three persons present.

Mr. Frank M. Chapman made an illustrated communication on the subject of the Bird Rocks of the Gulf of St. Lawrence. (No abstract.)

NOVEMBER 21.

J. CHESTON MORRIS, M.D., in the Chair.

Thirty-three persons present.

The death of Albert Fricke, M.D., a member, was announced.

A paper entitled "Notes on Tectibranchs and Naked Mollusks from Samoa," by C. N. E. Eliot, was presented for publication.

NOVEMBER 28.

MR. CHARLES MORRIS in the Chair.

Ninety-eight persons present.

Mr. G. Wharton James made an illustrated communication on the Havasupai Indians. (No abstract.)

Messrs. L. M. Underwood and N. L. Britton, of New York, were elected correspondents.

The following were ordered to be printed:

## DESCRIPTION OF AMEIURUS LACUSTRIS OKEECHOBEENSIS.

BY HENRY W. FOWLER.

**Ameiurus lacustris okeechobeensis** (Heilprin).

*Ictalurus okeechobeensis* Heilprin, Trans. Wagner Inst. Sci. Phila., I, 1887, pl. 18; Kissimee River, Lake Okeechobee, Florida.
*Ameiurus okeechobeensis* Jordan and Evermann, Bull. U. S. Nat. Mus., No. 47, I, 1896, p. 138.

This fish, which was first described by Prof. Heilprin, proves to be a subspecies of *Ameiurus lacustris* (Walb.), and as his description is insufficient I redescribe it.

Form of the body rather elongate. Head $3\frac{1}{2}$ in the body. D. I, 6. Eye $9\frac{1}{2}$ in head and situated anterior to the middle of the head and with the lower margin of the orbit on a line with the middle of the depth of the head. Head, convex posteriorly, its width between the opercles $1\frac{3}{10}$ in its length and $4\frac{1}{2}$ in the body. The supraoccipital process reaches the second interspinal and the ridge of bone is thus complete. Interorbital space more or less shallowly convex, the eye being contained in it $5\frac{2}{3}$ times. Mouth rather large, lips fleshy. Barbels thin, especially the nasal pair and the outstretched maxillary pair reach $\frac{3}{4}$ the length of the P. spine. Inner margin of the P. spine serrate. The D. spine is smooth and nearly $2\frac{1}{2}$ in the length of the head. Humeral process covered with thin skin, and only is it slightly rugose on the anterior portion, and it projects backward and slightly upward for more than one-half the length of the P. spine. The V. reach the A. The A. fin with 24 rays, and its base $4\frac{1}{4}$ in the length of the body. The insertion of the D. is at a point a little behind the tip of the outstretched P., and nearer the adipose fin than the tip of the snout. Lateral line slightly arched anteriorly. Caudal forked, the upper lobe longer than the lower, and with the rudimentary rays conspicuous. Color above blackish brown, the D., the A., and caudal fins of the same color. Upper surface of the P. and V. blackish brown. Lower surface of the body whitish. Barbels blackish brown, except the median mental pair, which are whitish like the lips. There are two specimens of this fish in the collection. The type, No. 8,443, from which the above description was taken, is larger than the other, which is No. 8,442, measuring 21 and 14 inches respectively. They both possess 26 rays in the A. fin if the anterior rudiments are counted and have the D. situated nearer the tip of the adipose fin than the tip of the snout. These specimens were collected in 1886, and presented to the Academy of Natural Sciences of Philadelphia by Prof. Angelo Heilprin.

## OBSERVATIONS ON FISHES FROM THE CAROLINE ISLANDS.

BY HENRY W. FOWLER.

Among the presentations made to the Academy of Natural Sciences of Philadelphia by the late Prof. E. D. Cope was a collection of marine Fishes, comprising forty-five specimens, from the Caroline Islands. Most of these specimens are in a fair state of preservation. They have been made into dry preparations or skins, some of them being only one-half of the skin of the original specimen, but most of them are entire, the bodies having been filled out and varnished on the outside. It is unfortunate that the data are very meagre, no precise localities being given.

### EXOCOETIDÆ.

**1. Cypsilurus quindecimradiatus** sp. nov. Plate XVII.

The form of the body is elongate and spindle-shaped. Head flat and broad above, compressed laterally so that the lower surface is rounded, $4\frac{1}{3}$ in the body without the caudal. Eye $3\frac{1}{5}$ in head and about $1\frac{1}{2}$ in the interorbital space, which is level, the orbits being placed in the upper anterior part of the head and with their lower margins below the lower jaw. The eye is also contained $1\frac{1}{2}$ in the space between its posterior margin and that of the operculum. The length of the snout, from the tip of the upper jaw, $1\frac{1}{2}$ in the eye. The mouth terminal, superior, the lower jaw projecting, and with the cleft inclined moderately. The posterior margin of the eye is nearer the origin of the P. than the tip of the upper jaw. Teeth minute. Branchial aperture large. Opercles large, scaled. The greatest depth of the body, which falls considerably short of the length of the head, is contained in the total length of the body about six times. The origin of the P. is situated on a level with the pupil of the eye, the radii of the fin about 14, the first and second somewhat enlarged and the third and fourth the longest ; of the former, which are simple, the second is bifid for the terminal half or more, while the rest of these rays are all branched. The outstretched P. probably reached backward to the eleventh or twelfth D. ray or at least as far as the tip of the V. Origin of the V. about midway between the origin of the P. and the first rudimentary rays of the caudal. Rays of V. 6, the third the longest, tip of the fin extending beyond the origin of the A. Origin of the D. inserted nearly equidistant to the origin of the V. and A., and also equidistant to the origins of the P. and the tip of the upper lobe of the caudal. D. with 15 rays, the posterior of which do not reach near the rudimentary caudal rays. Base of the D. not as long as the head and the base of the A. not as long as the base of the D. Caudal deeply forked, the lower lobe greatly exceeding the upper in length and contained in it $1\frac{2}{5}$ times. The lateral line runs very low along the lower part of the sides of the body and passes near the origin of the V. Rudimentary rays of the lower lobe of the caudal much more robust than those of the upper lobe and about 7 in number. The caudal is much compressed and flattened laterally, the rays being strong and giving great solidity and power to this steering instrument. Total length of the specimen $17\frac{5}{8}$ inches. No. 23,275.

## HOLOCENTRIDÆ.

**2. Holocentrus spinifer** (Forskal).

*Sciæna spinifera* Forskal, Descript. Animal., 1775, p. 49.

Body compressed, with the anterior dorsal region elevated. Scales 48, about 43 pores. D. xi, 15. A. iv, 10. P. i, 14. V. i, 7. Head about $3\frac{1}{4}$ in length, with caudal which is not quite 5. The greatest depth of the body about equal to the length of the head. Interorbital space very narrow, not as wide as the maxilla with its supplemental bone. The upper profile line of the head is nearly straight from the tip of the snout to the occiput and from this point to the origin of the D. convex, at which latter point the body assumes its greatest depth. There are five rows of scales on the cheeks, the row bordering the eye being the largest. The eye is contained more than $3\frac{2}{3}$ times in the head, and is equal to the snout in length. The præopercular spine is more than one-half the length of the posterior margin of the præoperculum and a trifle larger than the diameter of the eye. The serrations or spines of the præoperculum are much larger than those of the operculum. There are 2 spines at the posterior angle of the operculum, the upper of which is the largest, and the sharpest. The opercles are evenly striated, the striations forming small serrations on the posterior margin. The interoperculum has 4 or 5 tooth-like serratures on its posterior margin. The suboperculum is nearly smooth, the striations being indistinct, though there are several feeble serrations along the upper and lower portions of the posterior edge. There is a very narrow bony border around the eye which has its outer edge finely serrate. There are 6 præorbital spines, the outer of which are much larger than the 4 central ones, situated along the lower edges of the præorbital bones, they all point downward. The superior cranial bones are strongly radiated. The maxillary extends to the anterior margin of the pupil of the eye. Supplemental maxillary large. The eye is placed above and somewhat anterior to the centre of the head. Teeth all minute. The distance between the origin of the D. and the occiput is a little less than the length of the præopercular spine, the tip of which is directly below the former, while the insertion of the P. is more posterior and the insertion of the V. still more so. The third D. spine is the longest, the last being the smallest and equals the second A. spine. The spines of the D. are all more or less equal in thickness, not being swollen or one much thicker than the other. The membrane connecting the last D. spine with the first soft ray of the same fin is adnate to the latter only at the extreme base. The soft D. is a trifle higher than the spinous D., and its base is contained in the latter about three times, and with its first ray not spinous. The caudal fin is forked and with the upper lobe very little longer than the lower and both lobes are beset both along the upper and lower basal edges with 5 rudimentary rays, all of which, excepting the last posterior, are spinous. The third spine of the A. is greatly enlarged and broadened and the fourth is ensheathed in its posterior excavation. The first A. spine is exceedingly minute, being concealed by the scales around the base of the fin. The P. and V. are of equal size, the first ray of the latter being spinous and a little longer than the innermost, while the first ray of the P. is very short. Lateral line slightly recurved at first, then sloping gradually to its termination, though it does not run along the centre of the caudal peduncle laterally and the pores do not exist on several of the most posterior scales. Scales not striated, but with the posterior edges finely serrated. There is a row of scales along the base of the A. which is shorter than the base of the soft D. Total length of the specimen about $10\frac{5}{8}$ inches. No. 23,276.

**3. Holocentrus pœcilopterus** Bleeker.

Natuurk. Tydsch. voor Nederl. Indie, Deel VII (New Series, IV), 1854, p. 356.

The three specimens which I refer to this species have the following fin formula: D. xi, 14; xi, 14; xi, 14. A. iv, 9; iv, 9; iii ?, 6 ? (the first A. spine of this latter specimen I am inclined to think is really the second, though I am able to find but three); P. i, 13; i, 13; i, 13; V. i, 7; i, 7; i, 7. The scales in the lateral line average about 52. The first ray of the soft D. is not conspicuously enlarged and is much shorter than the second and third which are the longest rays of the fin. The row of large horny scales at the base of the A. is well developed in all three examples.

Nos. 23,277, 23,278 and 23,279.

## SERRANIDÆ.

**4. Bodianus guttatus** Bloch.

Ausl. Fische, IV, 1790, p. 36, pl. ccxxiv.

Three specimens. Nos. 23,280, 23,281 and 23,282.

**5. Epinephelus merra** Bloch.

L. c., VII, 1793, p. 17, pl. cccxxix.

Three specimens. Nos. 23,283, 23,284 and 23,285.

## LUTIANIDÆ.

**6. Lutianus bohar** (Forskal).

*Sciæna bohar* Forskal, Descript. Animal., 1775, p. 46.

Form of the body oblong, compressed. Head large, $3\frac{1}{4}$ in total length, greater than the depth of the body which is about $3\frac{2}{3}$ in the total length. Snout prominent, mouth large and with large maxillary which does not extend posteriorly beyond the anterior half of the eye. The width of the maxillary at its distal extremity is equal to half the diameter of the eye. Eyes $4\frac{1}{2}$ in head and very slightly over twice their diameter in the snout, and situated in the upper central portion of the head. Præorbital bones large, ensheathing the upper portion of the maxillaries. The interorbital width greater than the diameter of the eye and with the surface only slightly convex. The posterior margin of the præoperculum is finely serrated above the notch, which is moderate, below which and for a short distance along the lower margin, it is coarsely serrated, the anterior portion of this lower margin being smooth. The interoperculum is furnished with a small bony protuberance which is opposite the præopercular notch and into which it does not fit. The operculum terminates in a small pointed flap which extends backward beyond the base of the P. The mouth is furnished with four canines in the front of both jaws, the outer pair of the upper being the largest and the strongest. The posterior nares are situated within half an eye diameter of the anterior border of the eye. The profile line of the body from the snout to the origin of the D. appears to be gently concave. The distance between the anterior border of the eye and the first D. spine is equal to the length of the P. The origin of the D. is situated over the tip of the opercular flap, of course falling posterior to that of the P. Spinous D. longer than soft D., the radii x, 14, the spines being strong and sharp, and graduated to the third, which, with the fourth, fifth and sixth, are the longest, being, in fact, longer than any of the soft rays. The scales of the body pass over on to the basal portion of the soft D., covering it anteriorly for more than one-half its height, though this encroachment gradually diminishes posteriorly so that only a few scales are to be seen at the bases of these rays. The scales also pass out over the basal portion of the soft rays of the A. and are distributed in the same manner, though they do not extend out so far as on the soft D. The caudal has its base also scaled, the scales of the caudal peduncle passing over to the base of the tail in unbroken series, and even covering the rudimentary rays, for about one-half its length. All these scales which cover the portions of the fins mentioned are much smaller than any others on any part of the body except a few at the base of the P. P. i, 16, not reaching A., but reaching posteriorly beyond the tips of the V. The origin of the V. slightly posterior to the origin of the P. V. i, 5. A. iii, 8? The third spine of the A. is the longest and the strongest, though very little longer than the second. The tail is moderately forked, the depth of the emargination being about one-fourth its length. The spinous D. is more or less distinct from the soft D., to which it is joined. There are eight or nine rows of scales on the cheeks. Operculum and interoperculum scaled and a row of large scales from occiput to suprascapula and two rows between the former row, and running parallel with it, and the eye, the rest of the head naked except the scales in postocular region which are a continuation of the series on the cheeks. Lateral line running along the upper part of the body, and not running along the centre of the caudal peduncle laterally, sloping from its dorsal position gently till it terminates in the centre of the caudal fin. Scales about 64. The general color of the specimen appears to have been of an olivaceous tinge, the light spots at the base of posterior rays of the D. very distinct. Irides reddish. Dark oblique bands above the lateral line, and longitudinal bands below. Scales of the thoracic and postoccipital region smaller than those on the sides of the body. Upper caudal lobe the longest.

No. 23,286.

**7. Genyoroge marginata** (Cuvier and Valenciennes).

*Diacope marginata* Cuvier and Valenciennes, Hist. Nat. Poiss., II, 1828, p. 320.

Form of the body sparoid, with the antero-dorsal region produced. The profile line from the snout to the occiput is straight and from the latter point to the origin of the D. convex. The lower profile line from the snout to the A. is nearly straight or only very slightly convex. Head a little over 3 in the total length and the depth of the body about the same. Eyes placed in the upper anterior portion of the head, nearer the snout than the opercles and about 4 in the length of the head. Mouth large, the maxillaries extending posteriorly for about one-third the diameter of the eye. The distal extremity of the maxillary bones is dilated and about equal to one-half the diameter of the eye. The upper and anterior portions of the maxillaries are ensheathed by the orbital bones. Nostrils separated from the anterior margin of the eye by a space that is greater than the space between themselves. Interorbital space convex, not equal to the diameter of the eye, equal to the space between the anterior nostril and the anterior margin of the eye. Posterior margin of the præoperculum finely serrated above the notch, below and on the posterior edge of the lower margin strongly serrated. Interopercular knob developed and fitting closely into the præopercular notch. Posterior margin of the operculum developed into a flap. Suprascapula serrated. Origin of the D. over the tip of the opercular flap, both of these are situated posterior to the origin of the P. D. x, 14, the third to sixth spine the longest. Bases of soft D., caudal and A., covered with small scales though not extending very far on any of the fins. Longest spines of D. longer than any of the soft rays. Caudal emarginate, though not deeply. P. falcate, nearly extending to first A. spine, radii i, 14. V. situated directly below P., radii i, 5, tips not extending posteriorly to tips of P., though the tips of the latter may have reached as far as the A. spine. A. iii, 8, second and third spines very stout and about equal. A series of large scales from the suprascapula to the occiput, anterior and parallel to this several series of smaller ones. Opercles and interopercles scaled and the cheeks with 6 rows extending over the postocular region, and a row of small scales directly over the eye toward the suprascapula, rest of head naked. The ventral rays are very stout and strong. Lateral line curved, then descending to the centre of the base of the caudal, not running along the centre of the caudal peduncle laterally. Scales about 55. Eye $\frac{4}{5}$ of the least depth of the caudal peduncle.

Teeth even, large. The color of this specimen has apparently entirely faded, it being at present a pale buff-brown, with traces of red irides. Total length $10\frac{3}{4}$ inches.

No. 23,287.

## LABRIDÆ.

**8. Thalassoma immanis** sp. nov. Plate XVIII, fig. 2 (middle figure).

Shape of the body oblong-ovate, strongly compressed, its greatest depth situated anteriorly and in the region of the P. fins. The appearance is altogether very robust and strongly built. Greatest depth of the body nearly as great as the length of the head, and contained in the total length of the body about $3\frac{3}{4}$ times. Eyes superior and slightly anterior in position, about $6\frac{1}{2}$ in the head, 3 in the snout and $1\frac{1}{2}$ in the maxillary. Posterior margin of maxillary about midway in the space between the tip of the snout and the front margin of the eye. Upper and lower profile lines of the head sloping anteriorly in the form of an isosceles triangle, when viewed laterally, with the mouth at the apex. Interorbital space convex, about $1\frac{3}{4}$ in snout and a little over 4 in the length of the head. The eye is $1\frac{1}{2}$ in the interorbital space. Head entirely naked and with the skin on the cranium, the interorbital space, the upper and anterior portions of the operculum, the posterior and lower portions of the præoperculum, the interoperculum, suboperculum, the branchiostegal region and the sides and lower or under portion of the mandible papillose or rugose. On the upper portion of the operculum are 3 shallow tube-like elevations parallel with its upper margin, and which become indistinct after passing over the anterior half. The orbitals are strongly rugosely striate. Teeth strong, canines strongly developed, two pairs in the front of each jaw and the lower fitting in between the upper pair when the jaws are closed. The other teeth in both jaws are graduated from the canines backward, the largest of course being anterior and about one-half the size of the canines. Origin of the P. inferior in the depth of the body and anterior to the tip of the opercular flap which is very small. P. ii, 14, perhaps slightly anterior to the V. which are contained in the former $1\frac{1}{2}$ and have the radii i, 5. Origin of the D. nearly over the same of the V. radii viii, 13, the spines sharp, rather strong, and not thickened, of about equal length, similar to the soft rays which are of nearly uniform length. A. ii, 10 or 11, the first spine shorter than the second and the first soft ray the longest. Upper and lower rays of caudal produced into a projecting point, the lower reaching beyond the upper and the emargination being thus formed is oblique. Rays of the caudal, like those of soft D. and A., very strong and stout, of the former fin the bases of those which are produced are covered with several rows of small scales, much smaller than the other scales at the base of the same fin. Scales along the bases of the D. and A. smaller than those on the rest of the body and extending somewhat upon the bases of the fins. Scales about 28, the lateral line straight to about the twentieth scale when it falls and runs along the centre of the caudal peduncle. The tubes of the lateral line with several branches on each scale, some of which are in turn themselves branched. Most of the color in life has disappeared, yet the head appears to have been green, with the loreal region and the frontal region together with the space behind and below the eye forming a band along the margin of the præoperculum, across the operculum and over the interoperculum, of a different color. A green spot, in one specimen, divides the lighter color on the interoperculum and extends for a short distance upon the lower portion of the operculum, this spot being much larger than the same of the largest specimen. A light band from the opercular flap to the caudal rays and directly below this, and parallel to it, starting from the P. region, is another similar band. Longitudinal stripes along D. and A., longitudinal stripes along the inner of the produced caudal rays and the basal half of the rest of most the caudal rays of the same color as the lateral stripes. With the exception of a thoracic stripe from the interoperculum backward the body is bright green. Length about $11\frac{3}{4}$ inches. The specimens which I refer to this species show considerable color variation, which may be due to individual variation. There are three specimens, one of which is very young.

Nos. 23,288, 23,289 and 23,290.

## SCARIDÆ.

**9. Scarus pronus** sp. nov. Plate XVIII, fig. 3 (lower figure).

Form of the body elliptical, oblong, compressed and with the greatest depth more or less in the centre and apparently greater than the length of the head which is contained in the total length about $4\frac{1}{2}$ times. Eye not quite 6 in the head, about $2\frac{2}{5}$ in snout, in postocular region $2\frac{1}{2}$ and in the interorbital space twice. The greatest depth of the head is inferior to its length and the upper profile line from the tip of the snout to the interorbital space moderately convex, and from this latter point to the occiput with a very strong convex appearance formed by the elevation of the supraoccipital ridge. Snout produced, mouth small and with lateral canine-like teeth, projecting externally, at the angle, there is one on each side of the upper and two similar on the lower. The jaws which are modified into a beak, which is small, have the teeth small, at present whitish, and the lips appear to have covered the greater portion. Origin of the P. below the level of the eye, directly above that of the V., radii ii, 12, shorter than the head and equal to the base of the P. V. $1\frac{1}{2}$ in P., radii i, 5, much stronger than P. Origin of the D. a little behind that of the P. and V., radii ix, 10, the spines rather firm, though they may have been more or less pungent during life, and together with the soft rays of uniform size. A. ii, 9, the soft rays of the D. similar and the tips of both not much if any produced beyond a point. Caudal rays strong, the outer produced into points thus leaving the posterior edge deeply incised. Body covered with very large scales, a row along the base of the D., not much smaller than those on the other parts of the body except some smaller scales alongside the base of the A. The lateral line which is parallel with the back to the region below the posterior D. rays, where it is interrupted, traverses in this space 18 scales, it then appears again on the antero-lateral region of the caudal peduncle and traverses 5 or 6 scales, to the caudal. The tubes appear to be single. The head, with the exception of the nasal, loreal, frontal and labial regions naked, the rest covered with rather large scales. Three rows of scales below the eye, the middle row with 6 and the præoperculum with 3. Scales on the opercles and cranium large. General color greenish with the outer edges of each scale broadly bordered with light green or yellowish. The D. with a longitudinal bar, of lighter color than the green, which bifurcates near the middle which results in an intervening bar of the greenish color of the rest of the fin. A. similar to the D., but without the median green bar. P. and V. greenish, their lower and inner portions lighter. A bar, evidently reddish and bordered above and below by a dark olivaceous band from the anterior margin of the eye across the snout. Total length $11\frac{3}{4}$ inches.

No. 23,291.

**10. Scarus lupus** sp. nov. Plate XVIII, fig. 1 (upper figure).

Form of the body oblong, elliptical, deep and compressed, the greatest depth which is situated medianly about equal to the length of the head and $3\frac{1}{2}$ in the total length. Profile gently convex from snout to origin of D. The eye is situated in the upper portion of the head and nearly median, and in which it is contained 6, and in the snout $2\frac{3}{5}$, and in the postocular region $2\frac{2}{5}$, and in the interorbital space 2 and in the greatest depth of the head nearly 5 times. The greatest depth of the head falls short of its length by an eye-diameter, though it is longer than the P. by nearly the same distance. Snout very prominent, the beak large and powerful, the upper projecting beyond the lower and with small denticulations which are rounded and do not form a very sharp cutting edge. No lateral teeth at the bases of either jaw like those of the preceding species and the lips thin and covering the bases of the jaws for a short distance only. Head, with the exception of the nasal, loreal, præopercular, labial, frontal and ceratohyal regions scaled, though there is a naked strip above and behind the eye. The bare tracts mentioned are more or less striated, especially around the eyes and the lores, the præoperculum is strongly so, and the rest of the tracts on the under surface of the head are papillose. The opercular flap is about median in the depth of the body, the origin of the P. anterior to its extremity at which point directly above, the D. is inserted. The P. extends posteriorly beyond the A. a short distance, radii ii, 13. V. extending for two-thirds of the distance between their origin and that of the A., the rays not being enlarged and with the fin formula i, 5. A. basis not so long as the length of the P., about equal to the V. and with the radii ii, 9. D. ix, 10, its base very long and the rays of nearly uniform length. No row of scales along the bases of either D. or A. Upper and lower rays of the caudal produced into points extending beyond the posterior edge of the fin for about an eye-diameter, the margin of which is deeply convex above sloping obliquely to base of the lower projection. Body covered with very large scales, those on the cheek in 2 series and with 5 or 6 scales in the lower row. Lateral line parallel with the back, interrupted, extending over 19 scales before the interruption, after which it starts on the antero-lateral portion of the caudal peduncle where it continues over 6 scales to the caudal. The scales which ensheathe the base of the caudal are 3 in number, enlarged and widened. Tubes of the lateral line branched. General color greenish or greenish olivaceous, with the opercles bluish. A light band from the lores across the snout and a light round spot above each maxillary. Beak white. Total length $11\frac{5}{8}$ inches.

No. 23,292.

## CHÆTODONTIDÆ.

**11. Chætodon auriga** Forskal.

Descript. Animal., 1775, p. 60.

Three specimens. Nos. 23,293, 23,294 and 23,295.

**12. Chætodon semeion** Bleeker.

Natuurk. Tydsch. voor Nederl. Indie, Deel VIII (New Series, V) 1855, p. 450.

Two examples. Nos. 23,296 and 23,297.

## TEUTHIDIDÆ.

**13. Monoceros vlamingii** (Cuvier and Valenciennes).

*Naseus vlamingii* Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 216.

