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The extension of the scope of the National Museum during the pa
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series.

The articles in this series consist: First, of papers prepared by th
scientific corps of the National Museum; secondly, of papers by othe
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lication of freshly acquired facts relating to biology, anthropology, an
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SPENCER F. BAIRD,
Secretary of the Smithsonian Institution.

UNITED STATES NATIONAL MUSEUM,
Washington, March 1, 1887.

TABLE OF CONTENTS.

LIST OF ILLUSTRATIONS.

CUTS.

PLATES.

DATES OF PUBLICATION OF SIGNATURES.

The signatures of this volume were stereotyped on the following dates: Signatures 1, 2, August 14, 1886; 3, August 21; 4, August 23; 5, 6 August 26; 7, September 2; 8, September 13; 9, September 15; 10, September 17; 11–13, September 28; 14, October 11; 15–18, October 13; 19–22, October 19; 23–26, October 30; 27, December 7; 28, 29, December 8; 30–33, November 26; 34, December 2; 35, January 25, 1887; 36, February 8; 37, February 9; 38–40, February 11; 41, February 14.

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LIST OF CORRECTIONS.

Page 86, in the note, change *Elspect* to *Elspeet*; *Starezynon* to *Starezynow*; *Insol.—HCl* to *Insol HCl.*

Page 90, line 12, change *stean to steam.*

———, line 19, change *stain* to *strain.*

Page 91, line 21, Paper on "Composition of Fulgurites" is not by Mr. Rose; authorship unknov

Page 111, line 15, change *streets* to *straits.*

Page 120, line 31, change I to II.

Page 190, *Elaps bernadi*, sp. nov., is not described in this volume, but in Bulletin 32, U. S. Nati Museum.

PROCEEDINGS

OF THE

UNITED STATES NATIONAL MUSEUM,

1886.

LIST OF FISHES COLLECTED IN ARKANSAS, INDIAN TERRITORY, AND TEXAS, IN SEPTEMBER, 1884, WITH NOTES AND DESCRIPTIONS.

By DAVID S. JORDAN and CHARLES H. GILBERT.

During the months of July, August, and September, 1884, a series of explorations of the streams of the South and Southwest was undertaken under the direction of the U. S. National Museum and the U. S. Fish Commission by the writers, assisted by Prof. Joseph Swain and by Mr. Seth E. Meek. The present paper is the second of the series intended to place on record the results of these explorations. The first of the series, enumerating the collections of Jordan & Meek in Iowa and Missouri, was published in these Proceedings for 1885, pp. 1–17.

In the present paper is the record of the collections made by the writers working together in the streams farther south. The streams examined were the White River (Arkansas), the Poteau River and other tributaries of the Arkansas, the Washita River and its large tributary, the Saline, the Red River, the Sabine River, the Trinity River, the Lampasas River, the Colorado River, the Rio San Marcos and the Rio Comal.

Most of the specimens were taken with a fine-meshed seine of large size. These specimens are now in the U. S. National Museum, with the exception of a series retained for the museums of the Indiana University and the University of Cincinnati.

A.—WHITE RIVER, NEAR EUREKA SPRINGS, ARKANSAS.

The northwestern part of Arkansas is an extremely broken and rocky region, although none of the hills are of any great height. The streams of this region are fed by numerous springs. The waters are very clear, and the bottoms are gravelly. The general character of the streams resembles that of parts of East Tennessee, and the fish fauna is remarkably similar to that of the Tennessee River.

Our collections were made in the White River, above the "Narrow and in a somewhat smaller but very similar stream called King's Riv at a point east of Eureka Springs. A few specimens were taken fr the brook which has its rise in the different springs at Eureka.

1. Noturus miurus Jordan.
2. Ictalurus punctatus Rafinesque.
3. Moxostoma macrolepidotum Le Sueur.
4. Placopharynx carinatus Cope.

   Not rare.

5. Quassilabia lacera Jordan & Brayton.

   Not rare.

6. Campostoma anomalum Rafinesque.
7. Hybognathus nubila Forbes (var.).

   (*Alburnops nubilus* Forbes; *Hybognathus meeki* Jordan & Gilbert, MSS. Catalogue Fish. N. A.; no descr.)

Common. Our specimens of this species differ from typical exampl received from Professor Forbes (from Kishwaukee River at Belvide Ill.) in the greater slenderness of the body and in the much paler colo tion. We therefore took them at first for a distinct species, to which w given the MSS. name of *H. meeki*. A fuller comparison seems to lea no doubt of their identity with *H. nubila*.

Color light olivaceous above, sides with a plumbeous band overla by bright silvery; no caudal spot, and few dark punctulations on side only traces of a dark band along sides of head. In life the male fi has all the fins except the ventrals washed with light red. A r shade on temporal region.

Head, $4\frac{1}{2}$ in length; depth, $4\frac{1}{2}$ to $4\frac{3}{4}$. Eye, 3 in head. Scales, 5–37–12 scales before dorsal. Teeth, 4–4, with broad grinding surface, the t middle ones slightly but distinctly, [? hooked], as in so-called *Diond* Suborbitals extremely narrow. Snout short, not very blunt. Mou rather larger than in other *Dionda*, the maxillary reaching to opposi posterior nostril, $3\frac{1}{2}$ in head. Pectorals, $1\frac{1}{5}$ in head.

This species was also obtained in different streams of Southweste Missouri.

8. Pimephales notatus Rafinesque.
9. Notropis galacturus Cope.

Very abundant; the commonest inhabitant of all the streams. Ste blue in life. Base of caudal milky; the fin otherwise dusky, no re Not evidently different from specimens from Tennessee.

10. Notropis zonatus Agassiz.

    (*Alburnus zonatus* Agassiz. Putnam Bull. Mus. Comp. Zool., 1, 9, 1863. Osa R.; not *Cliola zonata* Jor. & Gilb., Synopsis, 183, which is *N. piptole* Cope.)

Our specimens are all nearly plain, olivaceous above, with a more less distinct plumbeous lateral band from snout to base of caudal, n

ending in a dark spot. In a few this band is quite distinct, but in most, especially the larger examples, it is very obscure and overlaid by silvery. Fins pale, the caudal somewhat dusky, with a little pale at base. None of these specimens show the very distinct dusky lateral band and the bright crimson flush of the sides and lower parts shown in specimens taken a few days earlier by Gilbert & Meek in Niangua River, Missouri. In these the red shades were very brilliant. All the specimens, red and pale, however, evidently belong to the same species and correspond well to Agassiz's scanty description of *Alburnus zonatus*.* Allied to *N. coccogenis* Cope, but with much smaller mouth.

Body comparatively elongate, moderately compressed. Head rather long, not very acute, rather broad and flattish above. Snout shortish, $3\frac{1}{3}$ in head. Eye very large (subject to considerable variation in different specimens), about 3 in head.

Mouth oblique, the jaws equal, the maxillary not quite reaching front of eye, its length 3 in head.

Scales not especially crowded, little deeper than long anywhere, their edges indistinct along the flanks, not being marked by any special dusky shade. Pores of the lateral line without dark dots. Lateral line complete, considerably decurved. Scales before dorsal large, about 16 in number.

Insertion of dorsal behind that of ventrals, at a point midway between tip of snout and base of caudal fin. Vertical fins moderately high. Pectoral fins reaching nearly to ventrals, the latter not quite to vent.

Head, $4\frac{1}{4}$ in length; depth, $4\frac{1}{2}$ to $4\frac{3}{4}$. D. 8; A. 8 or 9. Scales, 6–39–4. Teeth, 2, 4–4, 2, hooked, with slight grinding surface. Length, 4 to 5 inches.

This species is found in the river channels with *N. galacturus*, and is equally abundant.

11. Notropis scabriceps Cope.

Our specimens agree well with Cope's description (Proc. Ac. Nat. Sci. Phila., 1867, 166), and also with the description given in our Synopsis.

Head, $3\frac{4}{5}$ in length; depth, $4\frac{1}{5}$. D. 8; A. 8 or 9. Scales about 6–36–3. Teeth, 2, 4–4, 2, with traces of grinding surface. Length of longest specimen, $2\frac{3}{5}$ inches.

Body comparatively robust, not strongly compressed, the back somewhat elevated. Head large, broad, and flattish above, the interorbital width about equal to length of eye. Snout short, $3\frac{1}{2}$ in head. Eye large, about 3. Mouth rather large, oblique, the jaws equal, the maxillary extending to opposite front of eye, 3 in head.

* "Brown upon the back; a silvery band from the nose across the eye to the caudal fin; beneath this a slightly broader dark band, which extends from the snout to the tip of the central rays of the caudal fin; silvery below the dark band. Head large and rounded. Average length of specimens 3 inches. Osage River. Mr. Stolley." (Agassiz MSS., Putnam Bull. M. C. Z., 1883, 1, 9.)

Scales large, with well-defined edges; about 13 before dorsal. Later line decurved.

Insertion of dorsal very slightly behind ventrals, slightly nearer t of snout than base of caudal. Dorsal fin rather high and pointe other fins moderate.

Color greenish, sides with a silvery shade, above some plumbeou Some dusky on sides of snout and on opercle. Dusky points along t pores of the lateral line, and forming an obscure blotch at base of ca dal. Fins plain, with some dusky at base. Scales above, with dusk edges, their outlines therefore well defined.

This species is common with the two preceding. It is not very di ferent from the young of *N. zonatus*. Compared with the latter, it seen to be rather more robust, with larger scales, the boundaries of whi are more easily traced. There are also some slight differences in colo We regard it, however, as without much doubt a distinct species.

12. Notropis megalops Rafinesque.

Common.

13. Notropis micropteryx Cope.

Very abundant. Identical with specimens from Tennessee.