Form of the body oblong ovoid, very much compressed. The greatest depth of the body about the anterior part and about 3 in the total length without caudal filaments. Head, from tip of the snout, $5\frac{1}{5}$ in total length (excluding filaments), its greatest depth in that of the body not quite 2, much shorter than the length of the head, and equal to the space between the tip of the rostrum and the origin of the D. The rostrum or horn-like projection does not extend beyond the tip of the snout and with its apex bluntly rounded. The interorbital space very strongly convex and contained nearly 2 in the snout and 3 in the head. Nostrils in an oblique slit directly in front of the eye. Eye situated high in the head, the lower half horizontal with the rostrum or horn and posterior $4\frac{1}{3}$ in the head, $1\frac{1}{2}$ in interorbital space and $2\frac{2}{3}$ in snout. Space between tip of snout and posterior margin of eye and space between posterior extremity of maxillary and upper posterior edge of operculum equal. Teeth small, even and smooth, without groove, conical and without sharp edge. Præoperculum very oblique, forming an obtuse angle anterior to the eye. Origin of the P. below the mouth, radii ii, 15, equal to the space between the points formed by the branchial aperture. Origin of the D. slightly behind the eye, anterior to the branchial aperture, on a line with which the P. is inserted and with large strong spines, the radii vi, 26, and of uniform length. Origin of V. behind P., radii i, 2, the spines roughened and strong. Origin of the A. below the last D. spine, radii ii, 27, its base equal to the soft D. which it greatly resembles. Two large keeled immovable laminæ on the caudal peduncle, which is small, with the keels projecting forward. Caudal triangular in shape, the upper and lower outer rays produced into long filaments which project for a space beyond the fin, equal to the depth of the body. Posterior margin of caudal truncate. Body covered with very small granulations which are rough to the touch, this roughness extending over many of the spines of the fins and entirely over the caudal. General color dark blackish brown, the upper part of the trunk with indistinct blackish spots and the lateral and lower portions with indistinct narrow, wavy, blackish stripes arranged crosswise. Posterior portion of the caudal lighter than the general color and with a dark terminal band along the margin which is light. Tips of both D. and A. project posteriorly as far as the posterior margin of the posterior lamina Lateral line present extending along the upper part of the trunk parallel to the line of the back to below the posterior D. region where it terminates. Total length, without filaments, $17\frac{1}{4}$ inches.

Two fine specimens. Nos. 23,298 and 23,299.

**14. Teuthis guttatus** (Bloch and Schneider).

*Acanthurus guttatus* Bloch and Schneider, Syst. Ichth., 1801, p. 215.
*Acanthurus guttatus* Cuvier and Valenciennes, Hist. Nat. Poiss., X, 1835, p. 143.
*Harpurus guttatus* Forster, Descript. Animal., Ed. Lichtenstein, 1844, p. 218.
*Acanthurus guttatus* Günther, Cat. Fish. Brit. Mus., III, 1861, p. 329; and in Fische der Südsee, Journal des Mus. Godeffroy, II, 1873-75, p. 109, pl. 69, f. a.

The name *Acanthurus guttatus* of Bloch and Schneider is the earliest for this species that is tenable, though they refer to "*Harpurus guttatus* J. R. Forster, iii, 9," which seems to me to refer to some unpublished work, as the first reference to ***Harpurus guttatus*** is published in the ***Descript. Animal.***, Ed. Lichtenstein.

Nos. 23,300 and 23,301.

**15. Teuthis achilles** (Shaw).

*Acanthurus achilles* Shaw, General Zoölogy, IV, 1803, p. 383.

Form of the body oblong ovoid, somewhat produced anteriorly, much compressed and with the greatest depth about the anterior third, and contained twice in the length without caudal. Head about $1\frac{4}{5}$ in depth of the body and $4\frac{1}{4}$ in the length from tip of snout to the margin of the middle cadual rays Snout small and produced and the region forming the anterior profile line of the head above convex, rounded, and having a swollen appearance; cheeks concave. Nares directly in front of the eye. Eye midway between the tip of the snout and the tip of the first D. spine and also midway between the upper anterior profile line of the head and the upper point formed by the branchial aperture; 3 in snout, a little over 4 in head and $1\frac{2}{5}$ in the interorbital space. Teeth broad, the edge forming 4 or 5 lobate denticulations, which are more distinct in the upper jaw than in the lower, and about

8 or 10 in each jaw. Lower angle of the præoperculum anterior to the eye, and the operculum with striations. Scapular girdle exposed and with striations. Origin of the P. on a level with the mouth, and the caudal spine, anterior to that of the D., and behind the branchial aperture. P. ii, 14, not reaching beyond the tips of the V., though they exceed the latter in length and also extend beyond the origin of the A. V. i, 5, its origin posterior to that of the P. and its first soft ray the longest, expanded and produced into a filament-like point. D. ix, 30 or 31, the spines graduated to the eighth and ninth, which are the longest and of more or less equal height with the soft rays. A. iii, 27 (?) or 28, the spines and anterior soft rays graduated and then even, like the soft D. Caudal triangular, with developed rudimentary rays, the true radii 16 in number; several of the upper and lower rays are produced into long sharp points, which project beyond the margins of the other caudal radii for a distance equal to the width of a naked postero-lateral space on trunk. This space, which is deeply ovoid, includes in its apical portion the keeled spine of the caudal peduncle, which is furnished with a groove in the body, and also with its posterior portion produced into a small backward projecting point. Scales of the body very small, those upon the thoracic region especially so. Lateral line distinct, superior and crossing the upper part of the wide lateral space to the base of the caudal. General color blackish, cheeks light and with wavy stripes. Naked lateral space and basal portion of posterior D. and A. rays, which latter are in the form of narrow bands, slightly increasing in width upon the last rays, at present brownish. Caudal with a broad basal black band and the space between this and a black posterior bar which becomes attenuated above and below, and extends upon the produced rays for about half their distance when they run back and join the basal black band, brownish. This pattern on the tail is the same shape as the tail itself, only smaller and leaving a margin all around, which is broad medianly, and of a whitish color. Eyes reddish. Four specimens, the largest of which measures 9¼ inches.

Nos. 23,302, 23,303, 23,304 and 23,305.

16. **Teuthis aliala** (Lesson).

*Acanthurus aliala* Lesson, Voyage Coquille, Zool., pt. i, tome II, 1830, p. 150.

No. 23,306.

## BALISTIDÆ.

17. **Balistapus aculeatus** (Linnæus).

*Balistes aculeatus* Linnæus, Syst. Nat., Ed. X, 1758, p. 328.

Two fine specimens. Nos. 23,307 and 23,308.

18. **Balistapus undulatus** (Mungo Park).

*Balistes undulatus* Mungo Park, Trans. Linn. Soc., London, III, 1797, p. 37.

Two specimens represent this species, and they vary slightly, especially in the pattern of the coloration. In the smaller example there are three small spots on the labial margin and one below the distal extremity of the maxilla.

Nos. 23,309 and 23,310.

19. **Melichthys piceus** (Poey).

*Balistes piceus* Poey, Proc. Acad. Nat. Sci. Phila., 1863, p. 180.

Three specimens. Nos. 23,311, 23,312 and 23,313.

## OSTRACIIDÆ.

20. **Ostracion sebæ** Bleeker, Verhandel. Batavia. Genootsch. Kunst. Wetensch., Deel XXIV, 1852, p. 34, pl. vi, f. 13.

No. 23,314.

21. **Ostracion punctatus** Bloch and Schneider, Syst. Ichth., 1801, p. 501.

Nos. 23,315, 23,316 and 23,317.

## TETRAODONTIDÆ.

22. **Arathron nigropunctatus** (Bloch and Schneider).

*Tetrodon nigropunctatus* Bloch and Schneider, l. c., 1801, p. 501.

No. 23,318.

23. **Arathron** —— sp.?

A young specimen, most likely *Arathron reticulatus* (Günther).
No. 23,319.

DECEMBER 5.

The President, SAMUEL G. DIXON, M.D., in the Chair.

One hundred and twelve persons present.

GEORGE and WILLIAM S. VAUX, JR., made an illustrated communication on their studies of the glaciers of British Columbia during the last summer in continuation of their earlier investigations. The paper, under the title "Additional Observations on Glaciers of British Columbia," was presented for publication.

DECEMBER 12.

CHARLES SCHAEFFER, M.D., in the Chair.

Twenty-five persons present.

Papers under the following titles were presented for publication:

"Additions to the Japanese Land Snail Fauna," by Henry A. Pilsbry.

"Notes on some Southern Mexican Shells," by Henry A. Pilsbry.

"A New American Species of Zonitoides," by Edward G. Vanatta.

DECEMBER 19.

MR. GEORGE VAUX, JR., in the Chair.

Fourteen persons present.

The death of Emil Fischer, M.D., a member, was announced.

MR. WITMER STONE made a communication on the moulting of birds and variations in plumage. (No abstract.)

December 26.

The President, Samuel G. Dixon, M.D., in the Chair.

Twenty-six persons present.

*Presentation of a Portrait of Carolus Linnæus by Mr. Charles E. Smith.*—The Secretary called attention to a life-size portrait in oil of the great naturalist, and, presenting it to the Academy on behalf of Mr. Smith, he read the following account of the way in which the painting had been secured:

*Ladies and Gentlemen*:—It is my pleasant task this evening to present to you and to the Academy a full-length oil portrait of Linnæus, taken in his early manhood, in the dress he wore when making his trip to Lapland—the only copy in this country. I have been in search of it about twenty years.

Sometime in the fifties, when we were at the corner of Broad and Sansom streets, we received a number of steel engraved likenesses of Linnæus, which the members were asked to buy, the proceeds to be devoted to the erection of a tablet to Linnæus at Upsala.

When we moved to this building, in 1876, I was in correspondence with Mrs. S. M. Rust, President of the Ladies' Botanical Club, of Syracuse, N. Y. I asked her if she had seen the engraving—if not, if she would like to have a copy. She replied that she had not seen it, and would like to have one very much.

I came here and asked Dr. Nolan for a copy of it. He replied that he had none, and had not seen one since we had moved. I then went to Mr. Lindsay, dealer in engravings, and asked him to get me one. He wrote to various correspondents in the different capitals of Europe, without success. I was much perplexed. At last I had a bright idea. I got Mr. William Bell, one of our best photographers, to make a copy slightly enlarged, which I sent to Syracuse.

Mrs. Rust, in her reply, said: "This likeness is not vouched for. It has not even his name appended to it. How do you know that it is Linnæus? It is too handsome for a man who knew so much. These very handsome men never do know much. I do not believe it is Linnæus. Where is the original portrait?" This raised a new question. I then tried to find the original portrait. A letter was written to the Royal Academy of Sciences, at Stockholm, Sweden, asking where the original picture was. This elicited no answer. In my correspondence with the Linnæan Society of London, they mentioned that the original picture was at Amsterdam, Holland. This was my first clue.

Our late member, Dr. J. J. Levick, was going to Europe soon after this. I gave him a photograph and asked him to keep a lookout for it in the picture galleries. When he was in Amsterdam one day, in a street-car, he met an American friend, who asked him where he was going. He replied, " To the Academy of Fine Arts, to find a portrait of Linnæus for a friend." A lady, sitting beside him, who understood English, turned to him and very kindly said: " You will not find that picture at the Academy of Fine Arts. It is in the library of the Zoölogical Garden at the other end of the city." The name of the Zoölogical Society of Amsterdam is *Natura Artis Magistra;* the garden is popularly called *Artis.* He went there and found it. It is the original of the engraving. I wrote to the Society, and asked if they would allow the picture to be copied, and would name an artist of repute, who would be the best to do it. To this I got no answer.

I have a nephew, Dr. Charles E. Smith, of St. Paul, Minn. One of his patients is the Hon. Stanford Newel, our minister to La Hague, Holland. I wrote to Mr. Newel, introducing myself as the uncle of my nephew, asking his aid. He replied promptly and warmly. In selecting an artist he examined the work of about twenty of them. He asked the advice of Mr. Beaufort, the Minister of State of Holland. They fixed on Mr. Boudewijnse. They also ascertained that the *Artis* picture is itself a copy. The original belongs to Baron Verschuer, and is in his country home near Haarlem, twenty-three miles from La Hague. He was asked if he would allow a copy of it to be made. He assented, but required that it be done at his house—that the picture could not be taken away. The artist objected to this, as the light was not good. He said he could not do justice to the picture or to himself unless he had it in a proper light. The baron then yielded the point, and we have the picture.

If it affords you half as much satisfaction to receive it as it does me to give it, I shall be amply repaid.

There are two remarkable blunders in the picture. The second scientific trip of Linnæus' life was to Lapland. On it he discovered *Linnæa borealis,* described and named after him by Gronovius, the common name of which is twin flower, because each stem bears two flowers. Linnæus loved this plant very much. When he was ennobled by the king of Sweden, he chose *Linnæa* for his crest.

Stockholm stands on a number of rocky islands, some of them quite small. One of them is called Ritterholm, the Knights' Island. When I was there in 1850, there was but one building on it, called the Ritterholm Kirk—the Swedish Walhalla. It contains statues of all the great men of Sweden, among them Linnæus. It is of white marble. He stands with an open book in his hand, on its page is an outline of *Linnæa.*

This picture represents him holding in his right hand two specimens of *Linnæa*, a tall one and a short one. The tall one has three flowers and the short one only one, so that neither of them is a twin flower. The leaves of *Linnæa* are orbicular-spatulate, very obtuse and coarsely toothed. In the picture they are ovate-cordate, acute and entire. That the artist should have thought that one weed looked just like another is natural enough, but that Linnæus should have overlooked these errors in his favorite plant is very strange.

The President accepted the gift, commenting on the Academy's obligation to the donor, and stating that the portrait would be hung in the museum in such a position as to secure the best possible illumination.

The following resolutions were proposed at the suggestion of Mr. Smith, and adopted:

*Resolved*, That the thanks of the Academy of the Natural Sciences of Philadelphia be tendered to Baron Verschuer, of Holland, for his kindness in allowing the portrait of Linnæus, belonging to him, to be copied for the Academy.

*Resolved*, That the thanks of the Academy of the Natural Sciences of Philadelphia be tendered to the Hon. Stanford Newel for his judicious advice and valuable aid in securing for the Academy the portrait of Linnæus, copied by Mr. Boudewijnse, now in its possession.

The following resolution was then unanimously adopted:

*Resolved*, That the thanks of the Academy be voted to Mr. Charles E. Smith for the life-size portrait in oil of Carolus Linnæus, presented by him this evening, a gift which is valued not only as a work of art, an adornment to the museum, and a memorial of one of the world's greatest naturalists, but also as an evidence of the continued interest of one to whom the society is indebted for active aid and encouragement, extending over nearly half a century.

The following were ordered to be printed:

## ADDITIONAL OBSERVATIONS ON GLACIERS IN BRITISH COLUMBIA.

BY GEORGE AND WILLIAM S. VAUX, JR.

Excluding the territory which lies to the north of the Arctic Circle, all the principal glaciers of North America lie within the great ranges of the Rocky Mountain system. These ranges stretching along the Pacific Coast are peculiarly well situated for the formation of glaciers, which are found in places, probably not inferior to the better known ice streams of Switzerland.

While one or two glaciers exist in the central part of California, on the sides of Mt. Lyell, and further to the north in Oregon and Washington on Mts. Hood and Ranier, it is not till the international boundary is crossed that the scenery becomes truly Alpine and glaciers are found of great size and striking characteristics. As the ranges stretch northward they converge till at the narrowest portion they exceed but little a breadth of 400 miles. At this point they are composed of parallel ranges, the outer ones being nearly continuous, while the inner are more broken and cut by deep valleys through which, in several instances, noble rivers find their way. Beginning at the west, the most important of these ranges are the Cascade, the Gold, the Selkirk and the Rocky; the last two being the highest, the most Alpine and broken and the most covered with glaciers. The reason for the greater glacier activity in these eastern ranges is in part as follows:

If a map of the Pacific Ocean be examined on which the currents have been marked, it will be seen that the Japan current, after flowing past the islands of Japan, divides into two unequal parts. The smaller of these takes a northeast direction through Bering Sea and Strait into the Arctic Ocean, while the larger portion assumes an eastern and then a southeastern course, bathing the west coast of British North America, and finally, being deflected to the south by the continent, and cooled, forms the North Equatorial current, which is a feeder to the Japan current. The evaporation from this stream of warm water is very rapid, and the moist winds, the prevailing direction of which is eastward, soon reach the coast line and the ranges of mountains beyond. Nearly at right angles to the path of these moist winds lie the parallel ranges of the Rocky Mountains. The Cascade and Gold Ranges, not being high, the clouds pass over them with a comparatively small precipitation on the western slopes, but on reaching the higher and more rugged ranges of the Selkirks and Rockies, cooling takes place more quickly, and the precipitation is very rapid. It is for this reason that on the western slopes of the mountains the snow is always deeper than on the eastern. The clouds as they rise to cross the individual ranges are cooled, and give up their moisture, which is precipitated before the summits are reached.

While the annual snowfall in the Rocky Mountains is always heavy, the winter of 1898–99 was one of the most severe since the construction of the Canadian Pacific Railway during the late seventies and early eighties. The record of snowfall, which is kept with more or less regularity at Glacier House, shows an excess of 108 inches over the average of the three previous years, while the rain, which unfortunately was not measured, must have added materially to the total. At Field, in the Rocky Mountain range, on the Kicking Horse river, the winter was no less rigorous than the preceding ones, but the snowfall was much lighter than the average of previous years, being twenty-three feet, as observed by the watchman on the pass just above Field. The precipitation from the winds as they blew eastward from the Pacific Ocean took place earlier than usual, and while probably about the same amount of rain and snow fell in both localities, the local fall in the west was more and in the east less than the average. The spring being late and the early summer cool, melting took place without much damage from freshets, and resulted in the mountains retaining more snow during the summer months than for several years.

In addition to this the summer was unusually cool. Snow was noted frequently on the higher mountains and even down to the lower levels. On August 15th a heavy snowstorm broke over the mountains, which lasted for several hours. Snow lay thick on the ground at Glacier House, at an elevation of 4000 feet; at Field it measured four inches on the platforms, while at Hector, the summit of the Kicking Horse Pass, there was a full foot. Clearing weather soon melted this at the lower levels, but on the mountains the fall was heavier and lasted for a longer period. It will be interesting to watch the effect, if any, which this unusual season will have on the glaciers of the locality. Of the glaciers observed, both last summer and this, a much smaller recession took place during the twelve months than in previous years.

### VICTORIA GLACIER.

The Victoria Glacier, at the head of Lake Louise, Alberta, was visited on the 26th of July, 1899. Although seldom seen by travelers, it is almost as accessible, and probably more interesting, than the Illecellewaet Glacier, in British Columbia. A row across the beautiful Lake Louise, followed by a walk of about two miles over a fairly good trail, brings one to the tongue, which is deeply buried in a large and high moraine. Following the northwest side of the valley, which has evidently been quite recently abandoned by the ice, the surface of the glacier is reached with ease. Over the lower part crevasses are almost entirely wanting, the drainage, to a very large extent, taking place on the surface.

For a distance of nearly one and one-quarter miles from the tongue the surface is thickly covered with moraine composed of shales, sandstones of several colors and limestones. These fall with the avalanches from the hanging glaciers above, and many of them are of large size.

From indications which seem to be borne out by the observations of others,[1] the glacier is receding and contracting. The slope of the surface is small, the lower part being nearly flat, and the motion is accordingly likely to be insignificant, though no observations have been made for its determination. For future reference, a very large block of limestone, near the centre of the glacier, and about one mile from the tongue, was located by range lines and marked "VX, '99." The movement next year can easily be determined from this rock. The position of the ice on the northwest side was also located, being twenty feet distant from the nearest of three very prominent and nearly cubical blocks of red sandstone, which recently had been released from the ice.

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[1] *The First Ascent of Mount Victoria*, Prof. C. E. Fay, Appalachia, vol. ix, p. 4.

Many pretty examples of sand cones and glacier tables were to be seen, while the avalanches, which at frequent intervals thundered down the almost perpendicular cliffs of Mts. Lefroy and Victoria, lent an awfulness to the scene truly in keeping with the surroundings. The lower glacier is almost entirely fed from those hanging on the steep slopes above.

### ASULKAN GLACIER.

The Asulkan Glacier was visited on the 12th of August, when a picture was taken from the test rock of 1898, and three boulders marked to determine in future the position of the tongue. A search was made for the rocks marked by Mr. H. W. Topham without result. Changes in the deposits about the glacier have evidently taken place rapidly, and it is probable the rocks marked by him have been covered up by fresh material.

The tongue of ice seems to be slowly receding from the moraine, as noted last year,[2] and it was possible to locate the limit of the ice quite accurately. In order to fix its position on the above date, a line, passing through three rocks and the tongue, was chosen, the magnetic bearing of which was 85° 35′ E. The rocks marking the two ends of this line were situated, one on the small moraine just to the left of the glacier, and the other on the high and stable moraine to the right, while the third and smallest rock lay just below and to the right of the tongue. Bearings were taken to locate these rocks with other prominent objects.

The changes which have taken place in the glacier during the year are not marked. A comparison of the test pictures of 1898 and 1899 shows a slight shrinkage in the height and a very slight increase in the breadth, while the position of the tongue has not changed to an appreciable extent. The ice fall about three-eighths of a mile above the tongue, where a series of exquisite seracs is to be seen, is visibly less than last year, and the névé line is much lower. The hanging glaciers to the west, on the sides of Mts. Castor and Pollux, are more active, and we noted a number of pretty avalanches. These seemed to be very infrequent last year.

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[2] *Proc. Acad. Nat. Sci. Phila.*, 1899, p. 124. Also Plate VI.

## ILLECELLEWAET GLACIER.

Owing to its accessibility, this glacier has been more carefully observed than any other in the region. It may be reached by a good trail in thirty minutes from Glacier House, and we visited it almost daily between the 29th of July and the 20th of August of the present year. During this period, partly owing to the cold and damp weather, but little melting or recession of the tongue was noted. This was in marked contrast to the rate of melting observed last year.[3]

The observations on this glacier naturally divide themselves under four principal heads, which will be taken up as follows:

1. Measurements of rate of flow.
2. Measurement of recession and other changes since 1898.
3. Photographic record from test rock "W."
4. Survey of tongue, and mapping moraines and streams.

### 1. Measurements of rate of flow.

These were determined at nine points on the glacier, one a few feet above the tongue, and eight on a straight line at right angles to the flow and about 1500 feet above the tongue. Rev. Wm. S. Green, in 1888,[4] made a determination of the rate of flow by driving stakes into the ice in a direct line. Owing to the rapid melting, however, these soon fell, and when he returned to remeasure, no accurate results could be obtained. Profiting by his experience, we decided to employ plates of steel, six inches square and one-eighth inch thick, in the centres of which holes were bored and threaded to receive three-quarter-inch pipes, three inches long. The original purpose of the pipes was to support small flags to facilitate observation. It was found, however, when the practical test came to be made, that if the plates were inverted, with the pipes extending on the under side, they sank into the ice, forming anchors, while the plates rested on the surface and could be easily seen. The plates were given two coats of vermilion paint, and lettered and numbered in white for identification.

The right moraine of the glacier being high and secure, and

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[3] *Proc. Acad. Nat. Sci. Phila.*, 1899, p. 123.
[4] *Among the Selkirk Glaciers*, p. 218.

affording an excellent view of the surface of the ice, we determined to use its ridge as the station for the transit. Observations had been made to determine the mean direction of flow of the ice, and on the 31st of July, 1899, the transit was adjusted on the ridge. A large tree was taken as a line mark on the left side of the valley.

The plan of measuring a distance of 250 feet between the plates by means of a tape measure was proved to be impracticable on going on the ice. While the surface was comparatively smooth, it was rolling and broken by valleys running at right angles to the direction in which the measurements were to be made. In nearly every case it was not possible to see from one plate to the next. We accordingly decided to abandon the actual measurement, and after adjusting the plates, to lay out a base line and take the angles to the plates from each end. The results could then be plotted on the map and the distances obtained. This plan worked well, and on the second visit we were able to place a transit at each end of the base line, and make readings of both angles at the same time.

Eight steel plates were laid out on the line shown on the map. At this point the total breadth of the glacier is 1720 feet. Owing to the rounded surface of the glacier the position for the ninth plate was not visible from the ends of the base line, and as it was quite close to the left border it was omitted altogether.

On the 11th of August, or eleven days later, transits were set up at each end of the base line and the bearings to each of the plates taken. At the same time the exact movement of the plates was accurately measured from the direct line in which they had originally been placed. This will be found noted in the fourth column of the table.

*Table showing Motion of Line of Plates, across Illecellewaet Glacier, British Columbia, July 31st to September 5th, 1899.*

| Number of Plate. | Feet from N. Border. | Dates of Observation. | Motion since last Obs. (ins.). | Average daily motion (ins.). |
|---|---|---|---|---|
| 1 | 265 | July 31<br>August 11<br>September 5 | On line.<br>42.5<br>31.5 | 2.56 |
| 2 | 500 | July 31<br>August 11<br>September 5 | On line.<br>40<br>104 | 3.90 |
| 3 | 605 | July 31<br>August 11<br>September 5 | On line.<br>75<br>105 | 5.51 |
| 4 | 750 | July 31<br>August 11<br>September 5 | On line.<br>74.5<br>Lost. | 6.77 |
| 5 | 845 | July 31<br>August 11<br>September 5 | On line.<br>71.5<br>140.5 | 6.06 |
| 6 | 980 | July 31<br>August 11<br>September 5 | On line.<br>76.5<br>165.5 | 6.79 |
| 7 | 1040 | July 31<br>August 11<br>September 5 | On line.<br>60<br>172 | 6.16 |
| 8 | 1310 | July 31<br>August 11<br>September 5 | On line.<br>66<br>Lost. | 6.00 |

Again, on September 5, through the kindness of Mr. E. J. Duchesnay, of Revelstoke, B. C., another measurement was made by Messrs. H. B. Muckleston and C. E. Cartwright. The positions of the plates on July 31st and September 5th only are shown on the map, as the motion which had taken place up to August 11th was so small as to be hardly noticeable on that scale.