Head, $4\frac{1}{2}$ in length; depth, $5\frac{1}{2}$. D. 8; A. 10. Scales 5–38–2. Teet 2, 4–4, 2. Length, $2\frac{1}{2}$ to $2\frac{3}{4}$ inches. Body very slender, elongate. Hea rather small, the snout pointed; mouth oblique, margin of upper lip level with the pupil, tip of maxillary reaching slightly past vertic from front of orbit, its length $3\frac{1}{4}$ in head; snout, $3\frac{3}{5}$ in head. Eye rath small, its diameter $3\frac{1}{2}$ in head; interorbital width about equal to lengt of snout, slightly less than diameter of orbit. Pectorals short, $1\frac{1}{2}$ head, their tips reaching about $\frac{3}{5}$ distance to ventrals. Ventrals ver short, 2 in head, their tips reaching slightly more than $\frac{1}{2}$ distance anal. Dorsal fin situated far back, origin of its anterior ray midwa between anterior margin of opercle and base of caudal fin. Base dorsal, $2\frac{1}{2}$ in head; longest dorsal ray, $1\frac{3}{5}$ in head; base of anal, 2 in hea longest anal ray, $1\frac{3}{4}$ in head; 18 to 20 scales in front of dorsal. Colo olivaceous; sides, bright silvery; dorsal scales conspicuously dar edged; a dusky blotch at base of caudal underlying the silvery luste No red on specimens examined.

14. Hybopsis amblops Rafinesque.

Very common. Not evidently different from Indiana specimens.

15. Hybopsis dissimilis Kirtland.

Common. Lat. l. 49.

16. Hybopsis kentuckiensis Rafinesque.

(*Luxilus kentuckiensis* Raf. = *Semotilus biguttatus* Kirtland.)

17. Phoxinus neogæus Cope.

A single specimen, not agreeing very well with Cope's description rather better with that of Jordan & Gilbert (Synopsis, 243), but prob

ably identical with the types of each. Only the original specimens of Cope, from Southern Michigan, and ours, from Baraboo River, Wisconsin, have been hitherto known.

Head, $4\frac{1}{5}$; depth, $4\frac{1}{2}$. D. 8; A. 8. Scales, 18–80–10. Length, $2\frac{1}{2}$ inches. Teeth, 2, 4–5, 2.

Body rather stout, little compressed. Head large, broad, with rounded outline; the snout blunt, 3 in head. Eye small, $3\frac{2}{5}$. Mouth rather small, terminal, oblique, the jaws about equal, the maxillary reaching front of eye, $2\frac{4}{5}$ in head.

Scales minute, covering the body evenly. Lateral line decurved, incomplete, its pores visible for about half length of body. Insertion of dorsal behind that of ventrals, at a point midway between nostril and base of caudal. Dorsal fin high, $1\frac{1}{5}$ in head. Pectorals rather long, $1\frac{1}{5}$ in head; other fins pointed.

Color everywhere pale; sides with a well-defined plumbeous lateral band overlaid by silvery; no caudal spot.

18. **Fundulus catenatus** Storer.

Very abundant; even more so than in the Tennessee Basin.

19. **Zygonectes notatus** Rafinesque.

Common.

20. **Labidesthes sicculus** Cope.

Common.

21. **Micropterus dolomiei** Lacépède.

Common.

22. **Lepomis megalotis** Rafinesque.

Common.

23. **Lepomis humilis** Girard.

Common.

24. **Percina caprodes** Rafinesque.

Common.

25. **Hadropterus evides** Jordan & Copeland. (36325.)

Common. These specimens agree with those taken by Jordan & Meek in the Des Moines River at Ottumwa. Lat. l. 64 or 65.

26. **Diplesion blennioides** Rafinesque. (36324.)

Common.

27. **Etheostoma cœruleum spectabile** Agassiz. (36329.)

Common.

28. **Etheostoma zonale arcansanum**, subsp. nov.

Scarce.

The specimens of *E. zonale* (Cope) obtained by us in the Ozark region differ from the typical form in having the breast nearly or quite naked.

The following specimens of this type are in the National Museum:
36249. Spring River (Neosho), Carthage, Mo.
36275. James Fork of White River, Marshfield, Mo.
36399. Poteau River, near Hackett City, Ark.
36410. Washita River, Arkadelphia, Ark.
36447. Saline River, Benton, Ark.

In other respects it is not materially different from the typical *A. zonale*.

29. **Uranidea richardsoni** Agassiz.

Common, especially about springs in cool water.

B.—TRIBUTARIES OF ARKANSAS RIVER IN THE VICINITY OF FORT SMITH.

Our collections in this region were made in the Poteau River at Slat Ford, Indian Territory, some distance west of the village of Hacke City; in the James Fork of the Poteau, a smaller stream flowing into th Poteau from the west; in the Arkansas River opposite Fort Smith and in Lee's Creek, above the town of Van Buren.

The Poteau River is a rather muddy stream, flowing over shaly rock and at the time we were there its waters were very low on account dry weather. Lee's Creek is a similar stream, but smaller, with cleare waters, made up of a succession of pools, often muddy on the botton alternating with stony shoals.

The Arkansas River is there, as elsewhere, very muddy and re Fishes are scarce in that part of the river shallow enough for our net to be used.

The other streams mentioned are comparatively rich in species. Un less otherwise specified, all the species below were found both in th Poteau and in Lee's Creek.

1. **Lepidosteus osseus** Linnæus.

2. **Lepidosteus tristœchus** Bloch & Schneider.

A large skin seen.

3. **Noturus miurus** Jordan.

4. **Noturus nocturnus**, sp. nov.

Abundant in flowing water in the Poteau River.

Head, $3\frac{3}{5}$ in length; depth, $5\frac{2}{3}$; width of head, $4\frac{2}{5}$. D. I, 6; A. 15 c 16. Length, 2 to 3 inches.

Body moderately robust, slenderer than in *N. gyrinus*, but more ro bust than in *N. flavus* or *N. insignis*. Head not very large, little de pressed, rounded above. Eyes small, $2\frac{1}{2}$ in interorbital width, 5 to in head. Lower jaw included. Band of premaxillary teeth not pro longed backward. Barbels shortish, the maxillary barbel scarcel reaching gill-opening. Origin of dorsal fin a little nearer front of ad pose fin than snout, its spine $2\frac{2}{5}$ in head. Pectoral spine short, 2 i

head, its inner margin with short sharp teeth on the basal half, its outer margin nearly entire, with a few points near its tip. Adipose fin rather high, its edge continuous with that of the caudal, with no evident notch between. Anal fin rather long and high, its base $4\frac{1}{3}$ in body, its longest ray $1\frac{3}{5}$ in head.

Color uniform dark brown, without bars or markings, the body and fins being densely covered with dark points, visible under the lens; fins all dusky, with narrow pale margins.

This species is nearest to *N. leptacanthus* among those now known. It differs from that species in the stronger spines and in the more robust form.

It was also obtained by us in the Washita and Saline Rivers. The best specimens obtained (36461, U. S. N. M.) were from the Saline, at Benton.

5. **Noturus flavus** Rafinesque.

6. **Leptops olivaris** Rafinesque.

Arkansas River.

7. **Amiurus natalis** Le Sueur.

8. **Ictalurus punctatus** Rafinesque.

Very common, especially in the Arkansas.

9. **Ictiobus velifer** Rafinesque.

10. **Catostomus nigricans** Le Sueur.

11. **Moxostoma macrolepidotum** Le Sueur.

12. **Placopharynx carinatus** Cope.

13. **Campostoma anomalum** Rafinesque.

14. **Hybognathus nuchalis** Girard.

15. **Pimephales notatus** Rafinesque.

Scarce.

16. **Cliola vigilax** Baird & Girard.

Scarce.

17. **Notropis scabriceps** Cope.

Poteau River; rather scarce. Specimens apparently identical with those taken in White River, except that they are much more silvery than the latter and almost destitute of dark points on the scales except at base of caudal.

18. **Notropis illecebrosus** Girard.

Identical with Girard's types. Coloration very pale and silvery.

19. **Notropis dilectus** Girard.

Very abundant.

20. **Notropis umbratilis** Girard.

Not rare; originally described from tributaries of the Poteau.

21. **Notropis lutrensis** Baird & Girard.

Abundant in the Poteau; described from Sugar Loaf Creek, a tribu tary of the Poteau, under the name of *Moniana pulchella*.

22. **Notropis whipplei** Girard.
(*Cyprinella analostana* Girard.)

Common. Our Arkansas specimens are all slender as compared wit the ordinary Eastern *analostana*, but we detect no other difference. Th species was first described from Sugar Loaf Creek.

23. **Phenacobius mirabilis** Girard.

Common. Originally described from Fort Smith. Scales 47 to 5

24. **Hybopsis storerianus** Kirtland.
(*Ceratichthys lucens* Jordan.)

Common.

25. **Hybopsis amblops** Rafinesque.
(? *Gobio vernalis* Girard.)

26. **Hybopsis æstivalis** Girard.

Abundant in the Arkansas River; not found in the smaller streams

Color very pale olivaceous-silvery, sparsely and irregularly covere with small black dots as in *H. hyostomus*, &c. Fins plain.

Head, $3\frac{3}{4}$ in length; depth, $5\frac{1}{3}$. D. 8; A. 8. Teeth, 4-4. Scales 6-36-4. Length, $2\frac{1}{2}$ inches.

Body slender, with long and slender caudal peduncle, the bac scarcely elevated. Head long and low; the snout rather pointed, an projecting much beyond the mouth. Mouth small, inferior, the maxillar extending to opposite the large posterior nostril. Barbel very conspic uous, as long as snout, $2\frac{3}{4}$ in head. Eye comparatively small, 4 to 4 in head. Fins all high, the caudal deeply forked, its lobes subequa Pectorals reaching ventrals. Insertion of dorsal over that of ventrals nearer snout than base of caudal.

On comparison of our specimens with the types of *Ceratichthys ste letus* Cope, we find no difference.

27. **Dorosoma cepedianum** Le Sueur.

28. **Zygonectes notatus** Rafinesque.

Common.

29. **Gambusia patruelis** Baird & Girard.

In Lee's Creek.

30. **Labidesthes sicculus** Cope.

31. **Stizostedion canadense** H. Smith.

Coloration very dark.

32. **Stizostedion vitreum** Mitchill.

One specimen in Lee's Creek.

33. **Percina caprodes** Rafinesque. (36388.)

Common.

34. **Ammocrypta vivax** Hay. (36361, 36385.)

Very abundant.

This species differs from *A. pellucida* in a feature of coloration. There is a blackish bar constantly across the base of the soft dorsal, and usually a fainter one across the base of the caudal. The scales are firmer and rougher in *A. vivax* than in *A. pellucida*, and the nape before the dorsal is more or less closely scaled, while in *A. pellucida* this is naked. Perhaps the two species may be found to vary into each other.

D. XI, 10. Lat. l. about 75.

35. **Hadropterus phoxocephalus** Nelson. (36387.)

Not very common.

36. **Hadropterus aspro** Cope & Jordan. (36354, 36403.)

Not rare; coloration very pale.

37. **Boleosoma camurum** Forbes. (36402.)

One specimen taken in Poteau River.

38. **Ulocentra histrio** Jordan & Gilbert. (36386.)

Abundant in swift places in the Poteau River.

39. **Cottogaster shumardi** Girard.

Not very common; the only Darter taken in the Arkansas River. No bright colors in life.

40. **Cottogaster copelandi** Jordan. (36360, 36404.)

Abundant. This is the first notice of this species other than in the original locality, White River, at Indianapolis.

No bright colors in life. A dusky bar across spinous dorsal, but no distinct spot. D. XI, 11; A. II, 8. Lat. l. 57 to 59. Arkansas specimens have the cheeks usually more or less scaly, as is also the nape.

41. **Diplesion blennioides** Rafinesque. (36392.)

Lee's Creek.

42. **Etheostoma whipplei** Girard. (36353, 36377.)

(*Pacilichthys punctulatus* Jordan & Gilbert, Synopsis 516; not *P. punctulatus* Agassiz.)

Very abundant; the commonest of the Darters, living in the small streams. Adults with many bright orange spots on the body, arranged somewhat in vertical rows; young usually, but not always, with orange. Vertical fins largely blue-black, especially in the males.

We have found Girard's type of *Boleichthys whipplei* a young female of this species. The *punctulatus* of Agassiz is a different fish, never fully described, and not seen since Agassiz's time until lately taken by Gilbert & Meek in tributaries of the Osage.

43. **Etheostoma fusiforme** Girard. (36400.)

A few small specimens without bright colors, agreeing closely with the types of *Pacilichthys palustris* Gilbert, a species which we are now

unable to separate from *E. barratti* and *E. fusiforme*. The types o *Boleichthys gracilis* are identical with the *P. palustris*.

44. Micropterus salmoides Lacépède.

Very abundant.

45. Lepomis cyanellus Rafinesque.

Poteau River.

46. Lepomis humilis Girard.

Poteau River.

47. Lepomis megalotis Rafinesque.

Common. Coloration very green, with blue spots and with little red fins with little orange; operenlar flap long, with broad edgings.

48. Lepomis pallidus Mitchill.

Common.

49. Pomoxys annularis Rafinesque.

Poteau River.

50. Aplodinotus grunniens Rafinesque.

Common.

C.—WASHITA RIVER AT ARKADELPHIA AND SALINE RIVER AT BEN TON, ARKANSAS.

The Washita River and its large tributary, the Saline, are very clea streams, flowing down from the Ozark Mountains. At the localities ex amined both are moderately rapid, forming alternations of ripples an deep quiet pools. In both the bottom is chiefly made up of fine grave The Caddo River, another tributary of the Washita, is a swift, col stream, with the bottom largely rocky. In this few species were found The Washita was examined by us about one-half a mile above Arkadel phia. We found this a better locality for collecting fishes than any othe mentioned in this paper. The Etheostomoids were especially abundant a greater number being found here than in any other locality thus far re corded in the United States. The Saline River was examined near Ben ton, at a point just above the railroad bridge. This locality is also most excellent collecting ground. Although the stream is much smalle than the Washita, the number of species obtained is scarcely less tha was taken at Arkadelphia. Unless otherwise stated all the specie noted below were found both in the Washita and the Saline.

1. Ictalurus punctatus Rafinesque.

2. Noturus nocturnus Jordan & Gilbert

Abundant in shallow rapids.

3. Noturus miurus Jordan.

4. Ictiobus velifer Rafinesque.

Color very brassy in life; lower fins pink.

5. Catostomus nigricans Le Sueur.

6. Moxostoma macrolepidotum Le Sueur.

7. Placopharynx carinatus Cope.

Abundant.

A large, coarse Sucker, externally identical with the species of *Moxostoma*, from which genus it differs only in the remarkable development of the lower pharyngeals and their teeth. The coloration is much deeper than in most species of *Moxostoma*, the back dark olive-green, the sides brassy, without silvery luster; the caudal fin deep red. The dusky coloration persists even in alcohol.

Head about 4 in length; depth, $3\frac{4}{5}$. D. 12; A. 7. Scales, 6–45–5. Longest rays of dorsal longer than base of fin, $1\frac{1}{5}$ in head. Head rather broad and flattish above, its upper surface somewhat uneven. Upper lobe of caudal narrower than lower, and more or less longer.

8. Campostoma anomalum Rafinesque.

9. Hybognathus nuchalis Agassiz.

Very abundant in the Saline, where it is the commonest of all the Minnows.

10. Pimephales notatus Rafinesque.

Common. Numerous young specimens from the Saline are very slender, but seem to show no tangible points of distinction.

11. Notropis whipplei Girard.

Very abundant. These specimens are all rather more slender than the Eastern *analostanus* of the same size, but we find no other differences.

12. Notropis umbratilis Girard.

13. Notropis scabriceps Cope.

Abundant in the swift current, especially in the colder waters of the Caddo River.

14. Notropis dilectus Girard.

Very abundant.

A little fish very abundant in the Saline River; was at first taken by us for a distinct species, and referred to under the manuscript name of *Notropis ionthas*.

Renewed comparison leaves little doubt that this is the young of *Notropis dilectus*. The body in these young fishes is profusely sprinkled with black dots, as in *Hybopsis æstivalis*.

15. Hybopsis dissimilis Kirtland.

Common.

16. Clupea chrysochloris Rafinesque.

17. Dorosoma cepedianum Le Sueur.

18. Hyodon tergisus Le Sueur.

19. Gambusia patruelis Baird & Girard.

Abundant in the springs tributary to Caddo River.

20. Zygonectes notatus Rafinesque.

21. Fundulus catenatus Storer.

22. Esox vermiculatus Le Sueur.

In ponds and cut-offs tributary to the Saline.

23. Labidesthes sicculus Cope.

24. Roccus chrysops Rafinesque.

25. Micropterus salmoides Lacépède.

26. Micropterus dolomiei Lacépède.

The two species of Black Bass are about equally abundant in th Washita and Saline.

27. Lepomis cyanellus Rafinesque.

28. Lepomis humilis Girard.

29. Lepomis megalotis Rafinesque.

30. Lepomis pallidus Mitchill.

31. Ammocrypta vivax Hay. (36414, 36444.)

32. Crystallaria asprella Jordan. (36412.)

Three specimens taken in the Washita River, the largest about inches in length.

This species differs quite strongly from the *Ammocryptæ* in having the premaxillaries non-protractile, in the much greater development o the vertical fins, and in the less hyaline structure of the body, which is also more closely and firmly scaled. In all these regards it represent a transition from *Ammocrypta* toward *Hadropterus*.

The description in our Synopsis Fish. N. A., p. 490, is badly vitiated by the count of the fin-rays having been taken from a young example supposed to be the same as the type, but really belonging to *Ammocrypta vivax*. D. XIV, 13; A. I, 12. Scales, 7–83–x. The statement made by Mr. Worthen, the original discoverer of the species, that in life it "presents all the colors of the rainbow," is erroneous. The life coloration is substantially as described in the Synopsis, there being no red or blue markings.

33. Boleosoma camurum Forbes. (36420, 36441.)

Abundant in the small pools and cut-offs.

34. Cottogaster copelandi Jordan. (36416, 36471.)

Very abundant.

35. Cottogaster uranidea Jordan & Gilbert. (36413.)

Five or six specimens taken in shallow rapid water in the Washita

36. Etheostoma histrio Jordan & Gilbert. (36409, 36448.)

Not rare in the current. The frenum of the upper jaw in this species is very narrow, so that the premaxillaries are almost protractile. The skull is narrow and high across the parietal region, as in *E. cæruleum*.

37. Diplesion blennioides Rafinesque. (36418, 36469.)

Abundant.

38. Hadropterus aspro Cope & Jordan. (36422.)

One specimen taken in Saline River.

39. Hadropterus ouachitæ Jordan & Gilbert. (36449.)

Several specimens from Saline River.

40. Hadropterus scierus Swain. (26411.)

Abundant. These specimens agree well with the original types from the streams about Bloomington, Ind. It is remarkable that these three species (*Hadropterus scierus*, *Hadropterus evides*, *Cottogaster copelandi*), hitherto known from a few localities in Central Indiana only, should prove to be characteristic of the Ozark region.

41. Percina caprodes Rafinesque. (36417.)

42. Etheostoma cœruleum spectabile Storer. (36445.)

43. Etheostoma whipplei Girard. (36419, 36442.)

Specimens from the Washita, supposed to be of the same species, lack the red spots.

44. Etheostoma saxatile Hay.

A few from the Saline.

45. Etheostoma zonale arcansanum Jordan & Gilbert.

Not rare.

46. Etheostoma fusiforme Girard. (36515, 36470.)

Abundant in the muddy pools along the Washita and Saline. The specimens are similar to the type of *P. palustris* Gilbert.

47. Alvarius fonticola Jordan & Gilbert. (36607.)

One specimen from the Washita.

D.—RED RIVER AT FULTON, ARKANSAS.

The Red River at Fulton, Ark., flows with a moderate current over a bed of fine reddish sand and mud or silt. It is subject to great variations in level, according to the rain-fall, being in the winter and spring a torrent of muddy water, overflowing its banks, and in summer and autumn clear and reduced to 2 or 3 rods in width and 5 to 7 feet in depth in the channel. Along its shores are numerous "lakes," ponds of shallow muddy water in the forests, fed by the spring overflow, and drying up gradually in the summer.