These determinations show a marked decrease in the rate of flow as compared with the observations of Rev. William S. Green in 1888. They demonstrate the more rapid motion of the central portion of the glacier, and also that the ice on the convex side of the line of flow moves faster than on the concave side.

Two of the plates, Nos. 4 and 8, could not be found on September 5th. All the plates were left on the ice, and it will be interesting to determine the amount of flow during an entire year if they can be found again next summer.

Besides the row of eight plates across the glacier, an additional plate (No. 9) was placed a few feet above the tongue and measured at frequent intervals. The slope of the ice at this point was about 40°, and as the reference point was located at the level of the ground moraine below, the vertical height of the plate and the diagonal distance were noted, from which the horizontal motion was calculated. The vertical distance from the ground moraine was obtained through a crevasse near by, while the direct distance from the marked boulder was readily measured with the tape line. Unfortunately, after these measurements had been made for several days, and very satisfactory results obtained, a great mass of the tongue on which the plate had been located broke away from the main glacier. Immediately the daily rate of flow changed from a little over five inches to a fraction under three, and remained almost constant. Whether this apparent motion was due to the melting of the plate in the ice, or to the reduced flow of the smaller mass when not urged on by the parent glacier, was not determined. The crevasses seemed to widen from day to day in spite of the fact that the motion of the ice alone would cause them to become narrower.

*Table of Motion of Plate No. 9, on Tongue of Illecellewaet Glacier, British Columbia, August 1st to 20th, 1899.*

| | | | | | |
|---|---|---|---|---|---|
| *a.* Number of Observation | 1 | 2 | 3 | 4 | 5 |
| *b.* Date of Observation | 8/1 | 8/2 | 8/6 | 8/15 | 8/20 |
| *c.* Interval since last measurement (days) | | 1.24 | 3.75 | 9.25 | 5.1 |
| *d.* Actual horizontal motion of plate (ins.) | | 7.3 | 18.5 | 26.1 | 13.5 |
| *e.* Motion of plate per day (inches) | | 5.9 | 5.1 | 2.8 | 2.7 |

**2. Measurement of recession and other changes since 1898.**

After the rapid changes of the last few years we were surprised that very little alteration had taken place in the form of the glacier since last summer. In the fall of 1898 the average *daily* recession was nearly eight and one-tenth inches, while the average annual recession was fifty-six feet.[5] Measurements showed that on July 29th, 1899, the tongue was seventy-one feet above the marked rock "C," (see map, Plate XX) and on August 20th, seventy-six feet. These indicate a recession of but sixteen feet

[5] *Proc. Acad. Nat. Sci. Phila.*, 1899, pp. 123, 124.

for the year as compared with fifty-six feet, the average of the past eight years; and an average daily recession of but two and three-tenths inches as compared with eight and one-tenth inches in the same month of the previous year. On the right side, where the ice has a much steeper slope, practically no change from the position noted last year could be observed.

A few local changes in the ice and moraines have occurred. The great moraine on the left being supported on the ice foot is constantly slipping down upon the glacier below. The right moraine is much more stable, and no material change can be noted in it. On the extreme left of the glacier local shrinkage and recession have taken place, uncovering a mass of bed rock, over which the principal stream issuing from the glacier tumbles in a cascade. This fall has existed for a long time, and it is probable that before another year it may be covered again by the glacier. The cascade will form an easily identified point for the limit of the ice in 1899.

After a careful examination of the test pictures of 1898 and 1899, taken from identical positions, it appears that the depth of the ice in the upper regions of the glacier just below the névé is increasing. This fact was also noted by a number of persons who have been in the region for some time.

**3. Photographic record from test rock "W."**

The taking of the test picture from the rock "W," from which point the others had been taken, was accomplished on the 19th day of August, 1899—the same day of the year as the 1898 picture.

**4. Survey of tongue and mapping moraines and streams.**

The accompanying map, Plate XX, the basis of which was a trigonometric and photographic survey, may in future years prove of interest in tracing the changes of the glacier and locating the moraines and marked rocks. The first records of the position of the glacier are in 1887, when it followed closely the narrow moraine in which rocks "E," "R" and "A" are located. One year later, on the visit of Rev. William S. Green, a marked shrinkage and recession had taken place, as shown by his photographs, and the position of his tarred rocks, still plainly visible (marked "T" "T" on map).[6] It is probable that each year since 1887 has

[6] *Among the Selkirk Glaciers,* p. 219.

witnessed some recession of the ice. Before that time there are indications that the glacier was either stationary or advancing. The alder bushes and scrub evergreens which grow in places on this moraine show, from their leaves and annual rings, an average age of from twenty-two to thirty years. Taking the smallest number noted—twenty-two years—and subtracting from it the twelve years which have elapsed since 1887, there still remains an interval of ten years, during which the glacier did not cover a greater area than it did at the time we first observed it. We have no means of knowing whether, during this period, the glacier was advancing or retreating, but there is proof that in 1887 the tongue occupied as low a position as at any time during the past twenty-two years.

This border moraine of 1887 offers several interesting features. A large part of it is composed of two distinct moraines of nearly equal size. The same characteristic is noted on the great left moraine which, at a certain point, has a marked depression in the ridge. As the amount of morainal material carried down by the glacier is insignificant, these double moraines may mark the limiting positions of two periods of advance, one of which took place not far from 1887.

The average of all the movements of the glaciers of this region has been a marked recession, which is amply proved by the lines of moraines abandoned in the valleys below. At one time, the Illecellewaet and Asulkan Glaciers, which now terminate near the heads of the valleys, extended till they joined and flowed as a common ice stream. To estimate the time at which this took place, or rather to fix a date since which the glaciers must have been separate, the rings of a number of trees in both the Illecellewaet and Asulkan Valleys were counted. In the Illecellewaet Valley, at the Second Bridge, several examples were so counted, the oldest of which showed 250 rings. In the Asulkan Valley, a tree with 296 rings was noted, while one splendid example of white spruce was thirteen feet five and one-half inches in circumference. Allowing one ring to a year, this would indicate that the recession of the two glaciers took a much longer time than has been supposed by some. It is probable many hundreds of years have elapsed since they were united and covered the ground now occupied by the railway and the Glacier House.

In closing, acknowledgment is particularly due for the thoughtful coöperation and interest of Mr. E. J. Duchesnay, Division Superintendent of the Canadian Pacific Railway, Revelstoke, B. C., and of his assistant, Mr. C. E. Cartwright, for valuable assistance in connection with the surveys. Also to Edouard Feuz, of Interlaken, whose untiring interest, and skill on ice and rock, contributed largely to the success of the results.

## NOTES ON TECTIBRANCHS AND NAKED MOLLUSKS FROM SAMOA.

BY C. ELIOT.

Between the middle of May and the end of July, 1899, I collected a number of mollusks on the coasts of the Samoan islands, chiefly on the reef at Apia. Some of the Tectibranchs and Nudibranchs which I obtained seem to me to be undescribed species, and few of them have been examined in the living condition by more than one or two observers. I therefore submit the following notes, to those who are interested in this group of animals. My best thanks are due to the authorities of the Smithsonian Institution at Washington and the Academy of Natural Sciences of Philadelphia, especially to Mr. Pilsbry, for assistance, and to Dr. Nolan for access to the Library of the Academy, without which the specimens collected could not have been identified.

**Cryptophthalmus cylindricus** Pease. Amer. Jour. of Conch., IV, p. 74.

Pease's description and figure are accurate. I obtained several specimens of this animal at Apia. It is about an inch or an inch and a quarter long and generally black, but two specimens of apparently the same species are grayish white. The form is elongated and cylindrical, the epipodia being closely applied to the back, but the living animal sometimes contracts into a ball, and all my alcoholic specimens have assumed this shape. The shell is on the hinder part of the body, white, transparent, and nearly a quarter of an inch long. It is external and not covered by the mantle, though like all the dorsal region it is hidden under the epipodia. Branchia on right posterior side of body adjacent to the shell, but not covered by it.

All my specimens were found in the interior of a closely growing, bushlike seaweed.

**Doridium (Aglaia) Pilsbryi** n. sp. Pl. XIX, fig. *1a*, *1b*.

Body oblong. Two dorsal shields, of which the anterior has free margins all round and the posterior a free margin only behind, where it is bifid and covers a large branchial plume, which does not come out between the lobes and is not visible from the upper surface. No tentacles. Foot wide; sides recurved and extended into small epipodia. Color rather bright green, changing to fawn color at the edges; foot and branchial plume dark green. On the anterior shield is a vivid black pattern like a large figure of 8, on the posterior shield a somewhat similar pattern, but the lower circle of the 8 is not complete. The edges of the epipodia are irregularly marked in black and there are five black spots on the foot. An alcoholic specimen measures 33 mm. long.

I obtained a single specimen of this animal under seaweed on the Apia reef. In captivity it was very sluggish in its movements.

I have been unable to find any description corresponding to this species, which is clearly distinguished from other Doridia by its coloration and markings. Should I be right in supposing it to be new, I propose to call it *Doridium* (*Aglaia*) *Pilsbryi.*

**Aplysia (Tethys) nigrocincta** Martens.

I captured three specimens at Apia July 19, which seem referable to this species, though it is not very fully described, and recorded from Mauritius.

The animals are about an inch and a half long, but are apt to contract themselves into a ball, in which condition they become much smaller. The color is light brown, with multitudes of minute white spots, some of which are arranged in clusters so that they appear like one large gray spot. The edges of the foot, mantle opening, rhinophores, tentacles and siphon are marked with a fine but very distinct black border. The epipodia are ample but thin, united behind the large siphon, but widely separate in front. The mantle opening is very large and displays the shell, which is large, convex and white, not yellow, as stated in the descriptions of *Aplysia nigrocincta.*

The whole animal reminds one of *Aplysia parva,* which I have seen alive at Key West.

**Aplysia (Tethys) Benedicti,** n. sp. Pl. XIX, figs. 2*a*, 2*b*.

From July 19 to 21, I caught several examples of a species of *Aplysia,* which was abundant in Apia harbor during this period, on shallow sandy spots, and then vanished as suddenly as it had appeared.

The animals were singularly beautiful and very active, creeping and swimming rapidly, the latter movement somewhat resembling the flight of an insect. The body is plump and prolonged backward into a short tail, the tentacles and rhinophores large and leaflike. The epipodia are ample and winglike. They arise from each side of the neck at a moderate distance from the rhinophores with a clear space between them, but are united posteriorly. The ground color is bright pale green, with a border of lilac or pale blue around the edge of the epipodia. The outside of the epipodia, the head, neck, sides of the foot and upper surface of the mantle are marked with black reticulations, to which are added black eye-like spots on the three regions first-mentioned. The inside of the epipodia is marked with large irregular blotches of vivid black, which, in some specimens, almost form a network pattern. The lower surface of the mantle is black, and there is a distinct black spot at the end of the tail on the upper surface. The skin is smooth; there are no warts or filaments, but the edges of the epipodia are wrinkled. The spermatic groove, proceeding from the right oral tentacle, is very distinct. The mantle communicates with the shell cavity through a small tube. The shell is of a fair size, but very thin, and almost entirely membranous, with only a slight calcareous deposit. There is a large greenish ctenidium, which is not entirely covered by the mantle and shell. In front of it is the genital orifice. The opening of the opaline gland is single. The anal siphon is large. The sides of the stomach are set with 12–16 closely packed, brownish, horny plates. The jaws are long and leathery, and each divided lengthways into two halves, one blackish brown, the other white. The radula is composed of numerous teeth, the rows and the individual teeth being both very close together. The central tooth (fig. 2*b*, right side) consists of a basal plate with three cusps, of which the median is the largest; the lateral teeth (fig. 2*b*, left side) of a basal plate with a simple long inner cusp and shorter outer cusp, without accessory denticles along the margin. This form is retained even in the marginal teeth, the two outermost only becoming vestigial. The length of the specimen figured (in alcohol) is 75 mm.

This species corresponds in many ways with Pease's description of his *Siphonota viridescens*, but is much smaller and not at all like his figure, particularly in the shape of the head. The coloration also seems to be different. *Aplysia pulmonica* var. *Tryoniana* Pilsbry appears to be closely allied, and is recorded from Upolu, but has a starlike pore in the mantle, a much more solid shell, and no ocelli, and, to judge from the figure, differs in its general shape. Another species with points of resemblance is *Aplysia dactylomela*, from Bermuda and the Cape Verde Islands, of which I have examined a specimen. But it differs in having ocelli with a yellow centre, a longer interval between the epipodia and rhinophores, the epipodia not united posteriorly, the tail not black and another form of teeth. The central tooth is unicuspid and the laterals also have only an inner and not an outer cusp.

My specimens, therefore, appear to me not to coincide with any described species of *Aplysia*, and, if this proves correct, I would propose to call them *Aplysia Benedicti*.

**Dolabella Hasseltii** Ferussaç. Pl. XIX, fig. 3.

There is found in abundance at Apia, a species of *Dolabella*, which is eaten by the natives, and which seems to be identical with *Dolabella Hasseltii*, and particularly with the variety described and figured by Quoy and Gaimard (*Voy. de l'Astrolabe*, Vol. II, p. 306), though, if so, the coloring of their plate is not good.

The animal, which is heavy and sluggish in its movements, is generally found among seaweed growing on sand. When annoyed it excretes a copious purple fluid. The body is about six inches long and much broader behind than in front. The posterior disk is very large and distinctly marked off. It is fringed with ragged processes. The epipodial lobes are concrescent in front, the line of junction forming a spermatic groove, and touch one another, though they are not concrescent, in the region above the mantle, where they form a dorsal slit with two wider openings, one anterior above the ctenidium and one posterior above the excurrent siphon. Color olive-green with dark brown and sandy patches admirably imitating a mass of old seaweed. Though the animal is a conspicuous object if put in a basin, it is, thanks to its protective coloration, almost invisible in its native haunts. The foot is dark orange. The cavity surrounding the shell and mantle is large. The mantle greenish and only partly covering the shell and the large pale flesh-colored ctenidium. The shell is large and strong, hatchet-shaped, the edge of the blade membranous, but the spire heavily callous, and in its natural position on the back of the animal lower than the membranous portion. The part exposed is greenish brown, the part covered by the mantle white. The oral tentacles are auriform and directed forward, the rhinophores stout and canaliculate. Length of the figured specimen (in alcohol) 11 cm.

The walls of the stomach are set with about ten large horny plates. The genital opening is beneath the gill, about the middle, not at the posterior extremity. The purple gland is very large.

The jaws are subtriangular, horny and brownish. The radula consists of numerous close-set teeth, but the rows are somewhat wide apart. Each tooth consists of a narrow basal plate with one long thin cusp. No central tooth or central space is distinguishable.

I am inclined to think that *D. Hasseltii* Fér., *D. variegata* Pease and *D. Teremidi* Rang are all one species. The last named differs chiefly in having the mantle sky-blue, but in animals with protective coloration environment might produce such variations.

**Dolabrifera** Gray.

*D. Tahitensis* Pse. is common on all the islands under stones at low-water mark. I obtained it at Apia, Manono and Tutuila. Pease's description and plate (*Amer. Jour. of Conchology*, 1868, p. 77, Plate VIII, fig. 5) are quite accurate. In many specimens the bright blue eyes are very large and conspicuous, but there was some variety in this respect, as also in color. Perhaps the distinction between *D. Tahitensis* and *D. olivacea* is not very marked, and the two species may be connected by intermediate forms. I also obtained one specimen of *D. fusca* at Apia, but have nothing to add to Pease's description.

**Notarchus Indicus** Cuvier.

Three specimens obtained at Apia in June seem referable to this species, though smaller than the recorded size. The animal is capable of assuming two forms of exceedingly different aspect, one globular, and one sluglike and elongated. It is active in its movements and in captivity seemed to prefer swimming to creeping. As it moves, water is taken in through the dorsal opening between the epipodia in the anterior part of the body, and expelled from it rhythmically. The integument is transparent and allows the intestines to be seen distinctly.

**Pleurobranchus delicatus** Pse.

Three specimens from Safotu, Savaii, in July. The animal agrees with Pease's description (*Amer. Jour. of Conchology*, 1868, p. 79), but is not very like his plate, being smaller and of a much brighter orange except on the back, where the black viscera can be seen through the skin. Branchia and orifices very prominent.

**Platydoris** Bergh.

Two species of this genus (*scabra* and *arrogans*) are common under stones on Apia reef. They both grow to a length of about three inches, and are characterized by their flattened form, wide mantle, with irregularly indented edges, and a peculiar hard and leathery texture, which distinguishes them at once from all other Dorids which I have seen. They are sluggish in their movements and do not appear to be protected by their coloration. *P. scabra* (= *Doris scabra* Q. and G.) grows to be about three inches long. The outline is an irregular oval, the edge of the ample mantle being wavy. The color is white, with irregular blotches of brown produced by aggregations of small spots. The branchial rosette is yellowish, sixfold and very voluminous and delicate. Edge of foot brown, but sole and under surface of mantle white. Labial tentacles small, white and tapering. The branchial aperture is clearly defined and starlike. *Platydoris arrogans* Bgh. (= *Doris cruenta* Q. and G.) has the same external characters as *Pl. scabra,* but the markings are formed, not by minute spots, but by fine lines. In addition to them there are on the back four or five splashes of vivid red, looking like red ink, which disappear in alcohol.

**Discodoris fragilis** (A. and H.), Bergh.

*Doris fragilis* Alder and Hancock, Trans. Zool. Soc., Vol. 5, 1864, pp. 117, 38. From east coast of India.

This animal is common on Apia reef. In life it is brownish green, mottled with darker shades of the same color, the foot and under surface of the mantle being similarly marked. The rhinophores and branchial rosette are brownish and the labial tentacles white and pointed. The whole body is flat and oval, and the length from two to three and a half inches.

The creature is remarkable for its extraordinary powers of self-mutilation. When handled, it throws off part or the whole of the mantle edge, in some cases leaving behind it a complete ring of mantle more than a quarter of an inch wide, while the central part crawls away, apparently none the worse for the loss. The animal can hardly be described as "brittle," for it is gelatinous to the touch and secretes an abundant mucus. The process of amputation is not rapid, and would not protect the *Discodoris* against a fish or any quick-moving animal, but might perhaps enable it to escape the attacks of a carnivorous mollusk. I did not succeed in discovering what its enemy may be.

**Chromodoris scurra** Bergh.

This brilliantly colored species is common on the coasts of all the Samoan islands, and, though rarely an inch long, is conspicuous owing to its ornamentation, which must be warning. The back is striped with lines of white, violet and bright orange. The large rhinophores and the branchial rosette are violet at the tips and orange in the lower parts. Bergh's Plate XXXIII (in Semper's *Reisen*, II, 2) hardly does justice to the vivid coloration of the living animal.

**Chromodoris inornata** Pse.

Common on Apia reef. I do not know why Pease distinguished this beautiful animal by so inappropriate an epithet as "unadorned." The back and foot are white, subpellucid and spotted with purple. The mantle, but not the foot, which projects considerably behind, is bordered with a line of bright orange. The sevenfold branchial star is grayish yellow, and the upper part of the large rhinophores bright orange. The labial tentacles, which are of moderate size, are faintly tinged with the same color. The foot is long and narrow, and the length of the whole animal rather more than an inch.

**Chromodoris** sp.

Very dark green, edge of mantle bluish, shape very variable. Mantle edge indented or not at will of animal. Rhinophores dark green, tipped with white. Branchial rosette dark green, rather large. Labial tentacles very small. Foot light gray. Viscera visible from under surface. Tail much longer than mantle. One specimen at Manono.

**Trippa areolata** (A. and H.) Bergh.

This animal affords an extraordinary example of mimicry. It so exactly resembles a shell or old stone overgrown with green and blue seaweeds and with sponge that it is absolutely invisible when crawling on such objects. When the specimen which I caught was placed in a basin with shells it took up a position on an old Strombus, and could not be distinguished from the growths and accretions by which it was surrounded.

The body is deeply indented with cavities like those made by worms in stones. The rhinophores and branchial rosette are grayish brown, and in spite of their size, inconspicuous.

This animal is described by Alder and Hancock (*Trans. Zool. Soc.*, Vol. V, 1864) as *Doris areolata*, and recorded from the east coast of India. Bergh refers it, with a query, to his genus *Trippa*. The dentition shows that it undoubtedly belongs to this genus. There are no jaws, but the radula resembles that of *T. ornata* Bgh. There is no central tooth, but about forty laterals on each side. The innermost teeth are very small, but increase in size up to the fifteenth, after which they become equal, except the two or three outermost, which are reduced. The transverse rows are nearly straight at the sides, but bend downward in the middle.

**Doris setosa** Pse.

Bergh, in Semper's *Reisen*, II, 2, supplement Plate G, gives a figure of *Doris setosa* from Pease. *Proc. Zool. Soc.*, XVIII, 1860, p. 26, which he seems unable to assign to any of his genera. Last July I captured at Mulifanua, Upolu, three specimens of an animal which, except in color, appears to agree with Pease's plate. The largest specimens were an inch long. The upper surface, branchial rosette and rhinophores were brownish yellow with darker brown spots. The under surface of foot and mantle whitish. The branchial star was ten plumed and protected by two lateral lobes; the anal tube prominent. The whole dorsal surface covered with villous projections, which contain spicules, and can be scraped off, leaving a smooth surface. The radula consists of five rows of simple hamate teeth. There is no central tooth and the formula is 19 (or 18) 0. 19 (or 18). Jaws are absent.

**Doridopsis herpetica** Bergh.

*Doris compta* Pse.

Beautiful pearl gray, with spots of same color, but darker. Rhinophores and sixfold branchial rosette with faint yellowish tinge. Foot and under surface of mantle pearl gray with small spots. Labial tentacles small, whitish. Body slightly transparent, showing reddish intestines. Pharynx long, cylindrical; no jaws; no radula.

Pease's plate (*Doris compta, Amer. Jour. of Conch.*, 1871–72, Pl. 4, fig. 1) is fairly like the living animal, but he is mistaken in supposing that the mantle edge is permanently and regularly indented. The animal is sluggish in its movements, but constantly alters its shape; it is sometimes elongated and sometimes oval, and can wrinkle and undulate the edge of the mantle at will.

**Trevelyana citrina** Bergh.

One specimen obtained at Apia in July. It corresponds accurately in color and other external characters with Bergh's description and plate in Semper's *Reisen*[1] (II, 2, Pl. XLI).

With regard to this and all other tropical *Polyceridæ* which I have seen, I would observe that the expression non-retractile, applied to the rhinophores and branchiæ, is only comparatively true. In *Dorididæ* the branchiæ, when touched, disappear entirely, reëmerge slowly, and are, as a rule, invisible in alcoholic specimens. In the *Polyceridæ* they generally remain outside in alcoholic specimens, but when touched in the living animal, retract themselves into a pocket, though perhaps less thoroughly, and for a shorter time than in *Dorididæ*. But to say that a genus or family is characterized by non-retractile branchiæ may lead an observer into error.

**Cyerce nigra** Bergh.

This beautiful animal appears to be common, as I captured numerous specimens at Apia and Manono. It crawls rapidly, but I have not seen it swim. When it is walking its many cerata are agitated with a motion similar to that of a field of corn under the wind.

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[1] By an oversight corrected in another part of Bergh's work the animal figured in the plate is called *Nembrotha*.

**Placobranchus gracilis** Pease.

One specimen. Apia reef. June, under a stone. Buff-colored, with green eye-like spots, surrounded with bright black rims. Epipodia reflected over the back and striped internally with longitudinal bright green ridges. Edges of epipodia and frontal veil and tentacles violet colored. On a prominence between the tentacles are two distinct black eyes.

**Bornella** Gray.

I obtained two species of this genus at Apia. The first is *B. arborescens,* described by Pease in the *Amer. Jour. of Conch.*, 1870–71, p. 302). I have nothing to add to his account except that the red coloring is rather brighter than in his figure. The second I somewhat doubtfully identify with *B. Hancockana* (Kelaart, in *Annals and Magazine of Nat. History,* 1859, Vol. IV). In life the body was subpellucid, and the back mottled with yellow. Over the mouth are two stellate processes with about ten rays each. The rhinophores are greenish and retractile into four-fingered sheaths. There are five pairs of cerata, four containing hepatic diverticula, and all bearing branchiæ. The three anterior cerata are trifid, the two posterior bifid. There are two black eyes under the skin just in front of the rhinophores. The animal is very active and crawls and swims rapidly.

**Elysia nigropunctata** Pse.

A single specimen captured at Apia seems midway between the species called by Pease *Pterogastron* (= *Elysia*) *marginatus* and *Pterogastron nigropunctatus.* The body was greenish, with black and white spots, as in his figure of the latter (*Amer. Jour. of Conch.*, 1870–71, p. 304), but the lateral lobes are edged with a single line of orange, somewhat less conspicuous than in his figure of the former. On the whole, I think the animal should be called *Elysia nigropunctata.*

**Elysia Hendersoni** n. sp. Pl. XIX, fig. 4.

In July I found twelve specimens of an *Elysia* on green seaweed at Manono, which do not appear to me to be referable to any species of which I have seen the description. The outer surface of the animal is greenish, with yellowish markings, and resembles a piece of seaweed sprinkled with sand. The interior of the epipodia is bright green and striated with numerous fine veins. The epipodia are indented at their edges, and united behind in a very ample dorsal expansion. On the back, a little behind the two tentacles, is an elongated, bladder-like projection, containing the heart, which pulsates regularly and rapidly. From this arise three main trunk veins, each of which is numerously subdivided. This arrangement seems to distinguish the animal from *Elysia viridis*, and the coloration is unlike that of the other species described. If it proves to be a distinct species, I would propose to call it *Elysia Hendersoni.* Length, in alcohol, 17 mm.

**Onchidium Tonganum** Quoy and Gaimard.

*Peronia tongana.*

This curious animal is very common on the Apia reef at low-water mark. It is oval in shape, and attains a length of nearly three inches. The mantle is of a dirty olive green, thick and covered with processes and warts, on some of which are eyes. The tentacles are short, but the labial palps enormous.

Though an ungainly looking creature, *Onchidium* displays greater activity and intelligence in its movements than any mollusk except Cephalopods which I have seen. It may almost be said to run, and if placed in a vessel at the bottom of a boat will make a determined effort to climb over the sides and reach the sea. As it moves, the large posterior pulmonary orifice opens widely and contracts. It must be capable of living under water, as it frequents reefs which are submerged except at low tide, but in captivity, when placed in sea water, it invariably came out and wandered on the balcony, but specimens placed under a heap of wet seaweed remained quiet. It has been stated that *Onchidium* has dorsal eyes only in those regions where *Periophthalmus* is found, and that they assist it to escape the attacks of the fish. I cannot support this statement from my own observation, for, though *Periophthalmus* is common in Samoa, it frequents mud flats and mangrove swamps, and I have never seen it on the edges of coral reefs which are the habitat of *Onchidium.*

It will be noticed that the majority of the Nudibranchs described belong to the *Dorididæ* or *Elysioidea*, and that the *Æolidæ* and allied families are entirely absent. As Pease, who collected chiefly in the Society and Hawaiian islands, also describes no Æolids, it looks as if the group was not numerous in the central

Pacific, though on the shores of California it is very abundant. Many of the less-known species which I found have evidently a wide distribution. Thus *Trippa areolata* had previously been reported from the coast of Madras, *Dolabella Hasseltii* from Java and Mauritius, and *Aplysia nigrocincta* from the latter locality. Though the coast of Samoa is exceedingly rich in marine life, I observe that many species are smaller than those described from other places.

*Cyerce nigra*, *Aplysia Benedicti* and *Elysia Hendersoni* were found in small flocks or families of from ten to fifteen individuals ; *Dolabella* and the *Dorididæ* mostly in pairs.

## EXPLANATION OF PLATE XIX.

1*a*. *Doridium Pilsbryi*, n. sp., dorsal aspect.

1*b*. *Doridium Pilsbryi*, n. sp., ventral aspect.

2*a*. *Aplysia Benedicti*, n. sp.

2*b*. *Aplysia Benedicti*, n. sp., central and lateral teeth.

3. *Dolabella Hasselti* Fér.

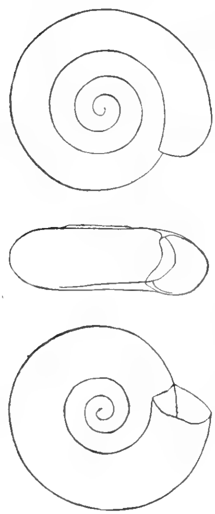
4. *Elysia Hendersoni*, n. sp.

## A NEW AMERICAN SPECIES OF ZONITOIDES.

BY EDWARD G. VANATTA.

**Zonitoides nummus** n. sp.

Shell discoidal, shining, translucent, waxen white. Spire very flat, composed of $3\frac{3}{4}$ rather convex slowly increasing whorls; suture impressed growth lines slight. The umbilicus is very wide, its width contained in the greatest diameter of the shell about $2\frac{1}{3}$ times. Aperture irregularly rounded-lunate, parietal callus thin.



Alt. 0.5, greatest diam. 1.5, lesser diam. 1.33 mm.

New Braunfels, Texas.

The type is in the collection of the Academy of Natural Sciences, No. 68,834.

This species has the color and texture of *Z. singleyanus* Pils., but with the same number of whorls it is much smaller, being only about one-half the size. It also differs from *Z. minusculus* Binn., in being much smaller and flatter.

It can easily be distinguished from the other members of the *Z. minusculus* group by the wide umbilicus, discoidal form, and the slowly increasing whorls.

On examining cotypes and description of *Z. læviusculus* Sterki, I find it is a synonym of *Z. singleyanus* Pils.

## ADDITIONS TO THE JAPANESE LAND SNAIL FAUNA.

BY HENRY A. PILSBRY.

The forms described below occurred in a collection of Japanese mollusca obtained by Marshall R. Gaines, President of Tillotson College, Austin, Tex., while resident and engaged in educational work in Japan some years ago.

They were chiefly collected by his pupils; and being accompanied by exact locality data, are a substantial addition to our knowledge of the terrestrial mollusks of Japan.

**Diplommatina tenuiplica** n. sp.

Shell similar in form, size and external sculpture to *D. collarifera* Schm. and Bttg., but of a reddish brown color, the columellar lamina within the whorl decidedly thinner and weaker, less oblique; lamina within the outer wall (visible through from the outside on the front of the last whorl) distinctly shorter. Crest behind the lip less developed and nearer the lip.

Kashima, Harima (Marshall R. Gaines).

**Ennea Iwakawa** n. sp. Pl. XXI, fig. 10.

Shell small, cylindrical, with small, deep, circular umbilicus, the latter 3 or $3\frac{1}{2}$ whorls of about equal diameter, those above convexly tapering; white; surface sculptured with numerous strong but slender longitudinal laminar riblets, curving to the left above, to the right below, and about 27 in number on the last whorl, absent on the apical $1\frac{1}{2}$ whorls. Whorls $6\frac{1}{2}$, slightly convex, the last tapering below, obtusely keeled at the base. Aperture small, subtriangular, wider above; peristome continuous, narrowly reflexed, emarginate at the position of the parietal lamella, the outer lip with a short rounded sinus above; the cavity contracted by an oblique, deeply placed fold on the columella, two nodular teeth upon the outer lip, the upper one submarginal, the lower further within, and a long, high sinuous parietal fold, which runs about one-half of a whorl inward, bending to the left a short distance within.

Alt. 3.2, greatest diam. 1.5 mm.; length of mouth 0.8 mm.

Named in honor of Mr. T. Iwakawa, the author of a meritorious essay upon the Japanese species of *Viviparus.*

**Eulota (Acusta) Gainesi** nom. nov.

*Helix læta* Gld. 1859, not *Helix læta*. Pfr. 1854. *Vide* Novitates Conchologicæ, pl. 143, figs. 17, 18, 19.

This species differs from the typical forms of the subgenus *Acusta* in having the peristome distinctly reflexed in adult examples. The figures cited above, represent a specimen not quite mature and less strongly wrinkled than my type. The color is either olive brown or olive yellow without bands, or varied by two broad bands. The interior of the aperture is blue gray, the columella pinkish lead color, pale pink at the outer edge, like the whole outer lip. The surface is glossy, coarsely wrinkled along the lines of growth, showing spaced engraved spirals under the lens, and an extremely minute, dense criss-cross scratching throughout when not obliterated by wear. Whorls 5½.

Alt. 27, diam. 32 mm.; aperture 22 mm. long, 20 wide (measured outside peristome).

Ushika, Prov. Tishio.

**Eulota luna** n. sp. Pl. XXI, figs. 1, 2, 3.

Shell low-conic above, flattened below, with a large well-like umbilicus, one-eighth the diameter of the shell, very slowly contracting as it penetrates; white under a thin, pale yellow cuticle, with two narrow chestnut bands, one above, the other below the periphery, the former visible above the suture on the whorls of the spire. Surface rather glossy, with fine irregular growth wrinkles and some subobsolete spiral lines above. Spire conic with convex lateral outlines. Whorls 6½, slowly, regularly widening, convex, the last rather more descending, with rounded periphery and base, not deflexed in front. Aperture oblique, lunate oval; peristome acute, outer margin slightly and the basal more expanded, dilated at the columellar insertion, impinging upon the umbilicus.

Alt. 16½, greatest diam. 20½, least 19½ mm.

Yurdamisawa, Prov. Ishikari (Gaines).

This species, while probably a *Euhadra*, does not belong to the *luchuana* group. It reminds one of *Pyramidula solitaria* (Say).

I do not know of any closely allied Japanese species.

**Eulota (Ægista) aperta** n. sp. Pl. XXI, figs. 7, 8, 9.

Shell perspectively umbilicate, the umbilicus exceeding one-fourth the diameter, at first rapidly widening, showing much of the penultimate whorl, then gradually narrowing. Corneous brown. Surface dull, with fine wrinkles of growth, bearing cuticular laminæ which are in large part rubbed off in the specimens described, and under a lens fine subobsolete spiral striæ may be seen on the base, at least in places. Spire low conoidal with slightly convex lateral outlines. Whorls $5\frac{1}{2}$, moderately convex, slowly increasing, the last decidedly wider, rounded at the periphery and beneath. Aperture quite oblique, subcircular, but little excised by the penultimate whorl; peristome thin, very slightly expanded, more so below and on the columellar margin, the latter scarcely dilated at the insertion.

Alt. 8.4, greatest diam. 14.2, least 12.3 mm.; length and width of aperture 6.2 mm. (including peristome).

Toyonishikami, Prov. Nagato (Gaines).

This is one of those Japanese Helices of uncertain position, with the peristome less developed than in *Ægista*, more as in the European "Fruticicolas." It is distinguished by the large umbilicus and the minutely shaggy cuticle. It has the form but not the texture or color of *Helix macrocycloides* Kobelt.

**Eulota cavicollis** n. sp. Pl. XXI, figs. 11, 12, 13.

Shell openly and deeply umbilicated, the umbilicus ample, showing all the whorls, its diameter contained $3\frac{1}{2}$ or four times in that of the shell. Corneous brown. Surface dull, when quite unworn clothed above with short compressed cuticular laminæ which gather and hold dirt, but usually these are worn off, leaving the surface finely striated, the striæ a little stronger toward the sutures, base smoother. Spire elevated, the lateral outlines convex. Whorls $6\frac{1}{2}$ to $7\frac{1}{3}$, very narrow, closely coiled, slowly widening, the last one abruptly and very deeply deflexed in front, constricted behind the peristome. Aperture nearly horizontal, truncate oblong; peristome thin, narrowly reflexed throughout, the upper margin of the outer lip somewhat straightened or sinuous.

Alt. 4, greater diam. $6\frac{1}{2}$, lesser 6 mm.

Alt. 4.7, greater diam. 6, lesser 5.7 mm.

Kyoto (Marshall R. Gaines).

A very peculiar little shell, not like anything hitherto reported from Japan, and probably typical of a new subgenus which pending anatomical details may be subordinated to *Eulota*, and thus defined: *Cœlorus*, n. s.-g. Mound-shaped, with numerous narrow whorls, ample umbilicus, and subhorizontal aperture with thin, reflexed, discontinuous peristome.

**Eulota rudis** n. sp. Pl. XXI, figs. 4, 5, 6.

Shell depressed-conoid, umbilicated, the umbilicus a little over one-fifth the diameter of the shell, rather narrow within, rapidly expanded at the last whorl. Solid; dull reddish brown, with irregular whitish lines and some darker streaks. Surface irregularly striated, the striæ stronger at the margin of the umbilicus. Spire conoidal. Whorls $6\frac{1}{3}$, slowly widening, the last whorl rather wider, decidedly descending in front, somewhat tubular. Aperture oblique, rounded, slightly excised by the penultimate whorl; peristome a trifle thickened, the outer lip somewhat expanded, basal and columellar margins more expanded; terminations considerably approaching.

Alt. 11, greater diam. 14, lesser 12.5 mm.; width of aperture 6.5, oblique height 6 mm.

Omi, Japan (M. R. Gaines).

A rude-looking, dark reddish shell, with somewhat the aspect of a *Pyramidula*. I know of no closely allied species.

**Ganesella satsuma** n. sp. Pl. XXI, figs. 20, 21, 22.

Shell globose trochiform, narrowly and obliquely perforate, thin, translucent, the internal pillar faintly visible through its substance; whitish-corneous, tinted a little with brown on the base. Surface rather glossy, with light, irregular growth wrinkles, cut by fine, close incised spirals which are distinct on the earlier, subobsolete on the last whorl. Spire elevated, with convex lateral outlines. Whorls $6\frac{1}{3}$, convex, slowly widening, the last distinctly though shortly deflexed in front, rounded at the periphery, convex beneath, indented around the axis. Aperture oblique; peristome white, expanded, thickened within, the basal and columellar margins reflexed; basal margin straightened, sloping, with a slight callus within; columellar margin very short, subvertical, concave, dilated and nearly closing the umbilicus, which it wholly conceals from below.

Alt. 19, greater diam. 19, lesser 17 mm.

Kyoto (Marshall R. Gaines).

Closely allied to *G. japonica*, and to some extent a transition species between the *japonica* and the *papilliformis* groups of *Ganesella*. It differs from *G. japonica* in the greater elevation, completely rounded periphery and almost closed umbilicus.

**Ganesella ferruginea** n. sp. Pl. XXI, figs. 14, 15, 16.

Shell shaped much like *G. japonica*, russet brown, paler near the suture and outer lip, girt at the periphery with a chestnut band bordered below by a corneous one; umbilicus pale corneous within. Surface slightly shining, striatulate, seen under a strong lens to be covered with a dense fine granulation, the granules point-like, in places arranged in oblique rows sweeping nearly at right angles with the growth lines, but on the base this arrangement is nearly lost. Spire convexly conic; whorls $5\frac{1}{2}$, the last rounded at the periphery and beneath, hardly deflexed in front. Aperture oblique, the lip expanded, thickened within, white; basal lip reflexed, straightened, with a slightly convex callus within; umbilicus deep, moderately wide, about one-third covered by the dilated columella.

Alt. 13, greater diam. $17\frac{1}{2}$, lesser $16\frac{1}{2}$ mm.

Okayama, Prov. Bizen (Gaines).

Similar to *G. japonica*, from which it differs in the russet color and minute sculpture.

**Ganesella heteroglypta** n. sp. Pl. XXI, figs. 17, 18. 19.

Shell somewhat trochiform, narrowly and almost closed umbilicate, thin, somewhat translucent, yellow-corneous, with a slight olivaceous tint, a faint darker peripheral band, light-bordered below. Surface with a dull silken lustre, produced by a clothing of microscopic papillæ or low elongated granules, irregularly and densely placed. Spire elevated, with convex outlines. Whorls fully 6, moderately convex, swollen just below the sutures, the last whorl obtusely angular at the periphery, becoming rounded on the latter portion, convex beneath, very slightly deflexed in front, and constricted behind the peristome. Aperture oblique; outer lip expanded, thickened within, basal lip reflexed, straightened, calloused within; columellar lip very short, dilated, nearly covering the umbilicus.

Alt. 16½, greater diam. 17, lesser 15 mm.

Fukura, Prov. Awaji (Gaines).

Like the two preceding species, this is allied to *G. japonica*, having the same form of aperture. It differs from *G. satsuma* chiefly in the fine sculpture, which consists of a dense granulation, without spiral incised lines. It differs from *G. japonica* in sculpture and the reduced umbilicus; from *G. ferruginea* in the pale coloring, small umbilicus and different sculpture.

## EXPLANATION OF PLATE XXI.

Figures 1 – 3. *Eulota luna.*
4 – 6. *Eulota rudis.*
7 – 9. *Eulota (Ægista) aperta.*
10. *Ennea Iwakawa.*
11–13. *Eulota (Cœlorus) cavicollis.*
14–16. *Ganesella ferruginea.*
17–19. *Ganesella heteroglypta.*
20–22. *Ganesella satsuma.*

The following annual reports were read and referred to the Publication Committee:

## REPORT OF THE RECORDING SECRETARY.

The average attendance at the meetings during the year has increased to 29. A quorum was lacking twice in midsummer, while the largest attendance at any meeting was 143. The plan of sending postal card notices of the meeting has been continued with good results. When the communications have been records of original observations they have been reported by the authors and published in the *Proceedings*. Such, of course, are of most importance, but in their absence it has been found desirable to secure résumés of progress in various fields of science, reports of collecting trips and explorations, remarks on current additions to the museum and other matters not strictly original, but yet of interest to those who find in them sufficient reason for attendance at the meetings.

Communications have been made by Messrs. J. C. Morris, Goldsmith, Dixon, Keeley, Calvert, Schumo, Heilprin, Pilsbry, Dall, Woolman, Boyer, Stone, G. Vaux, Jr., William S. Vaux, Jr., Miller, C. Morris, Mercer, S. Brown, Holt, Sharp, Holman, Skinner, Morsell, A. E. Brown, Bryant, MacFarlane, Harshberger, Cockerell, Rand, Lyman, U. C. Smith, Schaeffer, Hamilton, Rhoads, Palmer, Moore, H. C. Chapman, F. M. Chapman and James.

Five hundred and thirty-eight pages of the *Proceedings*, illustrated by eighteen plates, and the second number of the eleventh volume of the *Journal* have been published, the latter consisting of one hundred and thirty-eight pages and five plates. In addition forty-nine pages of the third number of the volume profusely illustrated by text figures, a continuation of Mr. Clarence B. Moore's papers on southern burial mounds, have been printed in advance at the expense of the author.

Forty-one papers have been presented for publication, as follows: H. A. Pilsbry 6, H. W. Fowler 4, Witmer Stone 4, William J. Fox 3, Gerrit S. Miller 3, E. G. Vanatta 2, J. Percy Moore 2, Philip P. Calvert 2, James Francis Abbott 2, C. W. Johnson 1, Thomas Meehan 1, Katherine J. Bush 1, T. D. A. Cockerell 1, Harry C. Oberholser 1, John W. Harshberger 1, Rev. William T. C. Morsell 1, Clarence B. Moore 1, Theodore D. Rand 1, C. N. E. Eliot 1, George and William S. Vaux, Jr., 1, H. A. Pilsbry and T. D. A. Cockerell 1, H. A. Pilsbry and Edw. G. Vanatta 1. Thirty-seven of these have been printed in the *Proceedings*, one in the *Journal*, two remain to be acted on, and one was withdrawn by the author.

The Entomological Section (American Entomological Society) has issued 306 pages and 7 plates of the *Entomological News*, and 309 pages and 5 plates of the *Transactions*.

The first series of the *Manual of Conchology* having been completed last year, the publications of the Conchological Section have been confined to the section of Pulmonata, as it has been deemed advisable to postpone, for the present, work on the marine bivalves, which will constitute the continuation of this important contribution to conchology, if the resources of the Section will warrant the undertaking. One hundred and seventy-six pages of Vol. XII of the second series, Pulmonata, illustrated by 46 plates, have been published.

The Academy's publications, therefore, during the year, have amounted to 1416 pages and 81 plates, a gratifying increase over the issue of last year.

The statistics of distribution are as follows:

| | | |
|---|---|---|
| *Proceedings,* | mailed to subscribers, | 78 |
| " | mailed to exchanges, | 102 |
| " | sent to exchanges through the International Bureau (Smithsonian Inst.), | 442 |
| | | 622 |
| *Journal,* | mailed to subscribers, | 37 |
| " | mailed to exchanges, | 14 |
| " | sent to exchanges through the International Bureau (Smithsonian Inst.), | 54 |
| | | 105 |

The edition remains as heretofore, 1,000 copies of the *Proceedings* and 500 copies of the *Journal.*

Cases have been erected on the upper floor of the museum building for the storage of the stock of the Academy's publications remaining on hand. It is hoped they may remain here until disposed of by sale or exchange. The plates damaged by the flood of last year have not yet been reprinted.

Eleven members have been elected since the last report. During the same period the deaths of fourteen members have been announced, five have been dropped for non-payment of dues, and seven resignations have been recorded, making a net loss of fifteen. Twelve correspondents have been added to the roll and the deaths of twelve have been recorded.

A proposition to revise the By-Laws was referred to the Council, February 21. After careful consideration at one stated and two adjourned meetings an amended code was reported to the Academy. It was adopted after reading, at meetings held April 27, May 2 and 9. The most important changes embodied in the new code are the substitution of Assistant Curatorships, the titles and duties of which are to be defined by the Council, for the Professorships, the repeal of the clause limiting the possible continuous term of the presidency to four years, and providing for the appointment of a Committee on Accounts in addition to the Committee on Finance. Numerous verbal alterations were also made, redundancies removed and related clauses placed in juxtaposition, resulting, it is believed, in a clearer and more explicit code than that which it replaces.

The thanks of the Academy were voted to Miss Adeline S. Tryon for her generosity in satisfying a mortgage of $5,000 on a property devised to the Conchological Section by her brother, Mr. George W. Tryon, Jr.

A committee consisting of Messrs. Nolan, Montgomery, Sharp, Pilsbry and Fox was appointed at the request of the representative of the committee on the proposed international catalogue of scientific literature, to consider the preliminary announcement, and to advise as to the desirability of the provisions and methods embodied therein. The committee presented a report March 28, 1899, which was adopted and ordered to be forwarded as the action of the Academy.

The lecture hall and library were used for the annual meeting of the American Ornithologists' Union, the most successful, it is believed, in the history of the society, and for the first autumn ession of the Pennsylvania Library Club.

Miss Harriet M. Wardle was appointed a Jessup Fund student under the provision for females made by the late Mrs. Bloomfield H. Moore as an addition to the trust endowed by her father.

A committee has been appointed by the President, at the instance of the American Philosophical Society, to represent the Academy at a meeting to be held in commemoration of the late Dr. D. G. Brinton, who held the position of Professor of Ethnology and Archæology in the Academy from February 25, 1884, until his death.

The Anthropological Section, not having held sessions or presented a report during the preceding twelve months, was, under the By-Laws, declared at the meeting of the Academy held December 27, 1898, to be no longer in existence.

EDWARD J. NOLAN,
*Recording Secretary.*

## REPORT OF THE CORRESPONDING SECRETARY.

During the past year, commencing December 1, 1898, there have been received from one hundred and ten societies, museums, libraries, etc., one hundred and eighty-six acknowledgments of the receipt of the publications of the Academy, and from forty-four societies, libraries, etc., fifty-six notices that their publications have been forwarded to the Academy. Fourteen applications for exchange and for supply of deficiencies in sets of the Academy's publications, together with eleven circulars and invitations to the Academy to participate in congresses or meetings, and seven announcements of the deaths of scientific men, have also been received, and when necessary, answered.

The deaths of twelve correspondents have been recorded.

Four hundred and twenty-nine acknowledgments of gifts to the library have been forwarded.

Respectfully submitted,

BENJAMIN SHARP,
*Corresponding Secretary.*

## REPORT OF THE LIBRARIAN.

Since the first of December, 1898, the accessions to the library, properly catalogued and placed, have amounted to 4,874. Of these, 4,213 were pamphlets and parts of periodicals, 647 volumes, 13 maps and one photograph. This is an increase of 405 pieces over the growth of the previous year.

They have been received from the following sources:

| | |
|---|---|
| Societies, | 2,045 |
| I. V. Williamson Fund, | 1,216 |
| Editors, | 855 |
| Authors, | 179 |
| U.S. Department of Agriculture, | 128 |
| James Aitken Meigs Fund, | 69 |
| U. S. Department of the Interior, | 33 |
| Wilson Fund, | 32 |
| Pennsylvania State Library, | 29 |
| Department of Agriculture, Cape of Good Hope, | 28 |
| F. W. Lewis, M.D., | 23 |
| U. S. Department of State, | 19 |
| Henry C. Chapman, M.D., | 17 |
| Geological Survey of Missouri, | 14 |
| Trustees of the Indian Museum, | 11 |
| Comité Géologique Russe, | 10 |
| Sveriges Geologiska Undersökning, | 10 |
| Department of Mines, New South Wales, | 10 |
| Trustees of the British Museum, | 9 |
| United States Treasury Department, | 9 |
| Geological Survey of North Carolina, | 8 |
| Geological Survey of Georgia, | 8 |
| Commission Géologique de Finlande, | 8 |
| William J. Fox, | 7 |
| Ministry of Public Works, France, | 6 |
| U. S. Dept. of Labor, | 5 |
| Conchological Section of the Academy, | 5 |
| Angelo Heilprin, | 5 |
| Biuroului Geologicu, Roumania, | 4 |
| Geological Survey of India, | 4 |
| Department of Mines, Victoria, | 4 |
| Thomas Meehan, | 4 |
| Geological Survey of Michigan, | 4 |
| Geological and Natural History Survey of Canada, | 3 |
| Sydney J. Hickson, | 3 |
| Geological Commission, Portugal, | 3 |
| U. S. Fish Com. | 2 |
| Volta Bureau, Washington, D. C., | 2 |

| | |
|---|---|
| Bentham Trustees, Kew Gardens, | 2 |
| Secretary of State, Mexico, | 2 |
| Department of Marine and Fisheries, Canada, | 2 |
| Library of Congress, | 2 |
| Illinois State Bureau of Labor, | 2 |
| U. S. War Department, | 1 |
| U. S. Coast and Geodetic Survey, | 1 |
| U. S. Civil Service Commission, | 1 |
| Francis J. Duffy, | 1 |
| Charles E. Smith, | 1 |
| Maryland Geol. Survey, | 1 |
| W. W. Jefferis, | 1 |
| Government of New South Wales, | 1 |
| Geological Survey of Alabama, | 1 |
| C. H. Vinton, M.D., | 1 |
| Department of Mines, Nova Scotia, | 1 |
| Pittsburg Filtration Commission, | 1 |
| H. C. Wood, M.D., | 1 |
| Messrs. Little, Brown & Co., | 1 |
| Geological Commission of Mexico, | 1 |
| William Beer, | 1 |
| Mary S. Schively, | 1 |
| International Geological Congress, | 1 |
| Geological Surv. of Iowa, | 1 |
| Geological Survey of New Jersey, | 1 |
| Trustees of the Australian Museum, | 1 |
| Santa Ana Chamber of Commerce, | 1 |
| Cambridge Univ. Press, | 1 |
| Bernice Pauahi Bishop Museum, | 1 |
| New Zealand Government, | 1 |
| Miss E. Field, | 1 |
| Department of Geology, Indiana, | 1 |
| Clarence B. Moore, | 1 |
| Jacob Cox Parsons, | 1 |
| Geological Survey of West Virginia, | 1 |
| Geological Survey of Minnesota, | 1 |
| Henry A. Pilsbry, | 1 |
| L. Döderlein, | 1 |

They were distributed according to subjects to the several departments of the library, as follows:

| | |
|---|---|
| Journals, | 3 878 |
| Geology, | 210 |
| Botany, | 182 |
| Agriculture, | 109 |
| General Natural History, | 104 |
| Voyages and Travels, | 52 |
| Miscellaneous, | 44 |
| Conchology, | 40 |
| Entomology, | 38 |
| Mammalogy, | 34 |
| Anatomy and Physiology, | 33 |
| Ornithology, | 31 |

| | | | |
|---|---|---|---|
| Anthropology, | 26 | Mineralogy, | 8 |
| Medicine, | 23 | Ichthyology, | 8 |
| Physical Science, | 17 | Bibliography, | 7 |
| Helminthology, | 11 | Chemistry, | 6 |
| Geography, | 10 | Encyclopædias, | 3 |

Two hundred and forty-nine volumes have been bound, nearly all at the expense of the special funds. A much larger appropriation than is at present available for this work is a pressing necessity.