At the time of our visit (September) the water was near its lowest point, and everything was favorable for collections. The stream is, however, singularly barren of fish-life, and although it was as carefully and fully seined as the Washita, we found barely half as many species as in the latter stream. The character of the bottom of the Red River is evidently unfavorable for fishes.

1. Scaphirhynchops platyrhynchus Rafinesque.

2. Lepidosteus osseus Linnæus.

3. Ictalurus punctatus Rafinesque.

4. Leptops olivaris Rafinesque.

Locally known as "Russian Cat."

5. Ictiobus bubalus Rafinesque.

(*Bubalichthys bubalus* Agassiz.)

6. Ictiobus velifer Rafinesque.

7. Hybognathus nuchalis Agassiz.

Very abundant; by far more numerous in individuals than any oth species in the river. None of the specimens are as large as those take in the Saline River, but we can find no specific distinction betwee them.

8. Hybopsis storerianus Kirtland.

Rather common.

9. Hybopsis æstivalis Girard.

Abundant in the current.

10. Notropis dilectus Girard.

Abundant; some of the specimens are much more slender than other but all seem to belong to the same species.

11. Notiopis venustus Girard.

(*Cyprinella venusta* Girard. *Cyprinella cercostigma* Cope = *Luxilus chicka* *venusis* Hay = *Cliola urostigma* Jordan & Meek.)

A few small specimens obtained of this species so characteristic the rivers of Texas. Although some of Girard's types, as the one e amined by Meek (see Proc. U. S. Nat. Mus., 1885, 124), may belong some other species, yet his figure represents this species so well that am compelled to regard this as the original *venusta*.

12. Clupea chrysochloris Rafinesque.

13. Dorosoma cepedianum Le Sueur.

14. Hyodon alosoides Rafinesque.

15. Gambusia patruelis Baird & Girard.

16. Zygonectes notatus Rafinesque.

17. Micropterus salmoides Lacépède.

18. Lepomis pallidus Mitchill.

19. Pomoxys sparoides Lacépède.

20. Cottogaster shumardi Girard. (36338.)

One specimen.

21. Ammocrypta clara Jordan & Meek. (36337.)

Three specimens.

22. Roccus chrysops Rafinesque. "Rock Bass."

23. Aplodinotus grunniens Rafinesque.

E.—SABINE RIVER AT LONGVIEW, TEXAS.

The Sabine River, 5 miles south of Longview, Tex., is, in midsummer, a small, rather clear stream, flowing with little current over a bottom of fine gravel, mud, and sand.

It is a better stream for fishes than the Red River, but, as it almost dries up in the summer, the larger species do not thrive in it.

1. **Noturus nocturnus** Jordan & Gilbert.

2. **Moxostoma pœcilurum** Jordan.

Young specimens, the caudal fin having precisely the same bright coloration as the original types.

3. **Hybognathus nuchalis** Agassiz.

Abundant.

4. **Cliola vigilax** Baird & Girard.

5. **Notropis dilectus** Girard.

A row of dark points above the base of the anal fin exists in this species, and may prove a convenient diagnostic mark.

6. **Notropis lutrensis** Baird & Girard.

Common.

7. **Notropis venustus** Girard.

Common.

8. **Notropis sabinæ**, sp. nov. (36454.)

Head, $3\frac{4}{5}$ in length; depth, $4\frac{2}{3}$. D. 8; A. 7. Scales, 4-33-2. Teeth, 4-4, hooked, with some grinding surface. Length, about 2 inches.

Allied to *Notropis deliciosus*, but notably different in form, the outline of the body resembling that of a young Red Horse (*Moxostoma*). Body moderately compressed, the caudal peduncle long and thick, the back distinctly elevated, the profile from the tip of the snout to the front of the dorsal forming a nearly regular curve. Back rather broad above, its edge little compressed. Head rather long, broad and flattish above. Interorbital width $2\frac{2}{3}$ in length of head. Snout $3\frac{2}{3}$ in head. Eye small, $3\frac{2}{3}$. Mouth rather large, nearly horizontal, the lower jaw a little shorter than the upper, the maxillary reaching to a little past front of pupil, $2\frac{1}{2}$ in head.

Scales very large, those on the back not reduced in size, 14 before dorsal. Lateral line not strongly decurved.

Insertion of dorsal fin slightly nearer tip of snout than base of caudal, nearly over insertion of ventrals. Dorsal fin rather short and small; anal fin small; pectoral fins comparatively long, about reaching ventrals; their length $1\frac{1}{4}$ in head.

Color very pale, scarcely silvery; margins of scales on back and sides with dark points, so that their edges are distinctly traceable; fins pale.

9. **Phenacobius mirabilis** Girard.

Lat. l. 48.

10. Gambusia patruelis Baird & Girard.

11. Zygonectes notatus Rafinesque.

12. Micropterus salmoides Lacépède.

13. Lepomis humilis Girard.

14. Ammocrypta clara Jordan & Meek. (36488.)

Abundant.

15. Ammocrypta vivax Hay. (36487.)

Rather common.

16. Hadropterus scierus Swain, var. *serrula*, var. nov. (36481.)

Abundant. The Texas specimens of this species differ somewha from those examined from Indiana and Arkansas, and may be taken a a distinct variety (*serrula*). The scales are somewhat smaller in va *serrula* (lat. l. 68 to 71 in *serrula;* 64 to 66 in most Indiana examples The coloration in *serrula* is paler, with more sharply-defined markings the black blotches on the side being less confluent, and the sides of th belly without dark clouds.

In the Texas specimens the breast is naked, while in most Indian examples it is more or less scaly. The preopercle is very weakly, bu generally distinctly, serrulate.

In very old specimens from Indiana these serrations disappear.

17. Etheostoma jessiæ Jordan & Brayton. (36482.)

(*Pœcilichthys jessiæ* Jordan & Brayton=*Pœcilichthys asprigenis* Forbes=*Pœcilichthys swaini* Jordan.)

Several specimens, all less than 2 inches long. In life these wer dark olivaceous, with cross blotches or bars of dark greenish; bod everywhere above and below covered with dark dots. Dorsals an caudal with dark cross streaks, the spinous dorsal with an orange-re bar across it near the edge. Three dark spots at base of caudal, th median one most distinct. The usual dark markings about eye. N dark humeral spot. Lower fins dusky.

Scales 5–48–7, their outlines distinct from the dark edgings. Breas naked; nape scantily scaled or partly naked. Opercles well scaled Cheeks nearly naked; a few small scales above. Lateral line extend ing about to middle of caudal peduncle.

These specimens differ a little from typical examples of *E. asprigen* (= *P. jessiæ* Jordan & Brayton), but these differences seem to b within the range of individual variation in this variable species.

F.—TRINITY RIVER, AT DALLAS, TEXAS.

The Trinity River at Dallas, Tex., is in midsummer a very small strea of muddy-gray water running with a sluggish current over dirty grave and mud. The conditions are unfavorable to fish-life, and very fe species were taken, although the locality was very thoroughly exam

ined. A few specimens were taken from a spring brook north of the city.

1. **Noturus nocturnus** Jordan & Gilbert.

2. **Leptops olivaris** Rafinesque.

3. **Campostoma anomalum** Rafinesque.

4. **Hybognathus nuchalis** Agassiz.

5. **Cliola vigilax** Baird & Girard.

6. **Phenacobius mirabilis** Girard.

7. **Notropis lutrensis** Baird & Girard.

Abundant.

8. **Notropis texanus** Girard.

A few specimens of a small Minnow of the *deliciosus* type, which we are compelled to believe identical with the *Cyprinella texana* of Girard.

Body more slender than in Girard's figure (perhaps deeper with age), the depth about 4½ in length. Head about 4. D. 8; A. 8. Scales about 5–35–4; 15 scales before dorsal. Eye 3 in head, a trifle longer than snout. Maxillary 3 in head, about reaching front of eye. Mouth nearly horizontal, the lower jaw little longer than upper. Lateral line nearly straight; fins moderate.

Color silvery, the scales above dark-edged; scales of lateral line with dark points; a small jet-black spot at base of caudal a little larger than pupil; a row of dark points along base of anal.

Compare with Meek's description of the type of *Cyprinella texana* (Proc. U. S. Nat. Mus., 1885, 124).

9. **Zygonectes notatus** Rafinesque.

10. **Gambusia patruelis** Baird & Girard.

11. **Lepomis pallidus** Mitchill.

12. **Hadropterus scierus serrula** Jordan & Gilbert. (36476.)

Rather abundant in flowing water in the river.

13. **Etheostoma fusiforme** Girard. (36541.)

Abundant in the spring outlet.

G.—RIO LAMPASAS, AT BELTON, TEXAS.

The Rio Lampasas, at a point some 5 miles south of Belton, Tex., is a clear, swift stream, fed by limestone springs, and with a gravelly or somewhat rocky bottom, the swift ripples alternating with deep quiet areas, in which the water reaches a depth of 6 or 7 feet. At the locality examined, just below the bridge on the toll-road, everything is favorable for seining, and our list, although short, is probably nearly complete for the locality. A large spring flows into the river at this point, and in the spring and its outlet we found all our specimens of *Ethcostoma* and *Gambusia*.

The Rio Leon, at a point about 3 miles north of Belton, just abo the upper railroad bridge, is a smaller stream than the Lampasas, a flows very shallow in a broad, rocky bed. Its waters are not very cl and wherever the current is slackened the bottom is covered with s mud. The locality is not a very good one, and nothing was fou that was not taken also in the Lampasas, into which the Leon flo a few miles lower down.

1. Lepidosteus osseus L.

The Gar Pikes obtained in the Lampasas have the round spots the sides of the jaws and the dark suborbital bar much more distin than in any other specimens we have seen. The eye is also unusua large. An examination of a considerable series of Gars shows that these as in various other respects the species are extremely variab and little weight can be attached to these differences.

2. Ictalurus punctatus Rafinesque.

3. Leptops olivaris Rafinesque.

Rather common.

4. Noturus nocturnus Jordan & Gilbert.

Scarce.