The additional shelving supplied by nine new cases on the entrosol floor has measurably relieved the crowding in the English and a part of the German sections of the library of periodicals and journals. The remaining portions still remain so crowded as to make the contents difficult of access. It is hoped that additional room may be secured during the coming year.

About five hundred volumes of industrial and miscellaneous reports, in no way related to the natural sciences, were, by direction of the Council, transferred to the Free Library, where they will be placed at the service of those interested in them, thus increasing their usefulness and making available the space occupied by them for the arrangement of works of more importance to the Academy.

Like ends were secured by the printing and distribution of a catalogue of the duplicate books which had been accumulating for years. The list embraces 1,154 titles of 1,061 volumes and 1,470 pamphlets. An intimation having been received from Washington after the issue of the catalogue that government publications could not be thus disposed of by societies to which they had been sent, all such volumes and pamphlets were withdrawn from sale so as to prevent misunderstanding, although some of those on the list were gifts from other sources than the departments of the government and some were paid for by exchange. The sales, while not very numerous, have much more than repaid the cost of printing and distributing the list.

With the coöperation of the Free Library of Philadelphia, a transcript of our card catalogue of periodicals has been made as a contribution to a proposed coöperative catalogue of journals in the libraries of the city. The Academy's contribution consists of upward of 2,500 titles, many of them not found in other collections. When issued the work will be a most important contribution to bibliography. It will not only inform the student of sources of information, but also prevent unnecessary and often expensive duplication, the possessions of one library being at the service of the patrons of the others, of course under the rules governing the several associations.

The October meeting of the Pennsylvania Library Club was held in the hall of the Academy. Your Librarian made a communication on the history and resources of the library, concluding with a short contribution to paleontological history, which, while not germane to the objects of the Club, seemed to interest those in attendance.

Dr. Sharp reports that the lantern slides of which he has charge now number 980. The collection embraces subjects in all departments of natural history and furnishes most desirable illustrations for the courses of lectures delivered under the auspices of the Academy.

It again gives me pleasure to acknowledge the efficiency of my assistant, Mr. William J. Fox.

EDWARD J. NOLAN,
*Librarian.*

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## REPORT OF THE CURATORS.

The general collections, with all the additions of the year in the care of the Curators, are in an excellent state of preservation.

A large amount of work has been accomplished since the last report in rearranging the specimens in the old building.

The dry invertebrates have been placed in new cases, so far as they could be arranged therein, though some of the geographic series have had to be temporarily stored in packing cases. The display series has been cleansed and entirely relabelled.

The remaining cases in the upper gallery have been removed from the damp walls, which have been whitened, thus securing additional light.

The many large specimens of minerals formerly displayed in the gallery have been placed in a case on the first floor where they have been labelled and arranged to much better advantage.

On the floor devoted to the mammals in the new building, a new mahogany and plate-glass case has been provided for the Carnivora, and another large one for Ungulates through the Mary Jeanes Fund, while another case of similar character has been presented by Dr. Francis W. Lewis for the reception of birds on the upper floor.

Four large storage cases have been provided for mammal skins, and placed on the fifth floor of the new building.

In the department of Archæology, Mr. Clarence B. Moore has presented one upright mahogany case with plate-glass sides and shelves, and one horizontal case for the accommodation of his rapidly increasing collection, and Dr. Dixon has provided a show-case for the display of certain human remains.

Besides these additions, considerable work has been done in improving the building, the entire vestibule on Race street having been repainted, and the lavatories all completely renovated, and modern fittings introduced.

Through the liberality of Mr. Clarence B. Moore, our museum has, for the first time in its history, been thrown open to the public on Sundays between the hours of one and five o'clock. This innovation has met with popular approval, the attendance of visitors being very large, and composed mainly of persons who would otherwise have been unable to view the collections.

The progress in adding to, rearranging, classifying, labelling and caring for the collections during the year has been satisfactory.

The Conservators of the several Sections have devoted much time to the care and classification of the specimens in their respective departments. Valuable work has been performed by Dr. H. A. Pilsbry in the Conchological ; by Messrs. Thomas Meehan and Stewardson Brown in the Botanical; by Dr. Henry Skinner, Dr. Philip P. Calvert and Mr. Charles Liebeck in the Entomological, and Messrs. Lewis Woolman and Theodore D. Rand in the Geological departments.

Rev. L. T. Chamberlain, special Curator of the Isaac Lea collection of Eocene Mollusca, has continued to add valuable material during the year, bringing the total number of entries up to 5,161. Dr. Chamberlain has now enlarged the scope of the collection to include the Oligocene. About one hundred and sixty species from the Vicksburg and Red Bluff horizons have been already incorporated, while much foreign Oligocene material, not yet labelled, is on hand. He proposes to send a collector to the principal exposures to procure new material. Mr. C. W.

Johnson has continued his work on the collection, completing the arrangement of the Eocene material.

Mr. Theodore D. Rand, special Curator, has spent much time in the arrangement and cataloguing of the William S. Vaux collection of minerals. These services are more specifically set forth in the reports of the several sections. Important service has also been rendered by Mr. Witmer Stone, assistant to the Curators, in all departments of the museum, especially in that of Ornithology. Assistance in the arrangement and care of the collections has also been received from the students of the Jessup Fund. Mr. H. W. Fowler has made a systematic study of many of the families of fishes in the collection, and identified a large number of unlabelled specimens. Mr. E. G. Vanatta has done excellent work on the mollusca and other invertebrates; Mr. S. H. Hamilton on the minerals and Mr. A. F. Satterthwait on the insects.

The additions to the collections during the year have been important.

The valuable Hoopes collection of North American Birds renders the Academy's material in this department equal to any in the world. A series of American birds presented by Dr. S. W. Woodhouse contains much of historic interest.

The collection of local fishes received from Mr. H. W. Fowler, comprising several thousands of specimens, is a valuable accession, containing in large series many forms previously but poorly represented in the museum.

The series of painted casts of American snakes presented by Mr. Clarence B. Moore is equal to any other such representation of Ophidia in this country.

The Zoölogical Society of Philadelphia has presented many valuable specimens, the mounting of which by the Academy's preparator illustrates strikingly the advance in taxidermic art, when compared with the objects formerly composing the cabinets.

Specimens have been loaned during the year to Lewis Woolman, F. L. Scribner, G. A. Boulenger, J. M. Coulter, G. S. Miller, H. M. Smith, W. H. Osgood, T. Wayland Vaughan, Robert Ridgway, H. C. Oberholser, J. Dwight, Jr., R. H. Howe and C. L. Lochman.

Henry C. Chapman,
*Chairman.*

## REPORT ON THE WILLIAM S. VAUX COLLECTIONS.

The Curator of the William S. Vaux Collections would respectfully report that a rough list of all the species in the collection, with the number of specimens in each, has been prepared, and that a fair copy of it is being transcribed in a book to be kept as a catalogue. In addition to this, a large number of labels have been corrected. The additions to the collection have numbered but twenty-seven, but some of them are very fine specimens, particularly two of barite, one of fluorite and one of rhodochosite, said to be the finest ever found.

A great deal more time than the present Curator can possibly give to it, ought to be spent upon this valuable collection to make it as nearly perfect as possible. He desires to acknowledge the valuable assistance of Mr. George Vaux, Jr., in the procuring of specimens, and in advice, and of Mr S. Harbert Hamilton in the cataloguing, etc. Respectfully submitted,

THEODORE D. RAND,
*Curator.*

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## REPORT OF THE BIOLOGICAL AND MICROSCOPICAL SECTION.

The Section has held ten meetings during the year with the usual average attendance.

A large Beck binocular microscope, with outfit of numerous objectives and accessories, was received by bequest, for the use of the Section, from the late Dr. Joseph J. Kirkbride.

Numerous communications were made during the year, and the following papers and communications were presented at the meetings of the Academy:

"Evolution of the Microscope," by Dr. J. Cheston Morris.

"Diatomaceous Deposits at the Mouth of Pensauken Creek," by Messrs. Lewis Woolman and C. S. Boyer.

"Nematode Worms," and "The Oyster Crab," by Dr. Benjamin Sharp.

"Sewage Poisons," by Mr. Holman.

"Parasites of the Oyster," by Mr. T. S. Parvin.

"On the Structure of Diatoms," by Mr. T. C. Palmer.

The communications of importance made to the Section were by Mr. F. J. Keeley, on the spectrum analysis of diatomine, on a Holothurian Parasite by Dr. J. C. Morris, and on observations of various material contributed by Mr. S. A. Schumo, Mr. John A. Shulze and Mr. Lewis Woolman.

The following officers were elected for the ensuing year:

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|---|---|
| *Director*, . . . . . | J. Cheston Morris, M.D. |
| *Vice-Director*, . . . . | T. Chalkley Palmer. |
| *Treasurer*, . . . . . | Lewis Woolman. |
| *Conservator*, . . . . . | F. J. Keeley. |
| *Corresponding Secretary*, . . | John G. Rothermel. |
| *Recorder*, . . . . . | C. S. Boyer. |

Charles S. Boyer,
*Recorder*.

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## REPORT OF THE CONCHOLOGICAL SECTION.

The main activity of the Conchological Section, as in former years, has been expended upon the continuation of the *Manual of Conchology*, which has now reached the thirteenth volume of the second series. The Conservator has been chiefly occupied during the year with the revision of the family *Bulimulidæ*, the work on American species being now completed, the specimens relabelled and returned to the museum.

Various changes have been made in the museum, the principal one being the removal of the land shells of the United States (excepting *Succinea* and *Pupa*) from the gallery to the study room on the library floor. This collection was formerly crowded into thirty-six drawers under the cases of fresh-water shells, and had long since outgrown the space available. It now occupies eighty-one drawers, leaving the space formerly used for the expansion of the fresh-water shells.

The accessions to the museum number about 4,000 trays and bottles, including many species new to science, as well as a larger number new to our collection. None of this material has been purchased, and but an inconsiderable part was obtained in exchange, nearly the whole having been sent by correspondents of the Section in America and abroad for identification, or with the understanding that it be worked up, or to further the work in progress in the *Manual of Conchology.* It will therefore be seen that much time must be devoted to this work, in order to keep the collection of the Academy abreast of others able to purchase freely. Among the more important accessions may be mentioned a large series of land and fresh-water shells collected by Mr. S. N. Rhoads in Florida and Mexico, a series of Samoan Opisthobranchs collected and given by Mr. C. N. E. Eliot, and a valuable lot of exotic slugs, given by the Rev. A. B Kendig, adding greatly to what is now by all odds the largest collection of slugs in America. The collection made by Mr. Rhoads, obtained in exchange for identification, contains the types of some twenty-five new species. That of Mr. Eliot the types and figured specimens.

Dr. J. C. Cox, Mr. H. Suter, Dr. H. von Ihering and others have continued their gifts of foreign mollusks, while the American series has profited by the sendings of about seventy-five persons, among whom Rev. E. H. Ashmun, Prof. T. D. A. Cockerell, Messrs. George H. Clapp and L. N. Frierson may be mentioned as contributing material of especial value.

The Conservator, in company with Dr. Montgomery and Prof. Conklin, made a collection of marine invertebrates in Biscayne Bay, Florida, and later made a vacation journey to the Great Smoky Mountains. A very large collection of the mountain mollusks was made, including some rare and new forms of excessively restricted range. Mr. J. H. Ferriss has contributed a valuable series from mountain localities south of those visited by myself.

The Conservator acknowledges valuable assistance received from Mr. C. W. Johnson, of the Museum Committee, and has also been aided throughout the year by Mr. E. G. Vanatta, whose efficient work deserves high commendation.

The officers elected to serve during the ensuing year are as follows:

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| *Director*, . . . . . | Benjamin Sharp, M.D. |
| *Vice-Director*, . . . . | John Ford. |
| *Recorder*, . . . . . | Edw. J. Nolan, M.D. |
| *Corresponding Secretary*, . . | Charles W. Johnson. |
| *Treasurer*, . . . . . | S. Raymond Roberts. |
| *Librarian*, . . . . . | Edw. J. Nolan, M.D. |
| *Conservator*, . . . . . | Henry A. Pilsbry. |

Respectfully submitted,

H. A. PILSBRY, *Conservator.*

## REPORT OF THE ENTOMOLOGICAL SECTION.

During the present year the regular meetings of the Section have been held and the average attendance was twelve persons. The verbal communications have been of interest and have had scientific value. The collections have been cared for and are in a good state of preservation. Many specimens have been acquired both by purchase and donation; the more important being the Griffith collection of exotic Coleoptera, numbering 10,000 specimens purchased from the heirs of the late Dr. H. G. Griffith; donations from H. A. Pilsbry, 212 specimens from Florida and Tennessee; E. G. Vanatta, 460 specimens from Maryland; Dr. A. D. Smith, J. E. and G. Farnum, 103 specimens from Manchuria; R. Weber, 93 specimens from Palestine; H. Skinner, 178 specimens from Utah; H. W. Wenzel, 150 specimens from Pennsylvania and New Jersey. The Academy has purchased two handsome mahogany cases for the plaster casts of butterflies presented by Mr. C. H. Hutchinson. The *Entomological News*, the journal of the Section, has been continued, and the volume for the year completed with 304 pages and six plates. One member has died, and three associates were elected.

The Section needs more room space, and a Conservator who can devote all his time to the exacting work required to care for the collections and incorporate the large amount of new material constantly being acquired. At the annual meeting held December 28, the following officers were elected for the year 1900:

*Director*, . . . . . . . . Philip Laurent.
*Vice-Director*, . . . . . . H. W. Wenzel.
*Treasurer*, . . . . . . . E. T. Cresson.
*Conservator and Recorder*, . . . . Henry Skinner, M.D.
*Secretary*, . . . . . . . . William J. Fox.

HENRY SKINNER,
*Recorder*.

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## REPORT OF THE BOTANICAL SECTION.

The slow but steady progress that has marked the history of the Botanical Section for several years still continues. The meetings have been held at the regular stated periods, distinguished botanists have been present, and communications of interest received and discussed. Field meetings in connection with allied societies in the city have been found of much value in bringing together those with a community of interest.

The proposition to raise $20,000 as a herbarium fund in memory of our lamented fellow-member, John H. Redfield, reached about one-fourth of the amount ; arrangements were being made to increase the fund, when it became desirable for the Academy to make a strenuous effort to raise money for another purpose. Not to divide the interest it was thought best to defer the Section's effort. It is, however, pleasant to record that from this fund the collections of C. C. Pringle for the past three years have been secured. Contributions of specimens have been made by Stewardson Brown, C. F. Saunders, William M. Canby and Anna C. Hartshorne.

The genera formerly composing the North American herbarium have been brought into proximity with the same genera in the general herbarium. The plants are still kept in their separate genera covers, but the present arrangement favors comparison. This work has been accomplished by the Conservator, aided by Mr. Uselma C. Smith. The North American herbarium has been enriched by the fine herbarium of the late Mr. William Wynne Wister, a gift from his family. The specimens are in an admirable state of preservation.

The work of mounting and verifying the specimens in the general herbarium, assumed by the Director since the death of Mr. Redfield, has reached only a few orders beyond those recorded last year, the Director having given the season chiefly to labelling, mounting and distributing the collections long on hand. Schlechter's South African plants, Sharp's Arctic plants, and the magnificent collections by Bang in Bolivia, have thus become an integral portion of the herbarium.

In the early part of the summer Prof. Gandoger offered to exchange a copy of his unique work, the *Flora of Europe*, in twenty-seven volumes, for its value in North American plants. The Section has never had the time to arrange for such exchanges. In this instance Mr. U. C. Smith generously undertook to collect from botanical friends nearly 1,200 species of plants required.

They were properly labelled and shipped, and the volumes received in exchange have been transferred by the Botanical Section to the library of the Academy.

At the annual meeting in December the following officers were elected to serve for the ensuing year:

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| *Director*, . . . . . . | Thomas Meehan. |
| *Vice-Director*, . . . . . | Charles E. Smith. |
| *Conservator and Treasurer*, . . | Stewardson Brown. |
| *Corresponding Secretary*, . . | Joseph D. Crawford. |
| *Recorder*, . . . . . . | Charles Schäffer, M.D. |

Respectfully submitted,

THOMAS MEEHAN,
*Director.*

*Report of Conservator.*—In making his report for the year, the Conservator of the Botanical Section is pleased to be able to state, that the work in the herbarium has been carried on in the usual satisfactory manner, though the amount accomplished has been necessarily limited.

The rearrangement of the herbarium, referred to in last year's report as in progress, was completed in the early part of the present year, bringing all the flowering plants, with the exception of some special collections, together in the two rooms on the library floor. This arrangement will be found of great convenience to those making use of the herbarium for comparative study.

The work of mounting the general herbarium has been continued during the year, the specimens being prepared and names verified as usual by Mr. Meehan. The additions received have been the herbarium of the late William Wynne Wister, presented to the Academy in the early part of the year by his family, and comprising several thousand plants, mostly North American. The specimens are all in an excellent state of preservation and will make an interesting addition on account of containing specimens from many localities in or around the city, which have now been destroyed.

Six hundred specimens of Mexican plants have also been added through purchase from the interest of the Redfield Fund, together with about three hundred specimens of Pennsylvania plants from Pike and Somerset counties, presented by Messrs. C. F. Saunders and Stewardson Brown, a number of North American plants from Mr. William M. Canby, and one hundred and fifty California plants from Miss Anna C. Hartshorne.

Were more time at the Conservator's disposal it would be an easy matter to materially increase the herbarium as well as library through the medium of exchanges as is done in other institutions, and it is to be hoped that some arrangement may be effected in the near future that will make this possible.

The Conservator wishes to express his thanks to the members of the Section in general and to Messrs. Thomas Meehan and Uselma C. Smith in particular for the valuable assistance rendered during the year.

Respectfully submitted,

STEWARDSON BROWN,

*Conservator.*

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## REPORT OF THE MINERALOGICAL AND GEOLOGICAL SECTION.

The Director of the Mineralogical and Geological Section would respectfully report that nine meetings of the Section have been held during the year, with a marked increase of interest and of value in the communications.

The Section is especially indebted to Dr. Florence Bascom, of Bryn Mawr College, who gave a lecture on the minerals of rock sections, illustrated by excellent slides shown by electric light, through the courtesy of the Franklin Institute, at its hall, the polariscope being furnished without charge by Messrs. Queen & Co.

Two interesting and largely attended excursions were made, one to Doylestown, Buckingham Mountain, and New Hope, the other to Bridgeport, Henderson Station and Port Kennedy.

Additions to the museum have been less than usual. It is worthy of consideration whether this may not be due to the fact that a large part of the collection formerly displayed is now where it cannot readily be seen. It is hoped that when means can be secured for the better display a greater interest may be developed.

The following officers were elected for the ensuing year:

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|---|---|
| *Director*, . . . . . . | Theodore D. Rand. |
| *Vice-Director*, . . . . . | William W. Jefferis. |
| *Conservator*, . . . . . . | F. J. Keeley. |
| *Corresponding Secretary and Recorder*, | Charles Schäffer, M.D. |
| *Treasurer*, . . . . . . | Emma Walter. |

Respectfully submitted,

THEODORE D. RAND,
*Director*.

## REPORT OF THE ORNITHOLOGICAL SECTION.

The ornithological collections of the Academy remain in practically the same condition as last year, lack of cases still preventing the removal of the main exhibition series to the new building, where it is eventually to be displayed. This collection has, however, been carefully examined during the year and the specimens in each family systematically arranged, which adds materially to the ease of consulting them.

The Delaware Valley Club collection has been largely increased and entirely relabelled, full information being given regarding each specimen, and a card added, on which the distribution and abundance of each species in Pennsylvania and New Jersey are described. The Club has met regularly during the year at the Academy, and on November 13–16, 1899, the American Ornithologists' Union held its annual congress in the building. This is the first time that a congress has been held in Philadelphia, and it is gratifying to know that the attendance of members and the number of papers presented was greater than on any previous occasion.

The most important accession during the year has been the Josiah Hoopes Collection of North American land birds, which was already on deposit, and which has now been purchased by friends of the Academy.

This collection of some 8,000 specimens renders the Academy's series of North American land birds nearly complete, and adds a large number of species heretofore lacking.

The Fowler collection of Pennsylvania and New Jersey birds has been added to the Stone collection already deposited, and being rich in water birds the two form a very complete local study series.

Dr. S. W. Woodhouse also presented a valuable collection formed by him many years ago, which contains much of historic interest.

The main collection of skins has been carefully examined during the year, and found to be in an excellent state of preservation. Better accommodations are, however, badly needed for a number of families of Old World birds which are temporarily stored in packing cases, but which should be arranged in air tight tin cases to ensure their safety.

The Conservator wishes to acknowledge much assistance from Mr. H. W. Fowler, student of the Jessup Fund, and to Mr. J. A. G. Rehn, who has throughout the year voluntarily given his assistance in the care and arrangement of the ornithological collections.

The collections have been very extensively consulted during the year, and many specimens have been loaned to ornithologists in other institutions.

At the annual meeting of the Section, held December 18, 1899, the following officers were elected:

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| *Director,* . . . . . | Spencer Trotter, M.D. |
| *Vice-Director,* . . . . . | George Spencer Morris. |
| *Secretary,* . . . . . | William A. Shryock. |
| *Recorder,* . . . . . | Stewardson Brown. |
| *Conservator and Treasurer,* . . | Witmer Stone. |

Respectfully submitted,

WITMER STONE,

*Conservator.*

The election of Officers, Councillors and Members of the Committee on Accounts to serve during 1900 was held with the following result:

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|---|---|
| *President,* . . . . | Samuel G. Dixon, M.D. |
| *Vice-Presidents,* . . . | Thomas Meehan, |
| | Rev. Henry C. McCook, D.D. |
| *Recording Secretary,* . . | Edward J. Nolan, M.D. |
| *Corresponding Secretary,* . | Benjamin Sharp, M.D. |
| *Treasurer,* . . . . | George Vaux, Jr. |
| *Librarian,* . . . . | Edward J. Nolan, M.D. |
| *Curators,* . . . . | Henry A. Pilsbry, |
| | Henry C. Chapman, M.D., |
| | Arthur Erwin Brown, |
| | Samuel G. Dixon, M.D. |
| *Councillors to serve three years,* | Thomas A. Robinson, |
| | Charles H. Cramp, |
| | Charles Morris, |
| | Isaac J. Wistar. |
| *Committee on Accounts,* . . | Uselma C. Smith, |
| | Charles Morris, |
| | William L. Baily, |
| | Harold Wingate, |
| | Lewis Woolman. |

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## COUNCIL FOR 1900.

*Ex-officio.*—Samuel G. Dixon, M.D., Thomas Meehan, Rev. Henry C. McCook, D.D., Edward J. Nolan, M.D., Benjamin Sharp, M.D., George Vaux, Jr., Henry A. Pilsbry, Henry C. Chapman, M.D , Arthur Erwin Brown.

*To serve Three Years.*—Thomas A. Robinson, Charles H. Cramp, Charles Morris, Isaac J. Wistar.

*To serve Two Years.*—Charles E. Smith, Uselma C. Smith, John Cadwalader, William Sellers.

*To serve One Year.*—Charles Schaeffer, M.D., Dr. C. Newlin Pierce, Theodore D. Rand and Philip P. Calvert, Ph.D.

## ELECTIONS DURING 1899.

### MEMBERS.

*January 31.*—Rev. A. B. Kendig, D.D.
*February 28.*—Mrs. Hannah Streeter.
*April 25.*—James Wallace, M.D.
*May 30.*—William T. Shoemaker, M.D.
*June 27.*—Isaac H. Clothier.
*July 25.*—R. A. F. Penrose, Jr., Benjamin West Frazier.
*Sept. 26.*—Charles B. Penrose, M.D., Carl V. Vischer, M.D.
*October 31.*—Mrs. Ellen M. Dallas, Francis Ralston Welsh.

### CORRESPONDENTS.

*October 31.*—Raphael Blanchard, of Paris; Carl Chun, of Königsberg; Carl Gegenbaur, of Heidelberg; Richard Lydekker, of London; K. Mitsukuri, of Tokyo; Gustav Retzius, of Stockholm; Wilhelm Roux, of Halle; G. O. Sars, of Stockholm; Otto Zacharias, of Plön; Oldfield Thomas, of London.

*November 28.*—Dr. N. L. Britton, of New York; Lucien Marcus Underwood, of New York.

# ADDITIONS TO MUSEUM.

## MAMMALIA.

O. and H. BEHR. Four specimens of Varying Hare, *Lepus americanus virginianus*, Sullivan county, Pa.

DR. H. C. CHAPMAN. Skull of Indian Elephant.

J. L. COX. Skin and skull of Newfoundland Lynx, *Lynx subsolanus.*

J. G. DILLEN. Skins of *Mephitis* (Texas), *Spilogale* (Iowa) and European Ferret.

DR. SAMUEL G. DIXON. Two skins of *Microtus pennsylvanicus* Islesboro, Me.

H. W. FOWLER. Twenty-two skins of Mammals from Philadelphia. Three skins of Flying Squirrels from Bacon Hill, Maryland.

P. LAURENT and DR. H. SKINNER. Two skins of *Tamias*, Utah.

J. GIBSON MCILVAIN. Rough skeleton of Horse.

H. A. PILSBRY. Skin of Southern Red Squirrel, *Sciurus hudsonius loquax*, mountains of Tennessee.

PURCHASED. Skull of Black Bear, *Ursus americanus.*

MAXWELL SOMERVILLE. Skulls of Otter and Arctic Fox, Spitzbergen; flat skins with skulls of Jerboa and Elephant Shrew, Sahara Desert.

MISS MARY M. VAUX. Yellow-haired Porcupine, *Erethizon epixanthum*, Glacier House, British Columbia.

ZOÖLOGICAL SOCIETY OF PHILADELPHIA. The following mammals, which have been prepared as indicated: Mounted: Lion, *Felis leo;* Bengal Cat, male, *Felis bengalensis;* Indian Fruit Bat, *Pteropus indicus;* Mongoose Lemur, *Lemur mongoz;* Hoffman's Sloth, *Chœlepus hoffmanni;* Six-banded Armadillo, *Dasypus sexcinctus.* To be mounted: Buffalo, female and young, *Bison bison;* Red Kangaroo, *Macropus rufus*, male and female; young Rhinoceros, *Rhinoceros unicornis;* young Elk, *Cervus americanus;* Black Macaque, *Macacus maurus.* Skin and skulls: *Ateles geoffroyi,* *Dasyprocta cristata, Tragulus javanicus, Castor canadensis, Lemur mongoz, Nyctipithecus trivirgatus, Canis mesomelas, Neotoma cinerea, Lepus nuttalli, Peromyscus eremicus, Cervulus muntjac,* ♀. Skin and skeleton: Ocelot, *Felis pardalis;* Chevrotain, *Tragulus javanicus.* Disarticulated skeletons: Axis Deer, *Cervus axis;* Sing-sing Antelope, *Cobus defassus;* Muntjak, male, *Cervulus muntjac.* Rough skeletons: Great Kangaroo, *Macropus giganteus;* Puma, female, *Felis concolor;* Oryx, *Oryx gazella;* Tapir, female, *Tapirus terrestris;* Bassaris, *Bassariscus astuta.* In alcohol: Gibbon, *Hylobates pileatus?;* Loris, *Loris gracilis;* Sacred Monkey, *Semnopithecus obscurus;* Indian Fruit Bat, *Pteropus indicus.* Skull of young Zebra, *Equus burchelli.*

## Birds.

J. L. Buck. Mute Swan, prepared as skull and sternum.

J. L. Cox. Skin of Loon, *Gavia imber*, Newfoundland.

Dr. Samuel G. Dixon. Skins of *Melanerpes erythrocephalus* and *M. carolinus*, North Carolina. Nine skins and sterna of Ducks purchased in Philadelphia market. 130 skins of birds from Bogota, collected by J. W. Detwiller.

Delaware Valley Ornithological Club. Five nests, two sets of eggs, and nine mounted birds; also through W. Weinert, specimen of *Anas discors;* through A. E. Brown, *Colymbus holboelli;* through Mrs. R. Ellis, nest of Robin; through W. M. Swayne, *Tringytes subruficollis.*

H. W. Fowler. Sixty-four skins of American birds.

H. L. Hoff. African Parrot.

L. Langstroth. Eight Snow Buntings and two Pine Grosbeaks, prepared as skins.

B. L. Johnson. Albino Barn Swallow, mounted.

D. N. McCadden. Sternum of Brunnich's Murre, Atlantic City, N. J.

J. Percy Moore. Nest of Mountain Solitary Vireo, N. Carolina.

S. N. Rhoads. Skin of Bald Eagle, Haddonfield, N. J.

Maxwell Somerville. Skull of Gull, Spitzbergen.

S. L. Schumo. Two birds' nests, Guatemala.

Dr. Paul Sartain. Skin of *Paradisœa apoda.*

ZOÖLOGICAL SOCIETY OF PHILADELPHIA. Skins: *Spinus cucullatus*, *Trichoglossus forsterii*, *Chrysotis leucocephala*, *Platycercus elegans*, *Caia leucogastra*, *Caccabis saxatilis chukar*. Skull and sternum: Boatbill, *Canchroma cochlearia;* Common Mynah, *Sturnia* sp.; Cinereous Eagle, *Haliætus albicilla;* Small Paroquet, *Pococephalus robustus*, *Lorius* sp. and *Chrysotis* sp. Rough Skeleton: Bearded Vulture, Flamingo, ♀ Emu, ♀ Cassowary, ♂ Ostrich, Cereopsis Goose, Turkey Vulture.

MISS J. C. WYLIE. Mounted specimen, *Lophophorus refulgens.*

DR. S. W. WOODHOUSE. Collection of about 350 North American birds.

C. S. WELLES. Red-shouldered Hawk, *Buteo lineatus* (skin).

## REPTILES.

P. LAURENT and DR. H. SKINNER. Two jars of Snakes and two Lizards, Utah.

DR. FRANCIS W. LEWIS. Cast of Python.

CLARENCE B. MOORE. Seven casts of American Snakes: *Crotalus adamanteus*, *Ancistrodon contortrix*, *A. piscivorus*, *Elaps fulvus*, *Zamenis flagelliformis*, *Z. constrictor*, *Coluber corais couperi.*

R. P. MORTON. Seven specimens of American Turtles, dry preparations.

ZOÖLOGICAL SOCIETY OF PHILADELPHIA. *Alligator mississippiensis* (prepared as skeleton), *Ctenosaura acanthura* (alcoholic), *Pelophilus madagascariensis* (alcoholic).

## FISHES.

H. W. FOWLER. A collection of 1,400 fresh-water fishes, mainly from the vicinity of Philadelphia.

F. B. KIRKBRIDE. Mounted specimen of Tarpon from Florida.

## RECENT MOLLUSCA.

C. C. ALLEN. Sixty-five trays of marine shells from Florida.

C. F. ANCEY. Thirteen trays of land shells from Algeria.

MRS. GEORGE ANDREWS. Ten trays of Tennessee land shells.

F. H. ANDRUS. Nineteen trays of fresh-water shells from Oregon.

REV. E. H. ASHMUN. Eight trays and three bottles of land shells from New Mexico.

W. D. AVERILL. *Goniobasis* from Georgia.

F. C. BAKER. *Zonites* from Chicago, Ill.

C. M. BARBER. *Polygyra* from New Mexico.

DR. CHARLES BAUM. *Polygyra albolabris* from New York.

H. H. BEADLE *Patella ferruginea* Lam.

S. HENRY BLAKE. Two trays of shells.

F. E. BLANES. Three trays of shells from Florida.

BOTANICAL SECTION. Two trays of land shells from Martinique.

J. H. BRITTS. Four trays *Polygyra* from Missouri.

STEWARDSON BROWN. Thirty trays of land and fresh-water shells from Somerset county, Pa.

F. L. BUTTON. Six trays of California land shells.

MR. F. F. CAVADA. *Liguus fasciatus*, Cuba.

CONCHOLOGICAL SECTION. Ten trays of shells.

GEORGE H. CLAPP. Four bottles and eleven trays of South American and Tennessee shells.

T. D. A. COCKERELL. Thirty trays of shells from New Mexico.

CHARLES COOPER. *Placostylus* from New Zealand.

E. D. COPE COLLECTION. Fifty-four trays and ten bottles of fresh-water shells.

DR. J. C. COX. Nine trays of Australian shells.

O. A. CRANDALL. *Glandina singleyana* from Texas.

W. H. DECAMP. *Anodonta* from Wisconsin.

DR. SAMUEL G. DIXON. Eight trays of shells from Islesboro, Me.

S. M. EDWARDS. Six trays of land and fresh-water shells from Colorado and Minnesota.

C ELIOT. Twenty-one trays and forty bottles of mollusks from Samoa.

JAMES H. FERRISS. Twenty-eight trays of land shells from Tennessee.

JOHN FORD. Ten trays of shells.

H. W. FOWLER. Three trays of fresh-water shells from New York.

WILLIAM J. FOX *Mitra episcopalis* L.

L. S. FRIERSON. Thirty-one trays and four bottles of shells from Louisiana.

M. R. Gaines. One hundred and ten species of Japanese shells.

A. H. Gardner. *Polygyra* from Brooklyn, N. Y.

Mrs. E. M. Gaylord. *Actæon punctocælatus* Cpr., S. Pedro, Cal.

William J. McGinty. *Marginella varia* Sby., California.

William Greenhalgh. *Limax maximus* from Philadelphia, Pa.

Wilfred Harned. Thirty-two trays of European land shells.

J. B. Hatcher. Two trays of shells from Chile.

H. Heath. Two trays of shells from California.

Charles Hedley. *Sclerochiton* from New Caledonia.

Angelo Heilprin. Four trays of fresh-water shells from Oneida Lake, N. Y.

Benton Holcomb. One tray of *Vitrea* from Connecticut.

Charles Hodgson. Four trays of land shells from Illinois.

C. W. Johnson. Three trays and one bottle of *Philomycus* from New Jersey.

Howard Jones. Five trays of New Jersey marine shells.

F. W. Kelsey. One tray of shells from California.

Rev. A. B. Kendig. Twenty-one species of foreign slugs.

E. J. Letson. Seven trays New York shells.

F. L. Lewton. *Succinea effusa* Shuttl., Orange county, Fla.

C. W. Lichtenthaler. *Pecten* from Lower California.

R. C. McGregor. Fourteen trays and five bottles of shells from California.

Hon. J. D. Mitchell. Twenty-eight trays and three bottles of shells from Texas.

T. H. Montgomery. *Polygyra septemvolva* from Florida.

Clarence B. Moore. Four species from Alabama.

Thomas Morgan. *Anodonta* from New Jersey.

J. H. Mortimer. Three trays of shells from North Atlantic.

Olof O. Nylander. Thirty-three species of land and fresh-water shells from Maine.

Dr. A. Ortmann. *Goniobasis* from Princeton, N. J.

Mrs. Mary P. Olney. Four trays of American land and fresh-water shells.

Joseph N. Pearce. Three trays shells.

H. A. PILSBRY. Two hundred and eighteen trays and thirty bottles of mollusks from Florida.

GEORGE PINE. Thirteen trays of land and fresh-water shells from Florida.

E. H. PITMAN. One tray of shells.

MISS WILMATTE PORTER. *Ashmunella thompsoniana porteræ* P. and C., New Mexico.

E. J. POST. Nineteen trays of shells from Florida and Honduras.

E. J. POST and E. L. DANIELS. Sixteen trays of marine shells from Tampa, Fla.

MISS SADIE F. PRICE. Seven trays of shells from Kentucky.

P. B. RANDOLPH. Two trays *Limnæa* from Washington.

W. J. RAYMOND. Twenty-four trays marine shells from California.

REV. G. D. REID. *Anodonta fluviatilis* Dillw., from Connecticut.

S. N. RHOADS. Three hundred and six trays and eight bottles of Mexican, Cuban and Floridan shells.

J. RITCHIE, JR. Five trays shells.

E. W. ROPER. Nine trays of marine shells from Vera Cruz.

DR. W. H. RUSH. Five trays of marine shells from Cape Verde Islands.

F. A. SAMPSON. Three trays *Polygyra*.

H. E. SARGENT. Five trays of *Goniobasis* from Georgia.

M. SCHICK. Eleven trays of Philadelphia shells.

MRS. S. L. SCHUMO. *Pedicularia* from California.

SILAS L. SCHUMO. One hundred and forty-eight species of Central American shells.

DR. B. SHARP. Sixty-four trays and fourteen bottles of shells from Oahu and Alaska.

HOWARD SHRIVER. Nine trays of American land and fresh-water shells.

USELMA C. SMITH. Two trays and three bottles of mollusks from New Jersey.

WILLIAM JONES SMITH. *Ampullaria* from Florida.

MAXWELL SOMERVILLE. Four trays of shells from Spitzbergen.

DR. V. STERKI. Ten trays of fresh-water shells from Michigan.

WITMER STONE. Two trays and two bottles of land shells from Pennsylvania.

L. H. STRENG. Six trays of American land shells.

H. SUTER. Six trays and three bottles of marine shells from New Zealand.

E. R. SYKES. Six trays of marine shells.

GEORGE W. TAYLOR. Seven trays of shells from Vancouver Island.

W. S. TEATOR. Four trays fresh-water shells from New Jersey.

DR. W. G. TORR. Eleven trays of marine shells from South Australia.

E. G. VANATTA. Nine trays of marine shells from New Jersey.

T. VAN HYNING. Nineteen trays of shells.

J. W. VELIE. Seven trays of American shells.

H. S. VIERECK. Five trays and four bottles of German land shells.

BRYANT WALKER. Twenty-six trays of American fresh-water shells.

MISS E. WALTER. One tray of shells.

WARD NAT. SCI. ESTAB. *Polygyra appressa sculptior* Chadw., from Virginia. Types.

A. G. WETHERBY. Fourteen trays of land shells.

WALTER F. WEBB. Ten trays of marine shells.

C. S. WELLES. One tray of shells.

F. A. WHITE. Seven trays of marine shells from Florida.

J. J. WHITE. *Mactra* from Lake Worth, Fla.

JOSEPH WILLCOX. Fourteen trays of marine shells from Florida.

REV. H. W. WINKLEY. Twenty-one trays of marine shells from Maine.

WILLIARD M. WOOD. Two trays of marine and land shells from California.

LEWIS WOOLMAN. Five trays of marine shells from Nantucket.

B. H. WRIGHT. One tray of shells.

PURCHASED. Eighty-one trays of shells from S. N. Rhoads.

## INSECTS.

MRS. JOSEPH R. ENGLISH. A collection of Lepidoptera.

GEORGE and J. EDW. FARNUM. One hundred and twenty-five specimens of Coleoptera from Manchuria.

Maj. C. A. H. McCauley. Centipede, scorpion and insect (in alcohol).

H. A. Pilsbry. Two hundred specimens of Coleoptera from Florida and Tennessee.

E. G. Vanatta. Four hundred and sixty specimens of Coleoptera, etc., from Maryland.

R. Weber. Ninety-three specimens of Lepidoptera from Palestine.

## Invertebrate Fossils.

H. C. Borden. Fossils from Lenola, N. J.

Rev. L. T. Chamberlain. Numerous accessions to the Isaac Lea Collection of Eocene Mollusca.

Dr. Samuel G. Dixon. Seven trays of fossils from Islesboro, Me.

S. H. Hamilton. Four trays of fossils from Salem, New Jersey.

Wilfred Harned. Eight species from Italy.

Angelo Heilprin. One tray of fossils from New York; thirty-five from Nantucket.

C. W. Johnson. Nine trays of fossils from Caloosahatchie River, Fla.

S. G. Morton. Eleven trays of fossils from New Jersey.

J. A. Murphy. *Loxonema* from Eureka Spring, Ark.

Burt Ogden. Fossil Coral, Iowa.

Dr. Charles Schäffer. One tray of fossils from New Jersey.

Silas L. Schumo. Nine trays of fossils from Jamaica.

Mrs Samuel Shreeve. Thirty-seven trays of fossils from Mt. Laurel, N. J.

Maxwell Sommerville. Two trays of fossils from Spitzbergen.

Joseph Willcox. Thirteen trays of fossils from Santiago de Cuba and North Carolina.

Lewis Woolman. One tray of fossils from Lenola, N. J., and specimen of *Cycad*, Phœnixville, Pa.

## Invertebrates.

J. L. Buck. One bottle of invertebrates.

Dr. H. C. Chapman. Seventy-nine vials of *Entozoa*, collected by Dr. Joseph Leidy.

Dr. Samuel G. Dixon. One jar marine invertebrates, Islesboro, Me.

H. W. Fowler. One bottle of invertebrates.

Langdon Gibson. One tray of invertebrates.

R. C. McGregor. One *Spongilla*(?) from California.

Olof O. Nylander. Two trays of invertebrates.

J. A. G. Rehn. Several Star-fishes, Atlantic City, N. J.

Silas L. Schumo. One bottle of invertebrates from Guatemala.

Dr. B. Sharp. Eight bottles of invertebrates from Naples.

Uselma C. Smith. Four bottles of invertebrates from New Jersey.

Lewis Woolman. Three trays of invertebrates from New Jersey.

## Vertebrate Fossils.

E. W. Claypole. Several specimens of Fossil Fishes.

George M. Thomas. Tooth of Mammoth.

L. Woolman. Bone of *Hadrosaurus* (deposited).

## Crustacea.

T. D. A. Cockerell. *Cypris* from New Mexico.

J. Percy Moore. One bottle of *Cambarus*.

Dr. B. Sharp. Twelve bottles of crustaceans from Oahu and Nantucket.

J. M. Sharp. One tray of crustaceans from Ocean City, N. J.

Maxwell Sommerville. One tray of crustaceans from Spitzbergen.

Witmer Stone and H. W. Fowler. Twenty-five bottles of crawfish, etc., from New Jersey and Pennsylvania.

## Minerals.

Dr. J. W. Donges. Agate.

Capt. F. J. Geissinger. Rock with Manganese deposit.

DR. JAMES V. INGHAM. Itacolumite, Ægerite, Siderite, Kryolite pseudo after Siderite, Quartz, Eudialyte.

DR. LEHMAN. Platnerite, Cerusite, Pyromorphite, from Mullan, Idaho.

V. L. LOGO. Natrolite and Stilbite, Morris Station, N. J.

CLARENCE B. MOORE. Water-worn concretions, Alabama.

THEODORE D. RAND. Seyenite and Calcite, Picrolite, Serpentine pseudo after Olivine, Serpentine (Saxony), Greenockite, Graphite from Pikeland, Chester county, Pa.

DR. H. SKINNER. Magnetite, Utah.

WALTER S. SHEAFER. Conglomerate, Pottsville, Pa.

AXEL SAHLEN. Hematite, Hod Barrow Mine, England.

STUDENTS' MINERALOGICAL CLUB. Quartz, Hitner's Pit, Montgomery county, Pa. Amethyst and Granite, Concord, N. H.

MISS J. C. WYLIE. Fluorite.

CALEB WAKEFIELD. Geode, New Jersey.

LEWIS WOOLMAN. Mellanterite, New Jersey.

EXCHANGE. Lepidolite, Maine; two meteorites, Kansas.

W. S. VAUX COLLECTION. Twenty-seven specimens (purchased).

ARCHÆOLOGICAL SPECIMENS, ETC.

W. J. GERHARD. Bow and Arrows, Bolivia.

J. S. METSGER. Indian Axe and Arrowhead.

DR. W. W. KEEN. Eskimo Skull.

CLARENCE B. MOORE. Numerous accessions to the Moore Collection from Florida, Georgia, Alabama, etc.

A. SHARPLESS. Indian Bread, *Pachyma cocas*, South Carolina.

MISCELLANEOUS.

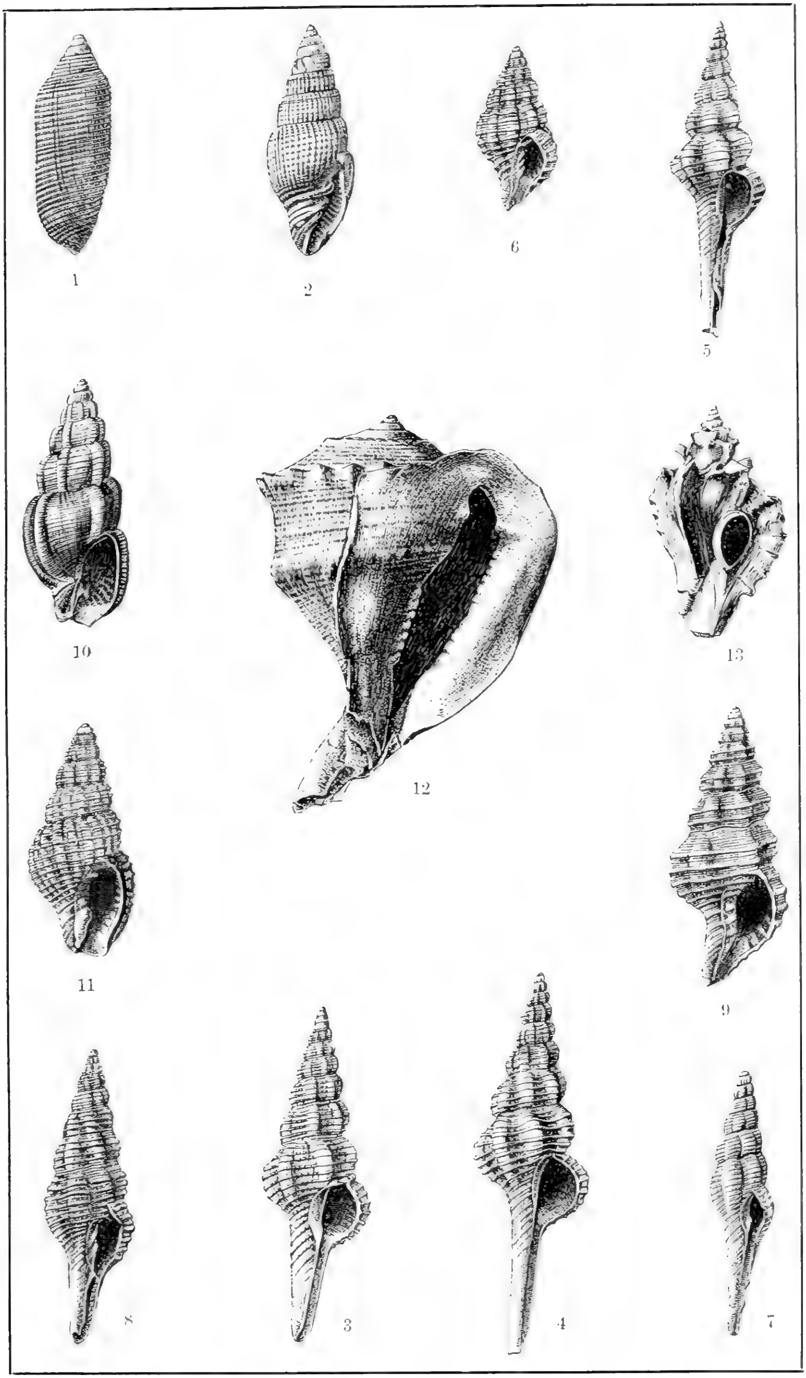
F. B. KIRKBRIDE. Microscope and accessories formerly property of Dr. Kirkbride.

# INDEX TO GENERA, ETC.,

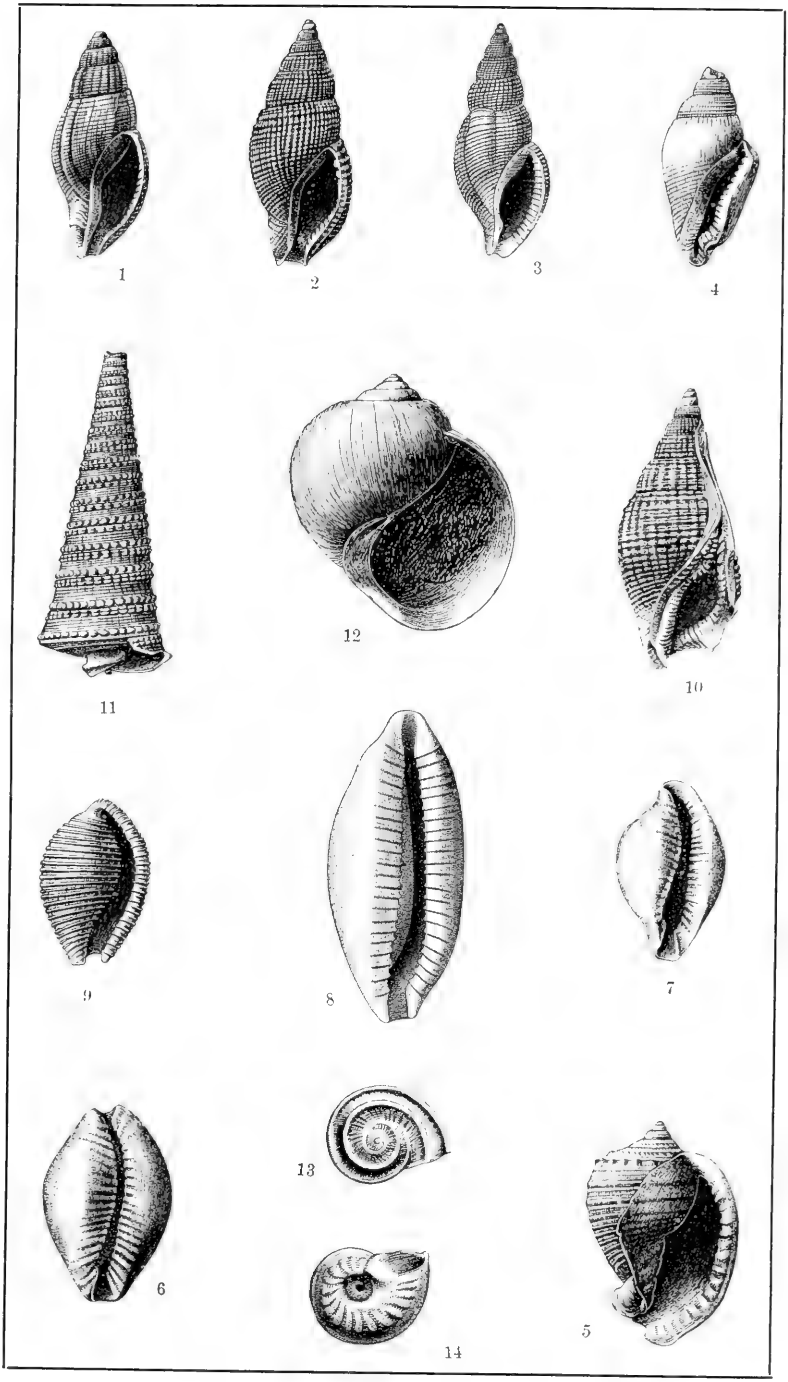
# 1899.