5. Moxostoma congestum Baird & Girard.
(*Ptychostomus albidus* Girard.)

Abundant in the Lampasas River in deep water, and reaching a co siderable size. A description of specimens from Belton is given in J dan's Cat. Fish. N. A. 1885, 19. It differs from *M. aureolum* chiefly the size of the dorsal fin, which is low and small, with but 12 rays. D sal always dusky; none of the fins red in life.

6. Ictiobus velifer Rafinesque, var.
(*Carpiodes tumidus* Baird & Girard.)

Our specimens agree very well with the figure given by Girard in t Report of the Mexican Boundary Survey. Compared with a specim of what I call *Ictiobus velifer*, of nearly the same size, taken in t White River, at Gosport, Ind., we find the following differences:

The general outline in the two is similar, but the Texas specimen less compressed, more robust in appearance, darker and more brassy color, with rather larger and coarser scales. The depth in both is o third the length. The head is 4 in length in the Texas specimen, $3\frac{3}{4}$ the other. The eye in both is 4 in head in specimens of 8 inches, a in both cases the snout projects not far beyond the mouth. The op cles in the Texas examples are strongly and sharply striate, as shown Girard's figure, while in the other the striations, similar in number a position, are very inconspicuous. In both, the long rays of the dors reach about to the base of the fourth ray from the last. In the Tex examples the anterior rays are much stouter than in the Indiana fis The scales in the Texas example are 6–37–5, in the other 7–40–6. A are without doubt referable to a single species.

7. **Campostoma anomalum** Rafinesque.

8. **Cliola vigilax** Baird & Girard.

9. **Notropis lutrensis** Baird & Girard.

10. **Notropis venustus** Girard.

Very abundant. Males with the fins bright orange-yellow in life; the tips milky. Back steel-blue.

11. **Notropis deliciosus** Girard.

Identical with specimens taken in the Rio Comal, but a little paler than the latter.

12. **Notropis texanus** Girard.

A single specimen, identical with those from the Trinity already mentioned.

13. **Gambusia patruelis** Baird & Girard, var.

Suborbital bar scarcely visible; otherwise essentially as in the Eastern form (*patruelis*).

14. **Zygonectes notatus** Rafinesque.

15. **Micropterus salmoides** Lacépède.

16. **Lepomis cyanellus** Rafinesque.

17. **Lepomis megalotis** Rafinesque.

Coloration peculiar; young, in life, light green, with light bronze streaks along the rows of scales, alternating with grayish-blue. Opercular flap with broad pale edging.

18. **Chænobryttus gulosus** Cuv. & Val.

In Leon River. (36546.)

19. **Hadropterus scierus** Swain (*serrula*).

Common in the river.

20. **Etheostoma lepidum** Baird & Girard. (36547.)

Abundant in the springs and their outlets.

General form and appearance of *E. cæruleum*. Olivaceous above; male with broad cross-bars, broader and less oblique than in *E. cæruleum*, of a bluish-green color, and separated by bright orange interspaces. First dorsal bluish on edge, then pale, then a stripe of bright orange, then dusky and yellowish at base. Soft dorsal speckled, with a diffuse median band of orange. Breast and throat orange; anal pale; ventrals bluish; caudal speckled, with some yellowish.

This species is extremely close to *E. cæruleum*, with which, through var. *spectabile*, it may prove to be connected by intermediate forms. In details of form there is no appreciable difference between the two. In *E. lepidum*, the head is, however, entirely scaleless, and the bars on the sides are greener in color, broader and less oblique. The nape is usually thinly scaled, as is often the case in *E. cæruleum*. We count D. IX, 12; A. II, 6. Scales, 5–48–8.

II.—RIO COLORADO, AT AUSTIN, TEXAS.

The Colorado River at Austin, Tex., is a broad, rather swift, cle stream, flowing over a bottom of gravel and rocks, occasionally mud in places where there is no current. Above Austin, a little over a m on the west side of the river, Spring Creek flows into the Colorad This is a very clear, cold, limestone stream, fed in summer, in large pa by the waters of Barton Spring. This spring is a round cavity so 50 feet across and 8 to 10 feet deep, from which flows a strong curre of pure cold water. The spring is full of water plants, and is the abo of Eels, *Gambusia*, and the Catfishes.

We seined very carefully and successfully the spring, the creek, a the river. Large numbers of individuals were obtained, but only small number of species. The fact is, apparently, that only a sm number of species actually inhabit the river. The Colorado River larger than the Washita or the White River, Indiana. It is a strea of similar character in many respects to these, and it was more th oughly explored than the Washita. Our records show 75 species in t White River (results of repeated work), 47 species in the Washita (r sults of the work of a single morning), and 25 in the Colorado.

1. **Ictalurus punctatus** Rafinesque.
2. **Amiurus nebulosus catulus** Girard.

In Barton Spring.

3. **Leptops olivaris** Rafinesque.
4. **Ictiobus carpio** Rafinesque.

Numerous specimens, apparently specifically identical with Northe specimens which we have called by this name, but rather more elonga than any of these, and rather more brassy in color.

Head short, 4 in length; depth, $3\frac{1}{10}$. Eye rather small, $4\frac{1}{3}$ in hea Snout projecting little beyond the mouth, its length a little more th that of eye. Opercle very strongly striate. Longest ray of dorsal n quite reaching to the middle of the fin when depressed; anterior ra little thickened, D. 32. Scales, 7–40–5. Body subfusiform, the ba compressed, little arched.

5. **Ictiobus velifer** Rafinesque (*tumidus*).
6. **Moxostoma congestum** Baird & Girard.
7. **Campostoma anomalum** Rafinesque.
8. **Pimephales notatus** Rafinesque.
9. **Cliola vigilax** Baird & Girard.
10. **Notropis lutrensis** Baird & Girard.
11. **Notropis venustus** Girard.

Abundant.

12. **Notropis notatus** Girard.

A few small specimens, which we refer to this species. They ha the caudal spot faint, overlaid by the scales, and but 34 scales in t

lateral line. In other respects they agree with *N. venustus*, from which species they may prove to be not distinct

13. **Notropis swaini** Jordan & Gilbert.

Abundant in the outlet of the spring.

14. **Hybopsis æstivalis** Girard.

Abundant in the current of the river.

15. **Anguilla anguilla rostrata** De Kay.

Abundant in Barton Spring.

16. **Gambusia patruelis** Baird & Girard (*humilis*).

17. **Zygonectes notatus** Rafinesque.

18. **Micropterus salmoides** Lacépède.

These specimens agree with Northern ones in form and squamation. The mouth is, however, a little smaller, and the coloration is somewhat different. The lateral band is broken up into numerous irregular dark cross-streaks, which reach the dorsal fin, and below this there are very distinct longitudinal streaks following the rows of scales. The caudal fin has narrow cross-streaks formed of dark spots.

19. **Lepomis cyanellus** Rafinesque.

20. **Lepomis megalotis** Rafinesque.

Coloration very green.

21. **Lepomis pallidus** Mitchill.

With cross-shades of coppery-red on lower part of sides.

22. **Percina caprodes** Rafinesque.

23. **Etheostoma lepidum** Baird & Girard. (36587.)

Abundant in the outlet to the spring.

24. **Aplodinotus grunniens** Rafinesque.

In the river.

2.—RIO SAN MARCOS, AT SAN MARCOS, TEXAS.

The San Marcos River takes its rise in a very large spring, one of the largest in the United States, in the limestone hills at San Marcos. From the spring flows a strong stream of very clear and somewhat cold water, rather swift, and full of grass and water-weeds. The size of the stream varies little with the change of season. Three or four miles below San Marcos the Rio Blanco, a long stream, flowing over gravel, and nearly dry in summer, flows into the San Marcos. Our collections were made in the Rio Blanco and in the Rio San Marcos, just below the mouth of the former. In the Rio Blanco we found little except *Notropis lutrensis*, which swarmed in all the pools. In the Rio San Marcos Darters were very abundant, as was to be expected in such waters.

1. **Lepidosteus osseus** Linnæus.

2. **Amiurus nebulosus catulus** Girard.

Two large specimens of the black Texas variety of the common Bu head. The original type of *Pimelodus catulus* Girard has the pector spines long, and belongs to *A. nebulosus* rather than to *A. melas.*

3. **Moxostoma congestum** Girard.

4. **Cliola vigilax** Baird & Girard.

Abundant.

5. **Notropis lutrensis** Baird & Girard.

Very abundant in the Rio Blanco; the males brightly colored. The specimens are more elongate than most of those from Iowa, but they not seem to differ specifically.

6. **Notropis swaini** Jordan & Gilbert.
(*Alburnus megalops* Girard; not *Cyprinus megalops* Raf.)

Not rare.

7. **Notropis deliciosus** Girard.

Scarce. Our specimens do not evidently differ from those taken us in the Des Moines.

8. **Hybopsis æstivalis marconis**, var. nov.

Abundant in the San Marcos, and reaching a length of 3 inche The specimens of this species from the San Marcos differ from the othe we have in a few respects. The eye is larger than in the types of *sterletus*, or than in specimens from the Arkansas River, it being 3½ head in *marconis* and about 4 in specimens of *æstivalis* of the sa size. The caudal peduncle is stouter in *marconis* than usual in *æstiv lis*, its least depth being half the greatest depth of the body.

H. hyostomus Gilbert is another very closely related species. In th the eye is still larger, and the snout shorter and less projecting. all the body is profusely sprinkled with black dots.

9. **Gambusia patruelis** Baird & Girard (var. *humilis*. Gthr.).
(*Zygonectes patruelis* Girard.)

Common; some of the specimens nearly 2 inches long; therefore ve large for this species.

These evidently represent the *Zygonectes brachypterus* of Cope, a apparently the *Gambusia gracilis* of Girard (=*humilis* Gthr.). From t ordinary *patruelis* they do not evidently differ except in color, t black suborbital spot being very faint or occasionally even obsolete, a the fins nearly plain. It is not likely that this form will be found su ficiently different from the ordinary *patruelis* to be worthy of speci notice.

10. **Anguilla anguilla rostrata** Le Sueur.

A large Eel taken in the San Marcos Spring

11. **Micropterus salmoides** Lacépède.

12. Lepomis megalotis Rafinesque.

Coloration greener than usual in Northern specimens, but otherwise very similar.

13. Hadropterus scierus serrula Jordan & Gilbert.

Abundant in the San Marcos; not different from Northern examples.

14. Etheostoma lepidum Baird & Girard.

Abundant.

15. Etheostoma lepidum Baird & Girard. (36516.)

16. Alvarius fonticola Jordan & Gilbert. (36523.)

Abundant in the San Marcos.

This species or variety is very close to the Northern *Alvarius* (*Microperca*) *punctulatus*. The only tangible differences seem to lie in the coloration and in the constant presence in *A. fonticola* of but one anal spine. The head in *A. fonticola* is nearly or quite devoid of scales. In life it is light olivaceous, the scales broadly margined behind with dusky. About eight indistinct dusky cross-blotches on back, the dorsal region dusted with fine dusky specks. A series of dark stitch-like short horizontal lines along the middle of the sides, forming an interrupted lateral streak. Three small dark spots at base of tail. Soft parts of vertical fins with light and dark bars. Lower half of spinous dorsal jet-black, then a broad red band narrowly edged above with black. A dusky streak below orbit and one in front of it.

J.—RIO COMAL, AT NEW BRAUNFELS, TEXAS.

At New Braunfels, Tex., the Rio Comal flows into the Guadalupe River. The latter is a considerable stream, very swift, and with rough rocky bottom, not suitable for seining at any point where we have seen it. In summer most of the water of the Comal comes from a large spring near New Braunfels, the outlet of which runs down a steep slope, turning a mill and flowing into the half dry bed of the main branch of the stream. Most of our fishing was done about the point of junction of the two streams. Not many species were obtained, but certain Minnows were extremely abundant.

1. Moxostoma congestum Baird & Girard.

2. Cliola vigilax Baird & Girard.

Very abundant.

3. Dionda episcopa Girard.

Small specimens, rather more slender than Girard's types. Lat. l. 40. Caudal spot distinct.

4. Notropis deliciosus Girard.

Abundant. Compared with specimens from the Des Moines, these show some differences. The form is more slender; the coloration is darker; the dark points on the edges of the scales being conspicuous.

These form a narrow, metallic lateral band, and also a dark area on upper edge of caudal peduncle.

The original *deliciosus* being from Texas, is probably the present form in which case the Northwestern form may be recognized, perhaps, as var *missuriensis.*

This species appears in Jordan's Catalogue Fish N. A., under the MSS name of *Notropis nocomis*, but the characters distinguishing it from *N. deliciosus* do not seem to warrant its separation. *Notropis comalis* another MSS. species mentioned in the same paper, should also be suppressed.

5. **Notropis lutrensis** Baird & Girard.

Only young ones taken.

6. **Notropis swaini** Jordan & Gilbert.

Very abundant. This species seems in Texas to take the place occupied in clear streams farther north by *N. scabriceps.*

7. **Hybopsis æstivalis** Girard (*marconis*).

8. **Dorosoma cepedianum** Le Sueur.

9. **Gambusia patruelis** Baird & Girard.

10. **Micropterus salmoides** Lacépède.

11. **Lepomis pallidus** Mitchill.

12. **Lepomis megalotis** Rafinesque.

13. **Hadropterus scierus serrula** Jordan & Gilbert.

14. **Etheostoma lepidum** Baird & Girard.

GENERAL CONSIDERATIONS.

The following general conclusions in regard to the distribution of fresh water fishes seem to follow from the data given in the present paper:

(1) Our species of small fishes, especially the *Etheostomatinæ*, are probably much less local in their distribution than has usually been assumed. Many of the species hitherto regarded as rare or local have been shown to have a very wide distribution in the West and South, and what is true of these species will very likely be found true of all those now known from only a few localities.

(2) As our knowledge of the geographical range of a species widens it becomes necessary to extend our ideas of the range of variation included by it, and we are compelled to admit under it geographical varieties or subspecies.

In other words, similar conditions obtain with the species of fishes that obtain with our birds, and when we know our fishes as well as we do our birds we shall have the same need of a trinomial nomenclature in ichthyology that is already felt in ornithology.

In fishes, as in birds, we find all possible grades of differences, and in the one case as in the other our only ultimate test of specific distinction is our failure to find or to recognize the intermediate forms.

(3) The fauna of the Ozark region is substantially identical with that of the hilly regions of Tennessee. The environment and conditions of life being similar, and water communication being free, we have a similar fauna in regions widely separated.

(4) The fauna of any Texas river is much less rich than that of any stream of similar size and character connected with the basin of the Mississippi. In other words, free water communication is essential to a varied fauna. The larger a river system the greater the number of species in each of its affluents. The reason for this seems obvious.

(5) The fish fauna of Texas differs from that of the Lower Mississippi Valley mainly by its deficiencies. Texas does not properly constitute a distinct faunal region. The paucity of its fish fauna is in some degree connected with its dry, hot summers. Most of the streams are flooded and often very muddy in spring, and are almost dry in summer; both conditions unfavorable to the increase of many species. These conditions do not affect the spring-fed streams of the limestone region.

(6) Some of the conditions favorable to the production in any stream of a large number of species of fishes are the following:

Clear water, a moderate current, a bottom of gravel preferably covered by a growth of weeds; water not too cold and not stagnant; connection with a large hydrographic basin; little fluctuation in the year in volume of the stream or in the character of the water.

These conditions are well realized in the Washita River and in certain affluents of the Ohio and the Tennessee, and in these, among American streams, the greatest number of species has been recorded.

INDIANA UNIVERSITY, *September* 18, 1885.

NOTES ON FISHES COLLECTED AT BEAUFORT, NORTH CAROLINA, WITH A REVISED LIST OF THE SPECIES KNOWN FROM THAT LOCALITY.

By DAVID S. JORDAN.

Two catalogues of the fishes of Beaufort Harbor have been published. The one (Notes on the Natural History of Fort Macon, N. C., and Vicinity, No. 3. Proc. Ac. Nat. Sci. Phila., 1877, 203–208), by Dr. Henry C. Yarrow, represents the collections made by Dr. Coues and Dr. Yarrow during their residence at Fort Macon, near Beaufort. The other (Notes on Fishes of Beaufort Harbor, North Carolina, Proc. U. S. Nat. Mus., 1878, 365–388), by Professor Gilbert and the writer, includes both the species of the previous list and those actually collected by the authors and the students (A. W. Brayton, B. W. Evermann, and others) who accompanied them at Beaufort in the summer of 1878.

During the present summer (1885) a considerable collection has been made at Beaufort by Mr. Oliver P. Jenkins, teacher of science in the Indiana State Normal School of Terre Haute, in connection with the Johns Hopkins Summer Laboratory, then in session at Beaufort.

Several species not taken by previous collectors were obtained b
Mr. Jenkins, and in preparing notes on these I have thought it bes
to recast the whole list, so as to include only those species concernin
which no doubt exists as to their pertinence to the Beaufort fauna
Some errors of identification exist, both in the list of Dr. Yarrow an
in that of Jordan & Gilbert, and in both some are included on in
sufficient or second-hand evidence.

[The numbers in parentheses in this list are those of Jordan & Gilbert's list. Thos
marked (J.) were first obtained at Beaufort by Mr. Jenkins.]

1. **Branchiostoma lanceolatum** Pallas. (118.)
2. **Carcharhinus terræ-novæ** Richardson. (117.)
3. **Sphyrna tiburo** Linnæus. (116.)
4. **Sphyrna zygæna** Linnæus. (115.)
5. **Carcharias littoralis** Mitchill. (114.)
6. **Pristis pectinatus** Latham. (J.)
7. **Pteroplatea maclura** Le Sueur. (111.)
8. **Dasybatis sayi** Le Sueur. (110.)
9. **Myliobatis freminvillei** Le Sueur. (109.)
10. **Stoasodon narinari** Müller & Henle. (108.)
11. **Manta birostris** Walbaum. (107.) (J.)
12. **Lepidosteus osseus** L. (J.)
13. **Acipenser brevirostrum** Le Sueur. (106.)
14. **Galeichthys felis** L. (104.)
15. **Ælurichthys marinus** Mitchill. (103.)
16. **Stolephorus browni** Gmelin. (102.)
17. **Opisthonema oglinum** Le Sueur. (99.)
18. **Brevoortia tyrannus** Latrobe. (97.)
19. **Elops saurus** L. (95.)
20. **Synodus fœtens** L. (93.)
21. **Cyprinodon variegatus** Lac. (89.)
22. **Fundulus majalis** Walbaum. (91, 92.)
23. **Fundulus heteroclitus** L. (90.)
24. **Gambusia patruelis** B. & G. (J.)
25. **Anguilla anguilla rostrata** Le Sueur. (105.)
26. **Conger conger** L. (J.)
27. **Hemirhamphus roberti** C. & V. (87.)
28. **Halocypselus evolans** L. (86.)
29. **Tylosurus marinus** Gmelin. (83.)
30. **Tylosurus caribbæus** Le Sueur. (84.)
31. **Tylosurus hians** C. & V. (J.)

32. Menidia menidia L. (81.)

33. Menidia laciniata Swain. (81.)

34. Querimana gyrans Jordan & Gilbert. (J.)

35. Mugil cephalus L. (80.)

36. Mugil curema C. & V. (79.)

37. Sphyræna borealis De Kay. (78.)

38. Echeneis naucrates L. (76.) (J.)

39. Remora remora L. (77.)

40. Elacate canada L. (J.)

41. Trichiurus lepturus L. (35.)

42. Scomberomorus maculatus Mitchill. (38.)

43. Caranx chrysus Mitchill. (46.)

44. Caranx latus Agassiz. (J.)

45. Caranx bartholomæi C. & V. (*C. beani* Jor.)

46. Caranx hippos L. (44, 45.)

47. Caranx crinitus Mitchill. (43.)

48. Vomer setipinnis Mitchill. (40.) (J.)

49. Selene vomer L. (41, 42.)

50. Chloroscombrus chrysurus L. (J.)

51. Trachynotus carolinus L. (48.)

52. Trachynotus rhomboides Bloch. (47.)

53. Stromateus triacanthus Peck. (50.)

54. Nomeus gronovii Gmelin. (J.)

One very young example, taken in a tow-net.