# GENERAL INDEX.

## 1899.




JOHNSON ON EOCENE MOLLUSKS.




JOHNSON ON EOCENE MOLLUSKS.

G. & W. S. VAUX, JR. ON GLACIERS OF BRITISH COLUMBIA.

ILLECELLEWAET GLACIER, 1887.

(ROCK "E" PLATES IV AND V IS SHOWN NEAR CENTRE OF PICTURE EMBEDDED IN ICE.)

G. & W. S. VAUX, JR. ON GLACIERS OF BRITISH COLUMBIA.

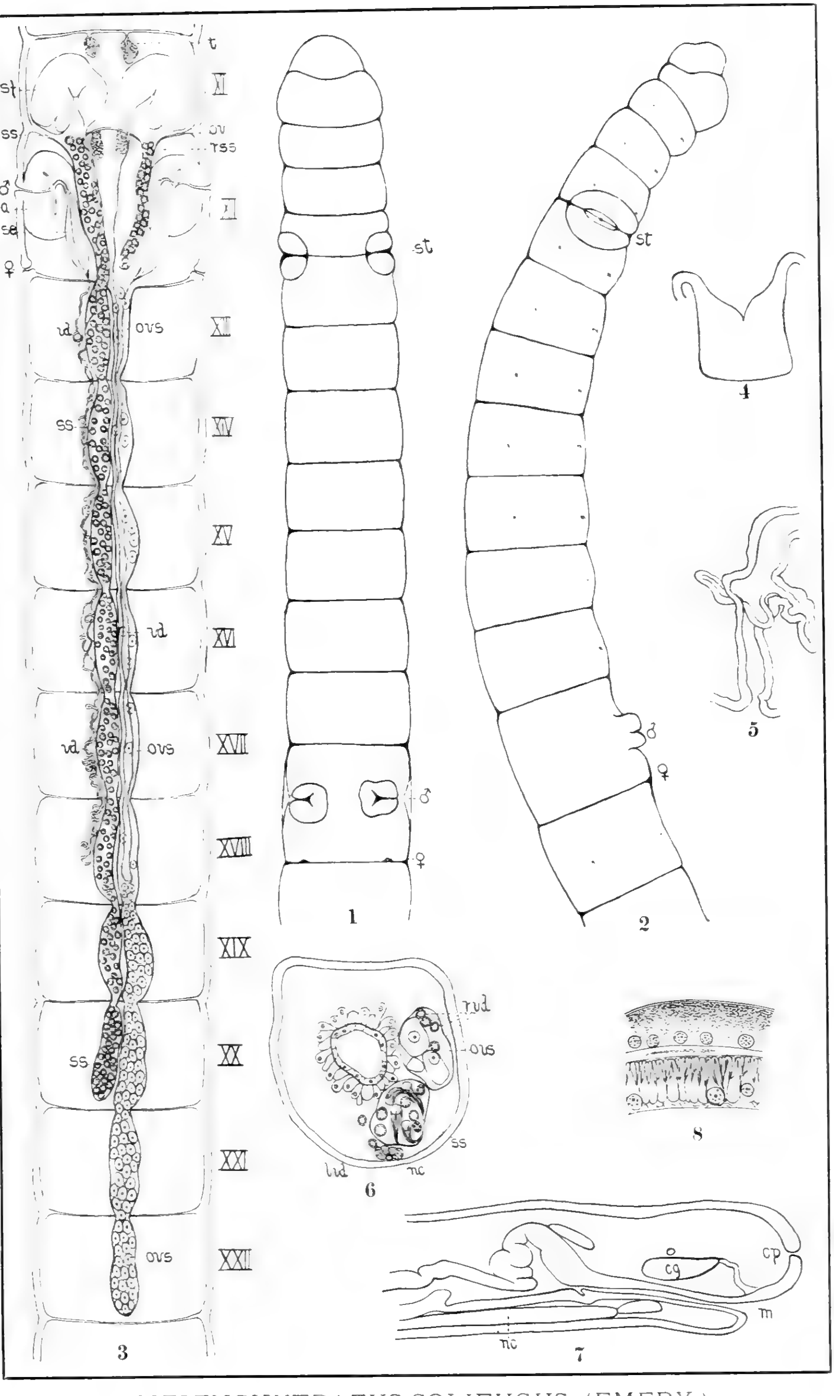
ROCK "E" PARTLY COVERED BY ICE IN 1887

(VERTICAL LINE SHOWS EDGE OF ICE.)

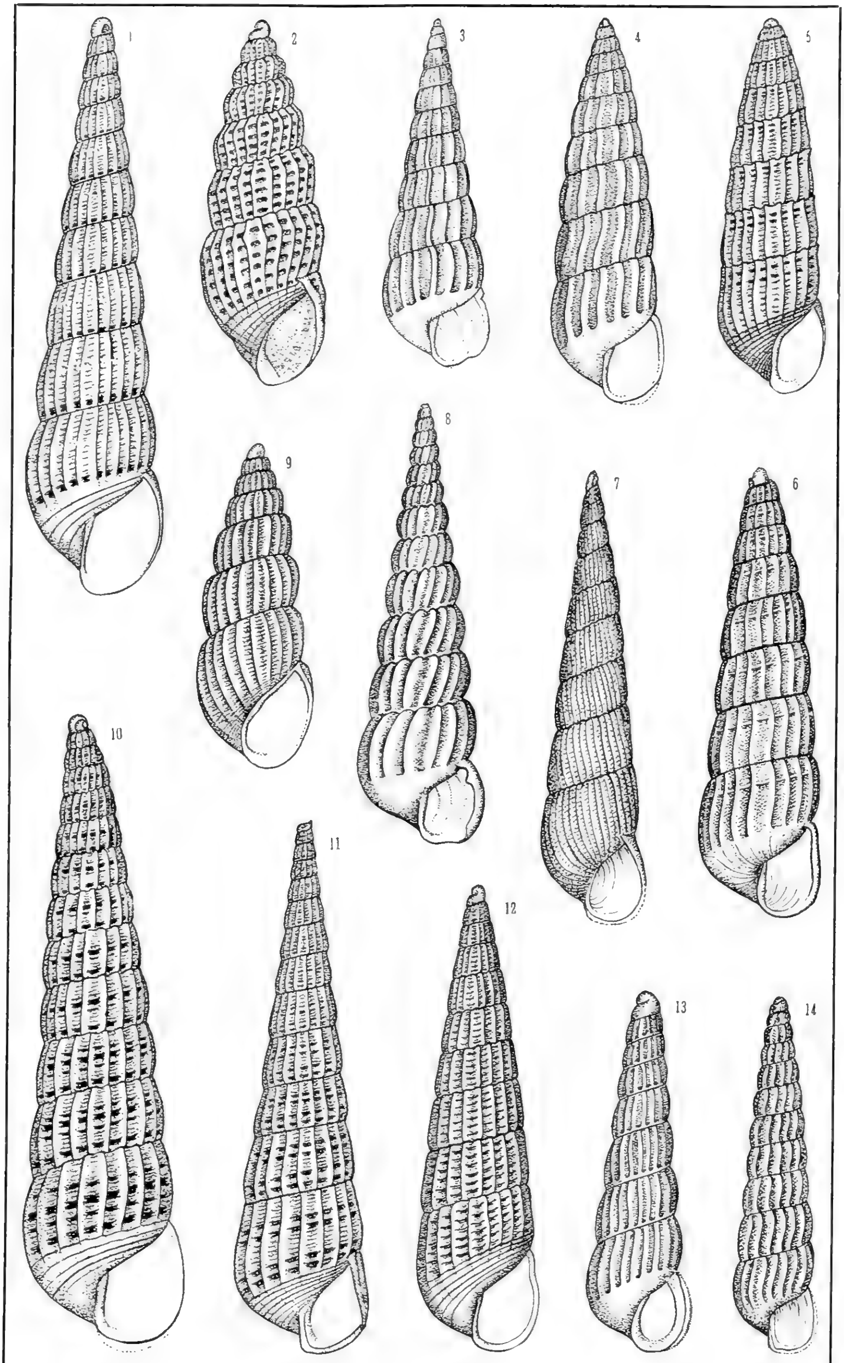

G. & W. S. VAUX, JR. ON GLACIERS OF BRITISH COLUMBIA.

ILLECELLEWAET GLACIER FROM TEST ROCK, 1898.

G. & W. S. VAUX, JR. ON GLACIERS OF BRITISH COLUMBIA.
ASULKAN GLACIER FROM TEST ROCK, 1898.

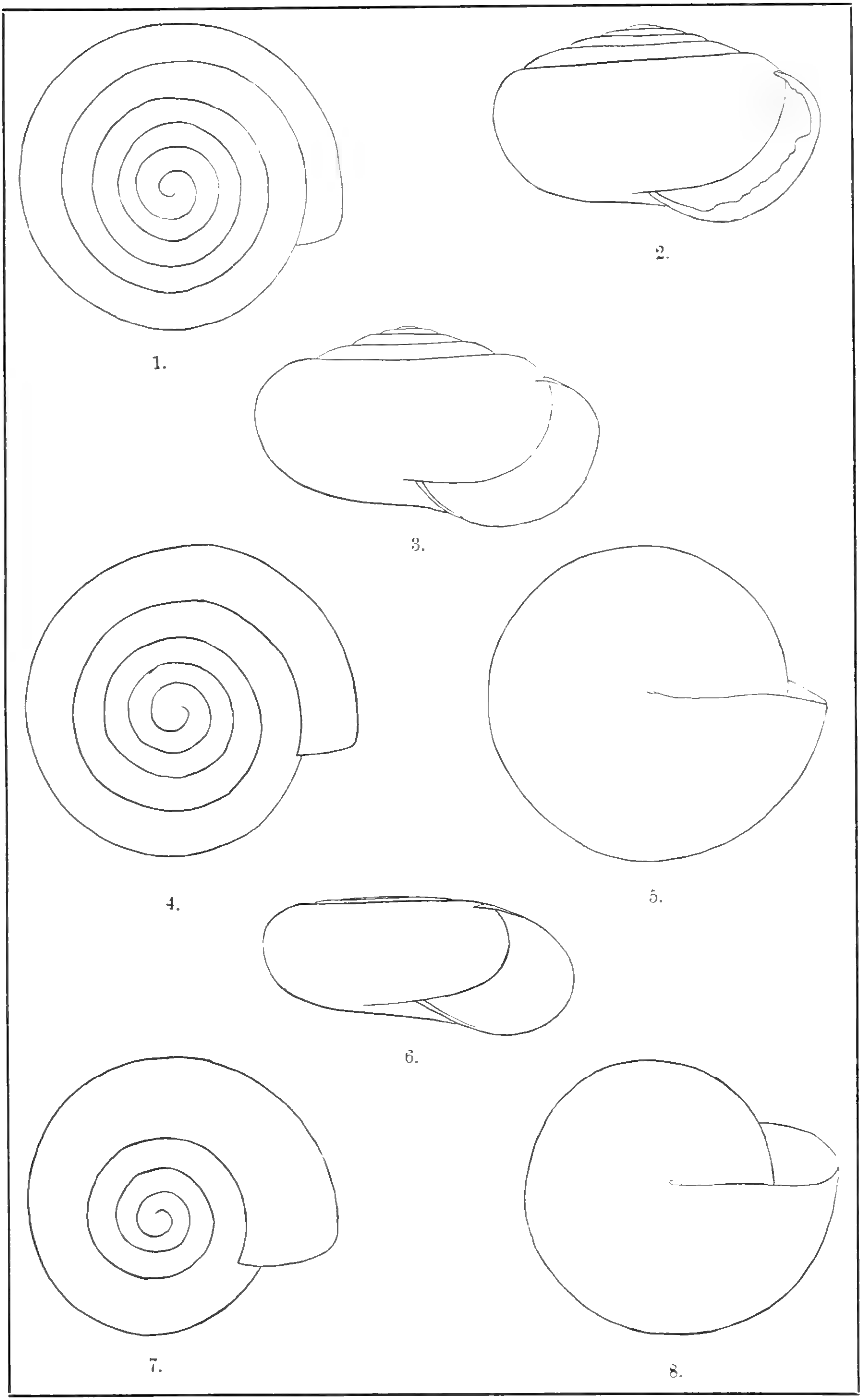



MESENCHYTRAEUS SOLIFUGUS. (EMERY.)

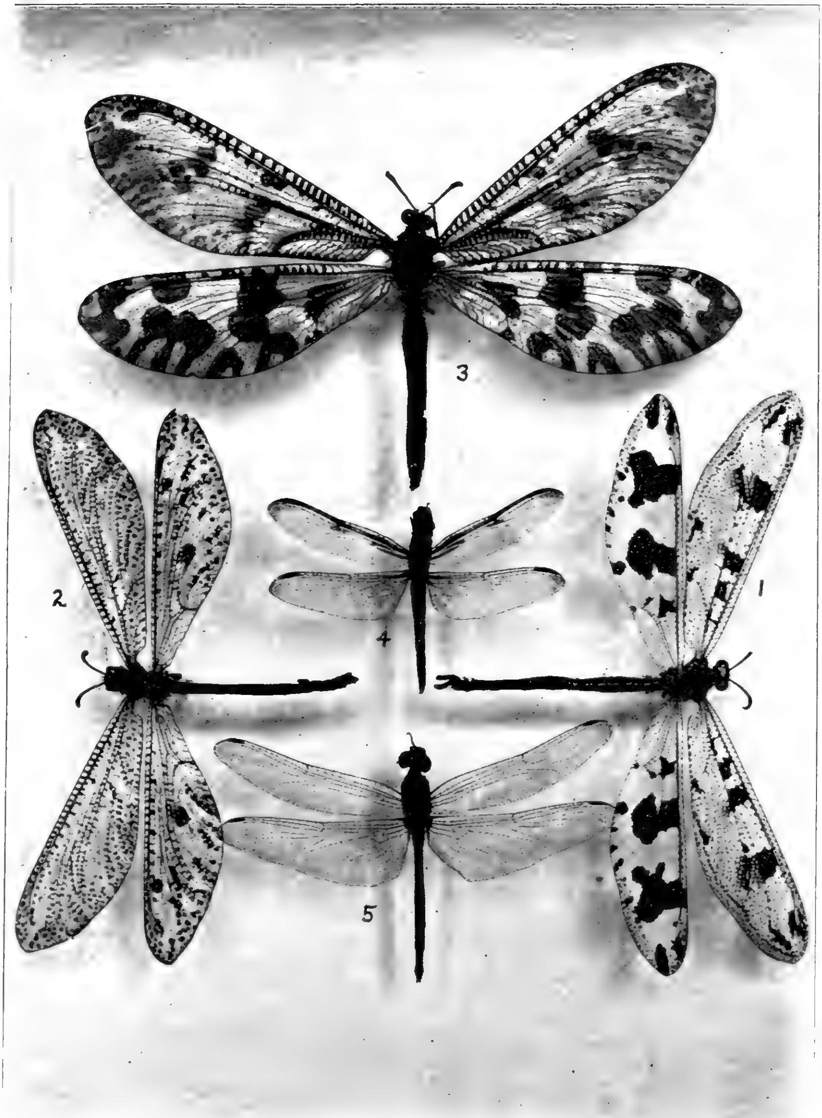



A. H. VERRILL, DEL.

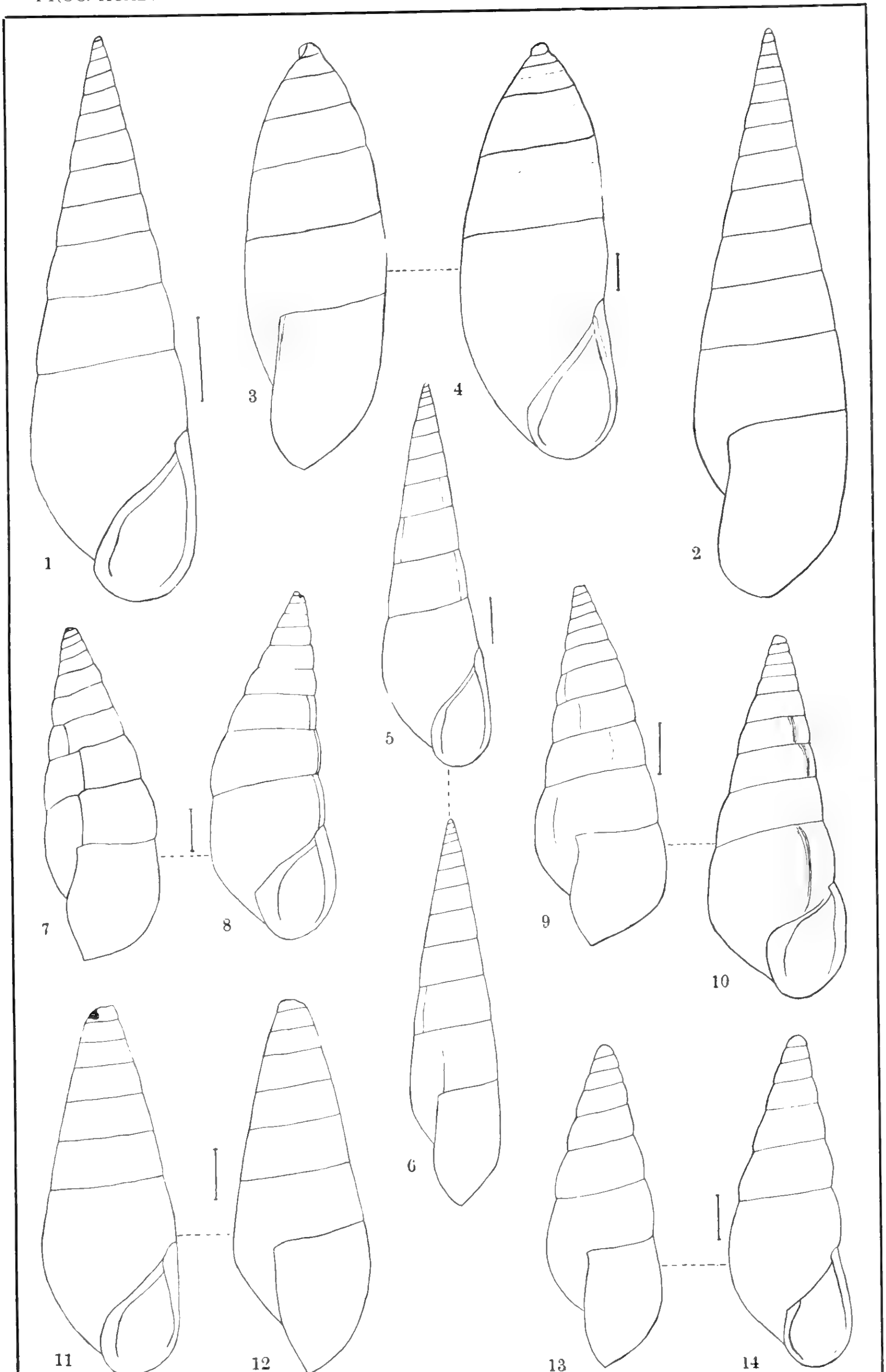
K. J. BUSH ON TURBONILLA.



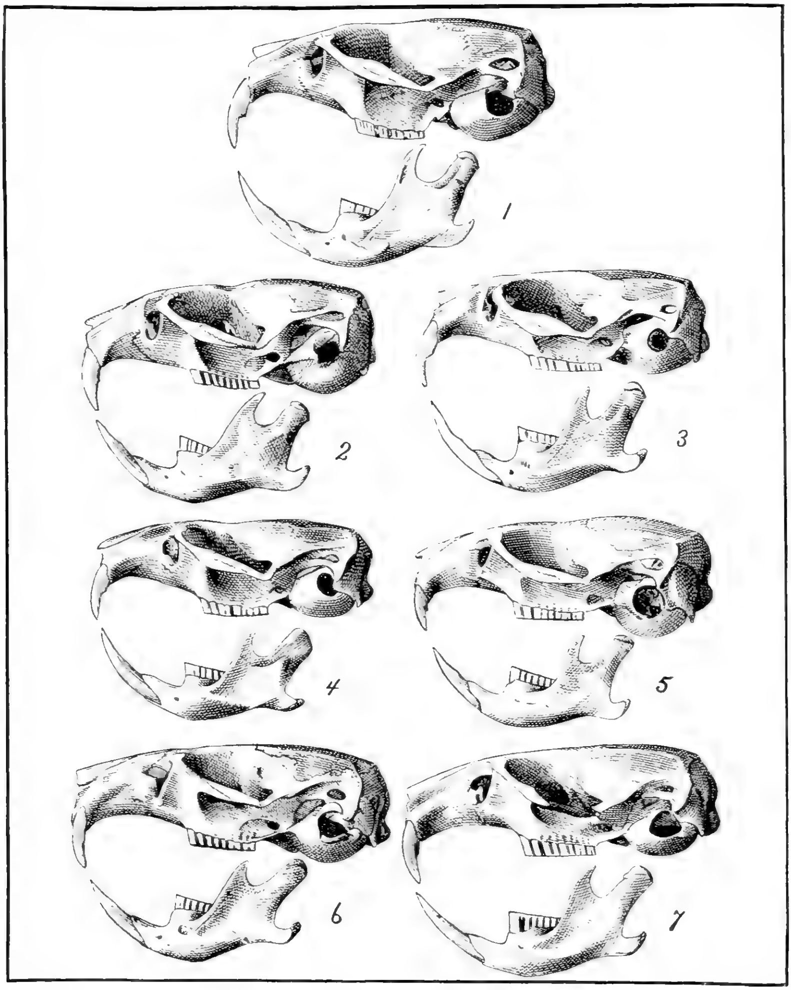

PILSBRY ON PRISTILOMA.



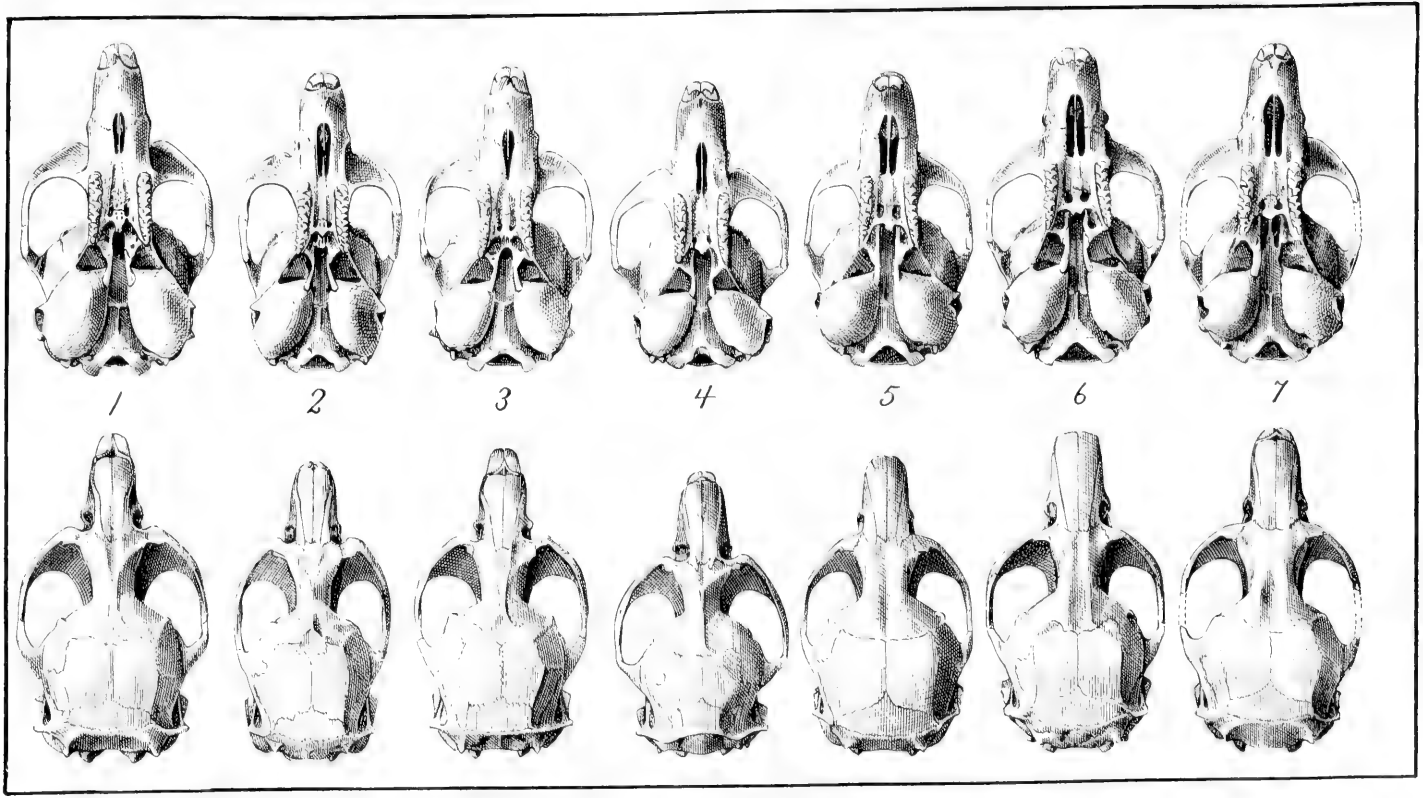

CALVERT. AFRICAN NEUROPTERA.