55. Pomatomus saltatrix L. (75.)

56. Serranus atrarius L. (71.)

57. Serranus dispilurus Günther. (J.)

(*Centropristis subligarius* Cope.)

A young specimen, taken in the eel-grass with the next species. Identical with specimens from Pensacola. This species bears some resemblance to *Serranus phœbe*, but the latter, when of equal size, has the eye much larger and the head more robust. There seems to be no doubt of the identity of *Centropristis subligarius* Cope with *C. dispilurus* Günther, described three years earlier from Trinidad.

58. Mycteroperca microlepis Goode & Bean. (J.)

59. Epinephelus morio C. & V. (70.)

60. Orthopristis chrysopterus L. (69.) (68.)

61. Stenotomus chrysops L. (67.)

62. Diplodus holbrooki Bean. (66.)

63. Diplodus probatocephalus Walb. (65.)

64. Diplodus rhomboides L. (64.)

65. Kyphosus sectatrix L. (63.)

66. Gerres gula C. & V. (62.)

67. Micropogon undulatus L. (61.)

68. Menticirrus alburnus L. (59, 60.)

69. Menticirrus littoralis Holbrook. (58.)

70. Sciæna ocellata L. (57.)

71. Sciæna chrysura Lacépède. (56.)

72. Liostomus xanthurus Lacépède. (54, 55.)

73. Pogonias chromis Lacépède. (53.)

74. Cynoscion regale Bloch. (52.)

75. Cynoscion maculatum Mitchill. (51.)

76. Chætodipterus faber L. (74.)

77. Hiatula onitis L. (31.)

78. Platyglossus bivittatus Bloch. (32.)

79. Platyglossus maculipinna Müller & Troschel. (33.)

80. Gobiosoma bosci Lac. (J.)

81. Gobionellus encæomus Jordan & Gilbert. (J.)

Many specimens.

This species is a *Gobionellus* rather than a *Gobius*. It is exceedingly close to *G. stigmaticus* Poey, and on comparison of specimens we can see no differences except that in *encæomus* the body is a little more slender, the markings on the head are obsolete, and the pale cross bands seen in some specimens of *G. stigmaticus* are not found in *G. encæomus*.

82. Prionotus evolans L. (30.)

83. Prionotus tribulus C. & V. (29.)

84. Prionotus scitulus Jordan & Gilbert. (28.)

85. Cephalacanthus volitans L. (27.)

86. Upsilonphorus y-græcum C. & V. (26.?) (J.)

87. Batrachus tau L. (25.)

88. Chasmodes bosquianus Lacépède. (24.)

89. Isesthes punctatus Wood. (23.)

90. Hypleurochilus geminatus Wood. (22.)

All the specimens taken by us at Beaufort, as well as one example sent to me from Pensacola by Mr. Stearns, belong to the form described as *H. geminatus* by Jordan & Gilbert in the Synopsis Fish N. A. All (5) of Mr. Jenkins's specimens agree with the type described as *H. multifilis*. The former have the orbital cirri "not large, shorter than eye, branched at tip." The latter have the cirri "very high [not much shorter than head], each with four smaller ones at base." In color

both forms vary much with their surroundings. As I find no other difference between *multifilis* and *geminatus* I have no doubt of their specific identity. The latter is probably the female, the former the male of the same species. Similar sexual differences exist in other Blennies.

91. Zoarces anguillaris Peck. (21.)

92. Ophidion marginatum De Kay. (20.)

93. Phycis regius Walbaum. (19.)

94. Paralichthys albigutta Jordan & Gilbert. (15, 16.)

95. Paralichthys lethostigma Jordan & Gilbert. (15, 16.)

96. Paralichthys dentatus L. (15, 16.)

97. Ancylopsetta quadrocellata Gill. (17.)

98. Bothus maculatus Mitchill. (18.) (J.)

99. Citharichthys macrops Dresel. (J.)

One specimen in good condition. This is the second specimen known of this well-marked species. It agrees very closely with the description given by Mr. Dresel.

100. Etropus crossotus Jordan & Gilbert. (J.)

Two large specimens. This is the northernmost locality at which this widely-distributed species has been taken.

101. Etropus microstomus Gill. (J.)
(? *Citharichthys microstomus* Gill.)

A single fine specimen, apparently the third individual of the species known. It is less slender than the specimen described by Gill from Beasley's Point, and also less slender than the one described from Long Island by Ensign Dresel, but in other respects the agreement is reasonably close.

Color brown, with very faint longitudinal streaks of darker brown along the rows of scales. Body with roundish rather irregular ink-like spots of black, some of them nearly as large as the eye; four of these spots along the lateral line and two at base of caudal; spots above lateral line forming two irregular rows, about 7 in each row, concurrent with the back. A row of round spots along dorsal, and one along anal, besides finer punctulations. Whole left side of body, and all fins, covered with fine dark dots. Right side plain whitish.

Body ovate. Head, $4\frac{1}{2}$ in length to base of caudal; depth, $1\frac{2}{10}$ ($2\frac{1}{4}$ in total). D. 76; A. 56. Lat. l. 43. Maxillary, $4\frac{1}{3}$ in head. Eye, 3 in head. Snout very short, much shorter than eye. Preopercle of blind side without cirri. Pectoral, $1\frac{1}{7}$ in head.

Length of specimen about $3\frac{1}{2}$ inches.

102. Achirus achirus mollis Mitchill. (13.)

103. Aphoristia fasciata Holbrook. (12.)

104. Fistularia tabaccaria L. (11.)

105. Siphostoma floridæ Jordan & Gilbert. (10.)

Abundant.

106. Siphostoma louisianæ Günther. (10.)

Less common.

107. Hippocampus punctulatus Guichenot. (9.) (J.)

One specimen. D. 18. Head without cirri; body everywhere wi light blue dots.

108. Hippocampus hudsonius De Kay.

The specimen described by Jordan & Gilbert in the Synopsis Fis N. A. came from Beaufort.

109. Monacanthus hispidus L. (8.)

110. Alutera schœpfi Walbaum. (6, 7.)

111. Ostracion trigonum L. (5.)

112. Tetrodon turgidus Mitchill. (4.) (3.?)

113. Chilomycterus schœpfi Walbaum. (2.)

(*Chilomycterus geometricus* Bloch & Schneider.)

114. Lophius piscatorius L. (1.)

INDIANA UNIVERSITY, *September* 25, 1885.

LIST OF FISHES COLLECTED AT HAVANA, CUBA, IN DECEMBER, 1883, WITH NOTES AND DESCRIPTIONS.

By DAVID S. JORDAN.

In the Proceedings of the U. S. National Museum for 1884, pp. 103–150, is given an account of the collections of fishes obtained by me at Key West in December, 1883. After finishing the work there described I spent ten days in Havana, devoting all my time to making collections of fishes in the various markets of the city. Two hundred and five species were obtained. These are enumerated in the present paper, with such notes as seem to me worthy of preservation.

In connection with each species I give the Spanish names *as heard by myself in the market*, and in all cases where the specific name adopted by me is different from that used in Professor Poey's excellent "Enumeratio Piscium Cubensium," I have given Poey's name in the synonymy.

I have had especial opportunities to be sure of my identifications of Poey's species, as I spent almost every evening of this time at the professor's house, and my list of the day was commented on, and in all disputed cases specimens were compared directly with the descriptions and drawings of his MSS. Ictiologia Cubana.

In some cases I have not been able to agree with Professor Poey, who has regarded the Cuban fauna as in some degree distinct from that of the Antilles generally. This has been almost unavoidable on his part, as the descriptions extant of fishes from other parts of the West Indies are very unsatisfactory. There can be no doubt, however, that Cuba forms, with the other islands of the West Indies, a continuous fauna, the differences being, as a rule, only those due to differences in the character of the bottoms and the shores.

In some cases I have regarded species of Poey as nominal, two or more of them, perhaps, referring, in my opinion, to one species. As to this point I may here quote from a sketch of the work of Professor Félipe Poey, published by me in the Popular Science Monthly for 1884, p. 549.

"Of late the types of the new species described by Professor Poey have been, after being carefully studied by him and represented in life-size drawings, mostly sent to other museums. * * * Duplicates have been rarely retained in Havana, the cost of keeping up a permanent collection being too great. As a result of this, Professor Poey's work has sometimes suffered from lack of means of comparing specimens

taken at different times. There is no zoological laboratory in Cuba, e cept the private study of Professor Poey, and here, for want of roo and for other reasons, drawings have, to a great extent, taken the pla of specimens." * * * Poey's writings "give some evidence of t disadvantages arising from solitary work, without the aid of the ass ciation and criticism of others, and without the broader knowledge the relations of groups which comes from the study of more than o fauna. On the other hand, Professor Poey has enjoyed the great a vantage of an exhaustless supply of material, for there are few por where fishes are brought in in such quantities or in such profusion variety as in the markets of Havana."

Besides my many personal obligations to Professor Poey, I am al indebted for many favors to Señor Leonel Plasencia, a naturalist-c lector in Havana, a former pupil of Poey, and a very skillful taxidermis To two of the fish-dealers in the Pescaderia Grande, or wholesale marke Señores José Rodriguez and Félipe Guadalupe, I am also indebted f intelligent aid in the work of making collections.

A full series, including nearly all the species here mentioned, has bee sent to the U. S. National Museum. The rest of the collection is in t museum of the Indiana University. Duplicates from the Key West an Havana collections have also been presented to the British Museum.

Several of the more important genera of Cuban fishes, as *Epinephelu Hæmulon*, *Calamus*, *Lutjanus*, *Scarus*, &c., have formed the subject special papers by myself and my associates or students in these Pr ceedings or in those of the Academy of Natural Sciences at Philadelphi These groups are therefore but briefly noticed here.

SCYLLIDÆ.

1. Ginglymostoma cirratum Gmelin.

GALEORHINIDÆ.