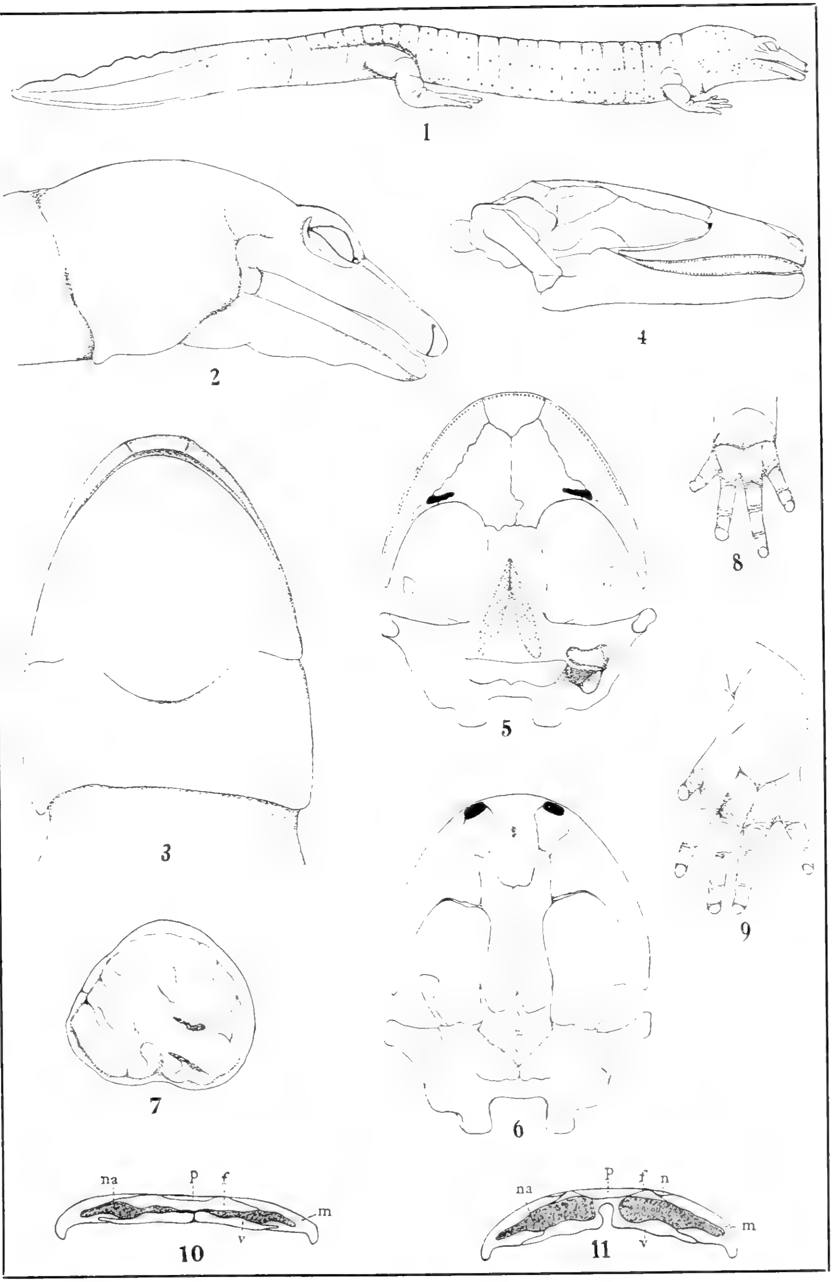

VANATTA ON EULIMIDÆ.



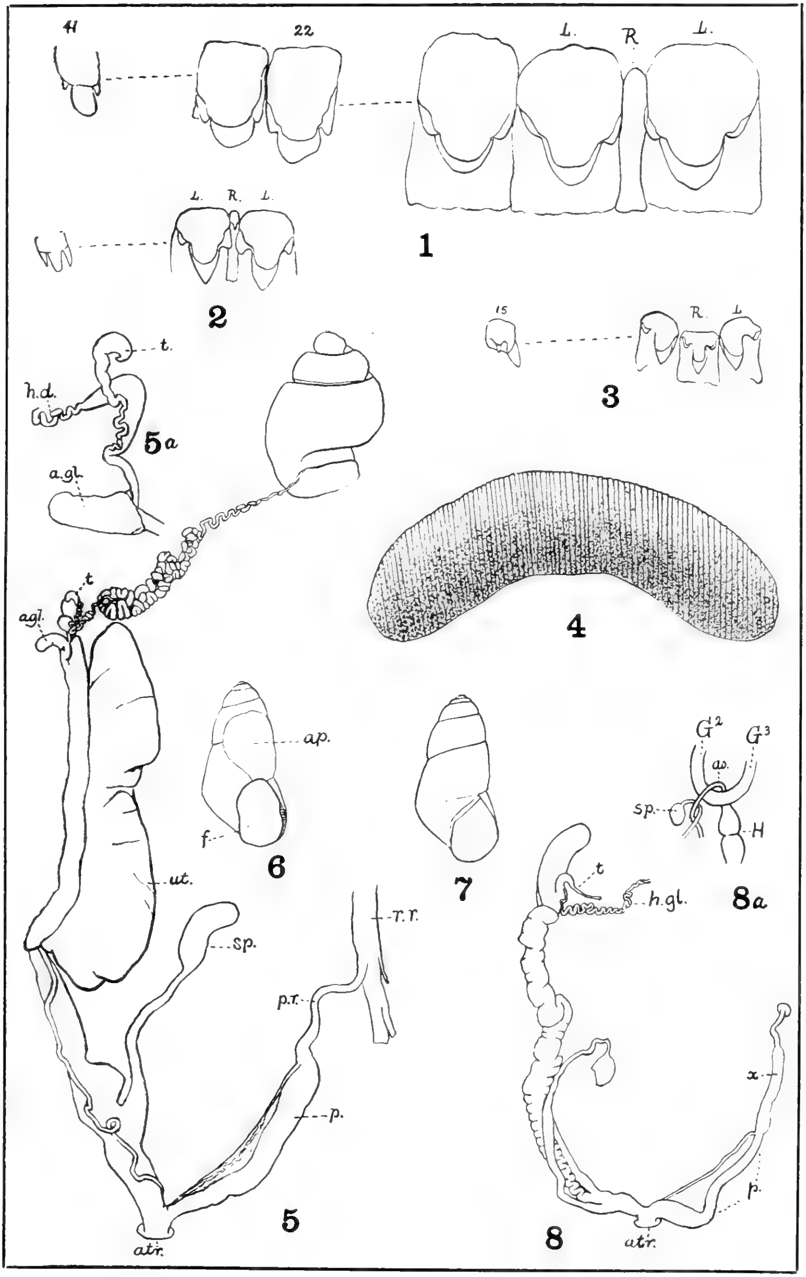

MILLER ON VOLES OF CENTRAL ASIA.



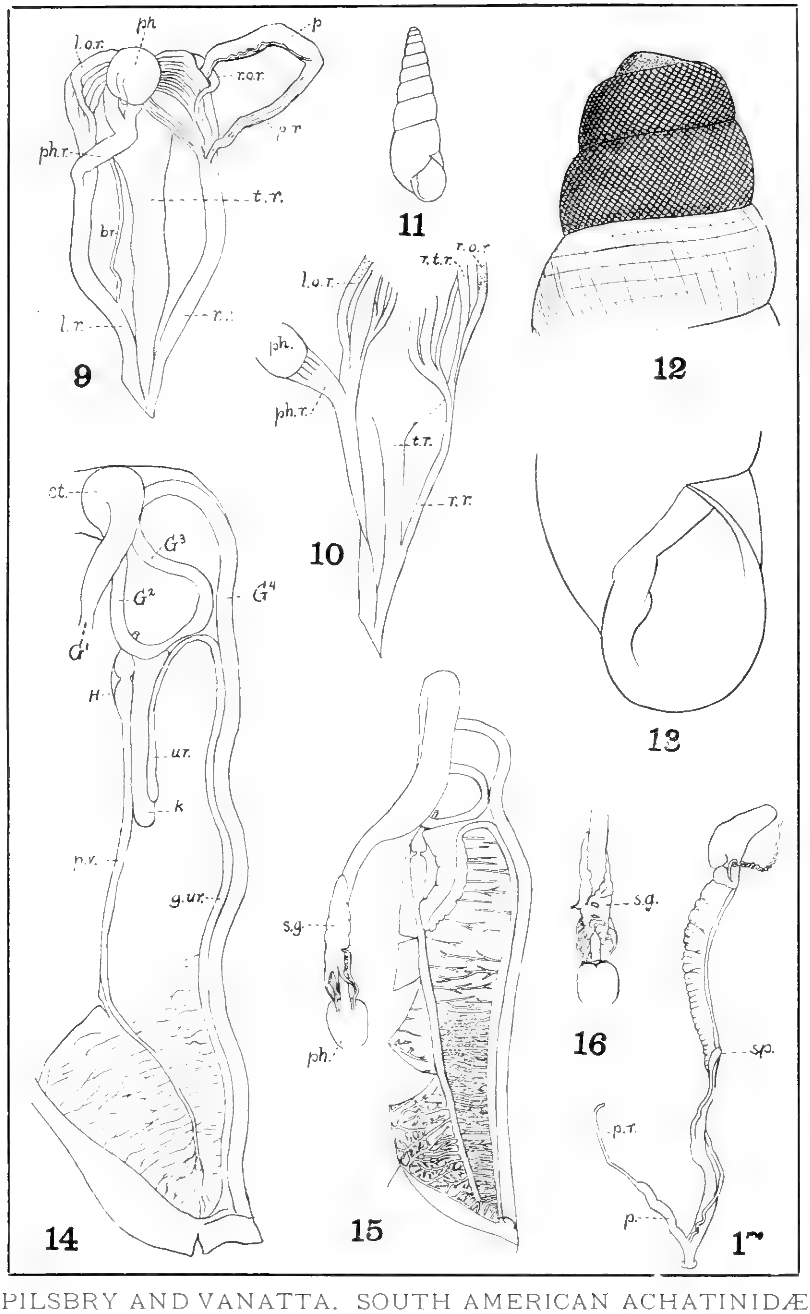

MILLER ON VOLES OF CENTRAL ASIA.



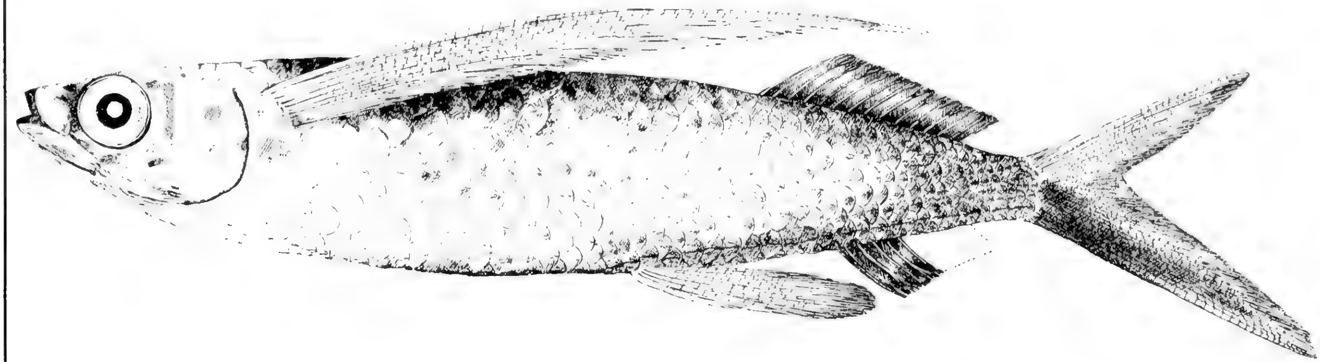

LEUROGNATHUS MARMORATA. MOORE.




PILSBRY AND VANATTA. SOUTH AMERICAN ACHATINIDÆ.

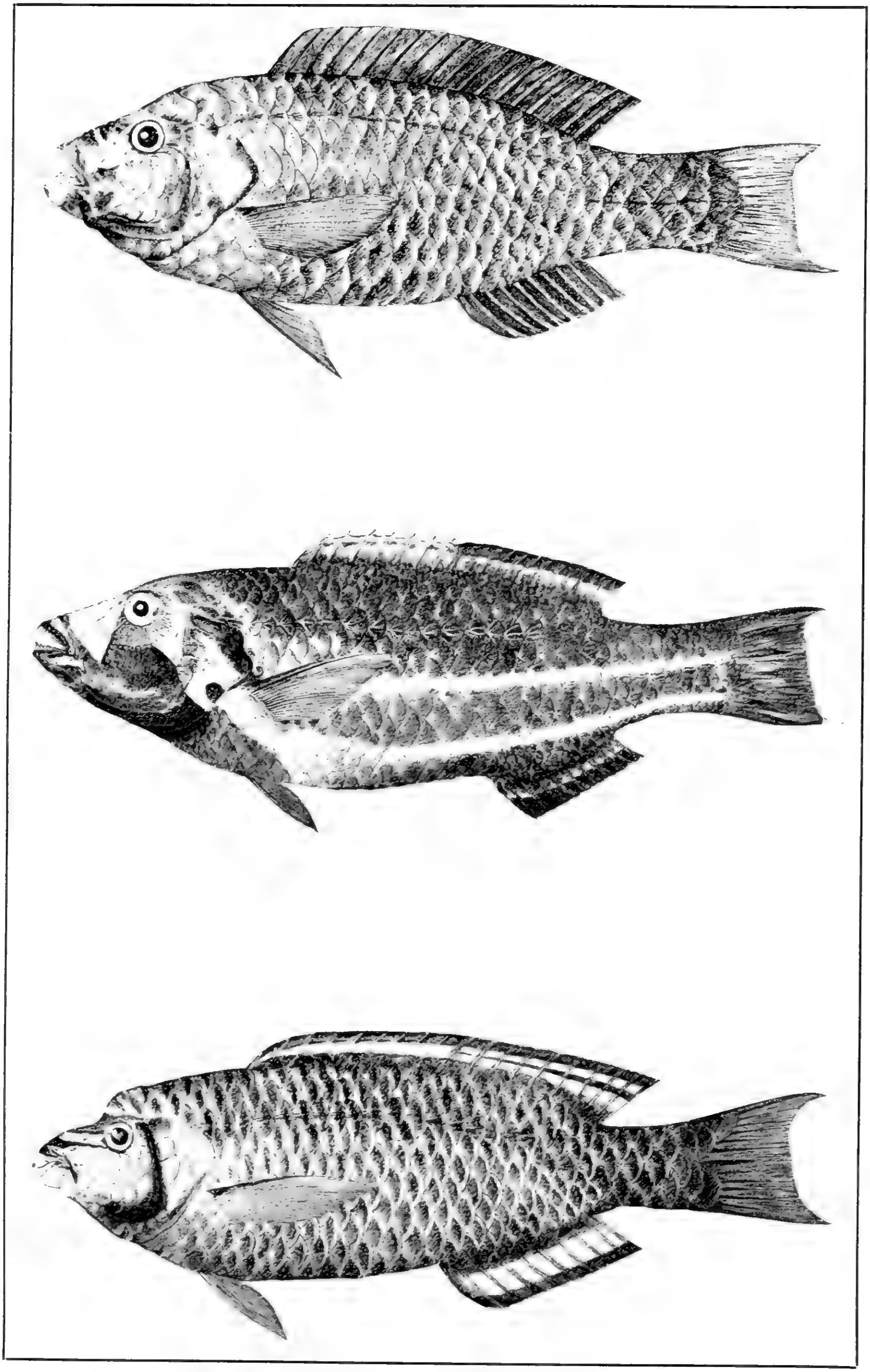



PILSBRY AND VANATTA. SOUTH AMERICAN ACHATINIDÆ.



FOWLER. FISHES OF THE CAROLINE ISLANDS.

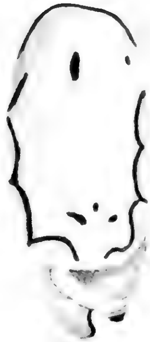
CYPSILURUS QUINDECIMRADIATUS.



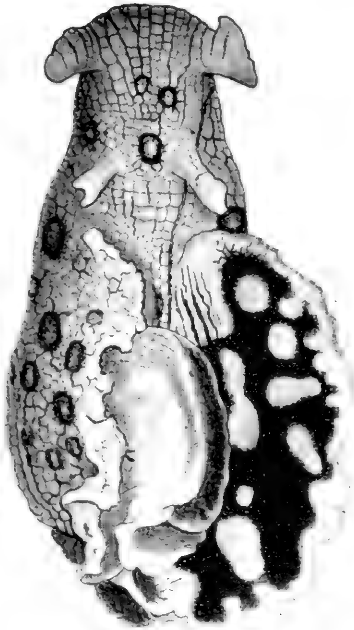
FOWLER. FISHES OF THE CAROLINE ISLANDS.

1. SCARUS LUPUS.
2. THALASSOMA IMMANUS.
3. SCARUS PRONUS.

1a.

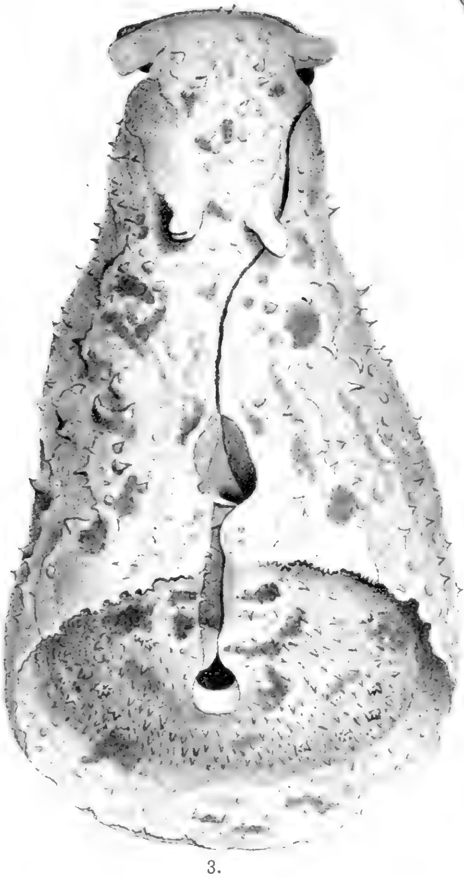


1b.

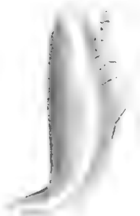


2a.

2b.

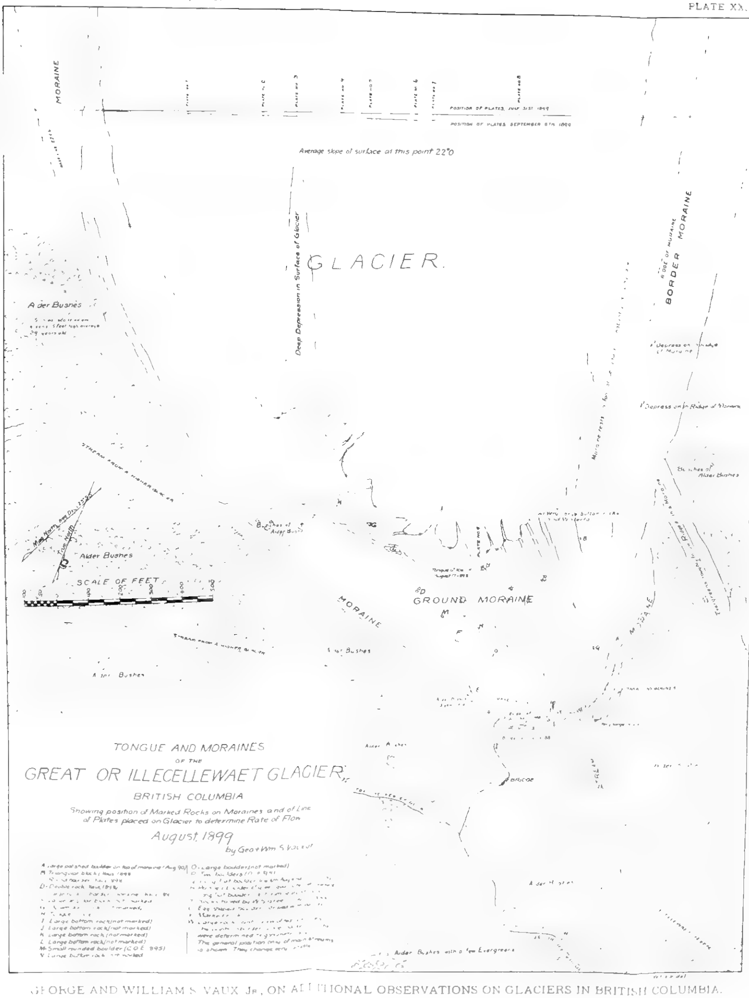


3.

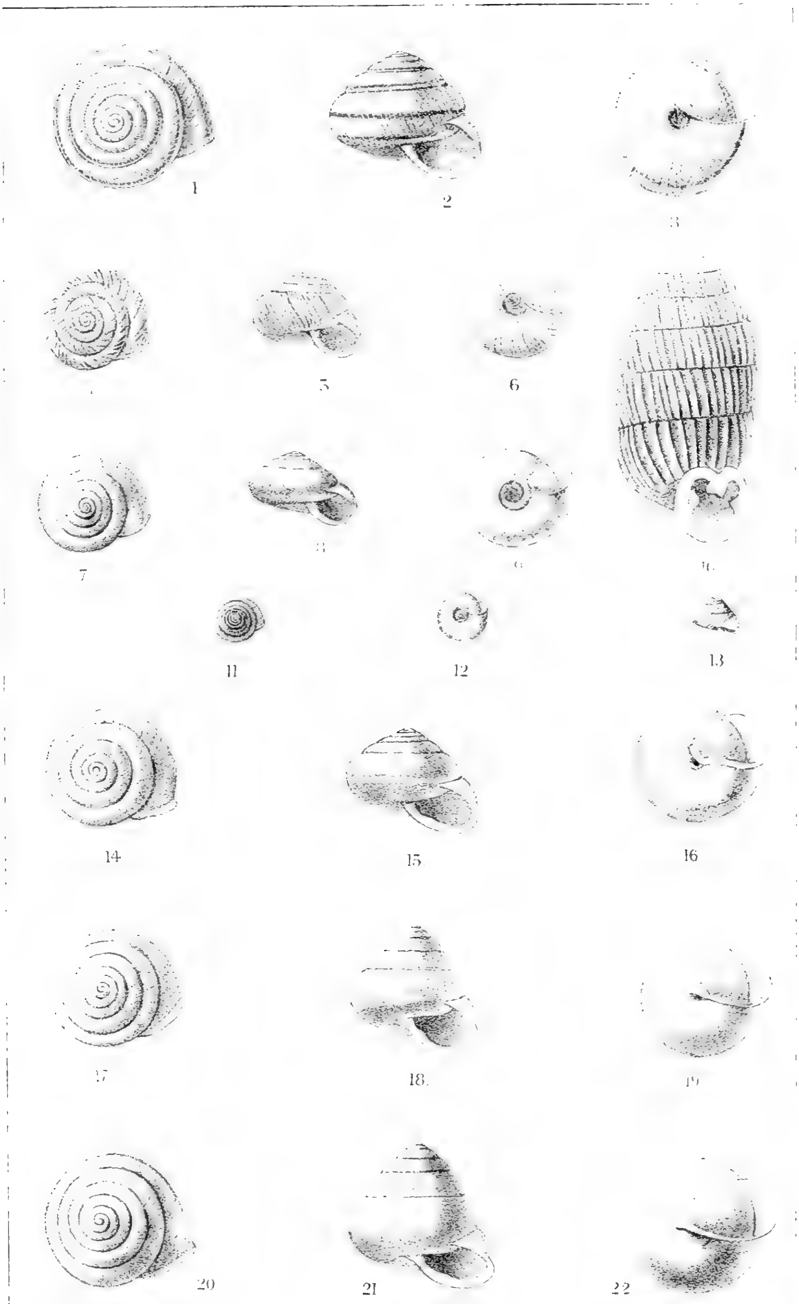


4.

ELIOT. MOLLUSKS OF SAMOA.




GEORGE AND WILLIAM S. VAUX, Jr., ON ADDITIONAL OBSERVATIONS ON GLACIERS IN BRITISH COLUMBIA.



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