2. Galeus canis Mitchill. *Boca Dulce.*

3. Carcharhinus falciformis Bibron. *Cazon.*

4. Carcharhinus terræ-novæ Richardson.
(? *Squalus punctatus* Mitchill, preoccupied. *Carcharias* (*Scoliodon*) *lalandi* Mü ler & Henle. *Scoliodon porosus* Poey.)

Specimens from Havana are exactly identical with others from Ke West, which belong unquestionably to *C. terræ-novæ*. *Sc. lalandi* without doubt the same, the difference in the form of the caudal bein doubtless, as Dr. Günther has suggested, due to age. *Carcharhinus lo gurio* of the Pacific coast is very closely allied to *C. terræ-novæ*, but ha a notably longer snout.

SPHYRNIDÆ.

5. Sphyrna tiburo Linnæus.
(*Reniceps tiburo* Poey.)

TRYGONIDÆ.

6. **Urolophus torpedinus** Desmarest.

7. **Dasyatis sayi** Le Sueur.

ALBULIDÆ.

8. **Albula vulpes** L. *Macabi.*
(*Albula conorhynchus* Poey.)

ELOPIDÆ.

9. **Elops saurus** L. *Carajo Realc.*

10. **Megalops atlanticus** Cuv. & Val. *Sabalo.*

CLUPEIDÆ.

11. **Clupea pseudohispanica** Poey. *Sardina de España.*

12. **Clupea sardina** Poey. *Sardina de Ley.*

I do not believe that this species is identical with any of those described by Cuvier & Valenciennes. Among the species called *Harengula*, this one, as Poey has stated, is well distinguished by the looseness of its scales.

13. **Clupea clupeola.** Cuv. & Val. *Sardina Escamuda.*

This species seems to be the *Harengula clupeola* C. & V. and the *Clupea humeralis* of Günther. The poorly-described *Alausa striata* C. & V. may be the same fish, and I do not see that it differs in any respect from the descriptions of the European *Clupea latulus*. *Harengula pensacolæ* Goode & Bean is a different species, having the body considerably deeper. Very similar to the latter is the *Harengula humeralis* of C. & V. and also *Harengula jaguana* of Poey. Possibly *humeralis jaguana* and *pensacolæ* may prove identical. The *Clupea macrophthalma* of Ranzani, as described by Günther, is different from any of these and the *Clupea maculosa* of Cuv. & Val. seems to be the same as the *macrophthalma*.

14. **Opisthonema oglinum** Le Sueur. *Machuelo.*
(*Opisthonemus thrissa* Poey.)

ENGRAULIDIDÆ.

15. **Cetengraulis edentulus** Cuvier. *Bocon.*
(*Cetengraulis brevis* Poey.)

There is no evident difference between *C. brevis* and *C. edentulus*. Our Cuban specimens have been compared with an example of the latter from Rio Janeiro.

16. **Stolephorus browni** Gmelin. *Bocon.*

Excessively common.

17. **Stolephorus perfasciatus** Poey.

SYNODONTIDÆ.

18. Synodus spixianus Poey. *Lagarto.*

19. Synodus intermedius Agassiz.

20. Synodus myops Forster.
(*Trachinocephalus brevirostris* Poey; probably based on an error in copying o perhaps on a mutilated example.)

CYPRINODONTIDÆ.

21. Gambusia punctata Poey. *Guajacon.*

Very abundant in the Rio Almendares.

MURÆNIDÆ.

22. Sidera ocellata Agassiz.

23. Sidera moringa Cuvier. *Morena Pintita.*
(*Gymnothorax rostratus* Agassiz, Poey. *Gymnothorax picturatus* Poey. ? *Gym nothorax versipunctatus* Poey.)

This common species is extremely variable in coloration. In som specimens the dark markings almost entirely obscure the ground colo confining it to scattered reticulations, while in others the pale greenis ground color predominates. There is also considerable variation in th length of the head, more than enough to account for the differences no ticed by Poey between his *picturatus* and *rostratus*. There is also con siderable difference in the size of the eye, it varying from one-third t one-half the length of the snout in specimens of similar size.

24. Sidera vicina Castelnau.

One specimen, agreeing very closely with Dr. Günther's descriptio but not with any of Poey's.

Color yellowish-brown, densely, closely, and irregularly marbled, an reticulated with dark brown or leather color, the surface being abou equally divided between this and the lighter ground color. Head, fins and inside of mouth similarly marked. Anal with a conspicuous pal edge. Angle of mouth with a brown spot. No dark spot around gil opening.

Other characters essentially as described by Dr. Günther. Head, 2 in trunk. Cleft of mouth 2⅝ in head. Eye, 2 in snout.

Many of the species of this genus described by Poey must be merel nominal, based on color variations, but none of them seems to corre spond to this.

CONGRIDÆ.

25. Conger conger L. *Congrio.*
(*Conger esculentus* Poey.)

ANGUILLIDÆ.

26. Anguilla anguilla rostrata Le Sueur. *Anguila.*
(*Muræna cubana* Poey.)

My specimens agree precisely with others from the United States.

BELONIDÆ *

27. Tylosurus hians Cuv. & Val.
(*Belone maculata* Poey.)

28. Tylosurus raphidoma Ranzani. *Agujon.*
(*Belone crassa* and *B. melanochira* Poey.)

29. Tylosurus notatus Poey. *Agujon.*

30. Tylosurus euryops Bean & Dresel.
(? *Belone depressa*, Poey.)

Several specimens.

SCOMBERESOCIDÆ.

31. Hemirhamphus pleei Cuv. & Val. *Escribano.*
(*Hemirhamphus filamentosus* Poey.)

32. Hemirhamphus unifasciatus Ranzani. *Escribano.*
(*Hemirhamphus poeyi* Poey.)

SYNGNATHIDÆ.

33. Hippocampus punctulatus Guichenot. *Caballito.*

FISTULARIIDÆ.

34. Fistularia tabaccaria L. *Trompeta.*

MUGILIDÆ.†

35. Mugil liza Cuv. & Val. *Lebrancho.*
(*Mugil lebranchus* Poey.? *Mugil brasiliensis* Agassiz, not of later writers.)

36. Mugil gaimardianus Desmarest.

37. Mugil curema Cuv. & Val. *Liza.*
(*Mugil brasiliensis* Poey, not of Agassiz, which is probably *M. liza*.)

38. Mugil trichodon Poey.

39. Joturus pichardi Poey. *Joturo.*
(*Joturus stipes* Jordan & Gilbert.)

A large specimen from a river of the interior was obtained for me by Señor Leonel Plasencia.

Head, $4\frac{4}{5}$ in length; depth, $3\frac{3}{5}$. D. IV–I, 9; A. III, 9. Scales, 42—13 or 14. Length about 20 inches.

Color dull olivaceous, without distinct markings, paler below.

I have compared this specimen carefully with the description of *Joturus stipes* Jordan & Gilbert given in these Proceedings for 1882, p. 373. I find no difference at all which cannot be readily accounted for by the greater size of the individual now before me. I have there-

*An account of the species of this group will be given elsewhere.

†See Jordan & Swain, Proc. U. S. Nat. Mus., 1884, for an account of the species of *Mugil*.

fore no doubt that *Joturus stipes* is specifically identical with *Joturus pichardi*. The teeth appear on cursory examination to be, as stated by us, "coarse, bluntly conical," but a lens shows that, as Poey has stated, they are broad truncate incisors, with their free edges serrate.

ATHERINIDÆ.

40. Atherina stipes Müller & Troschel. *Cabezota.*
(*Atherina laticeps* Poey.)

Rather common. Our specimens agree entirely with others from Key West, which are *A. reliana* Goode & Bean.

SPHYRÆNIDÆ.*

41. Sphyræna picuda Bloch & Schneider. *Picuda.*

42. Sphyræna guaguanche Cuv. & Val. *Guaguanche Pelon.*

43. Sphyræna picudilla Poey.

POLYNEMIDÆ.

44. Polynemus virginicus L. *Barbudo.*
(*Trichidion plumieri* Poey.)

SCOMBRIDÆ.

45. Scomberomorus regalis Bloch *Pintada.*

Scomberomorus maculatus Mitchill, also called *Pintada*, is occasionally sent over to the market from Key West.

46. Scomberomorus cavalla Cuvier. *Sierra Serrucho.*
(*Cybium caballa* Poey.)

47. Acanthocybium solandri Cuv. & Val. *Peto.*
(*Acanthocybium petus* Poey.)

CARANGIDÆ.

48. Decapterus punctatus Agassiz.

49. Trachurops crumenophthalmus Bloch. *Chicharro.*
(*Trachurops plumieri* Poey.)

50. Caranx ruber Bloch. *Cibi Mancho ò Carbonero.*
(*Carangoides iridinus* Poey.)

51. Caranx bartholomæi Cuv. & Val. *Cibi Amarillo.*
(*Carangoides cibi* Poey.)

52. Caranx chrysos Mitchill. *Cojinúa.*

53. Caranx sexfasciatus Quoy & Gaimard. *Jurel.*
(*Caranx latus* and *C. lepturus* Agassiz. *Carangus fallax* Cuv. & Val.)

54. Caranx hippos Linnæus. *Jiguagua.*

55. Caranx lugubris Poey. *Tiñosa.*

* For notes on the *Sphyræniдæ* of this collection see a paper by Meek & Newland, in Proc. Ac. Nat. Sci. Phila., 1884.

56. **Caranx crinitus** Mitchill. *Pámpano.*
(*Blepharis crinitus* and *Scyris analis* Poey.)

57. **Vomer setipinnis** Mitchill. *Jorobado.*

In the Proc. U. S. Nat. Mus., 1885, 196, Messrs. Goode & Bean adopt for this species the name of *Vomer vomer*, regarding it as the *Zeus vomer* of Linnæus, which has been hitherto considered as belonging to a species with falcate dorsal (*Selene vomer*). We may, therefore, inquire into the history of the name *Zeus vomer*.

In the tenth edition of the Systema Naturæ the name *Zeus vomer* is first given, and it is based on the *Rhomboida alepidota argentea*, &c., of Sloan, and the *Zeus cauda bifurca* of the Museum Adolphi Frederici. In the twelfth edition of the Systema Naturæ the description of *Zeus vomer* is somewhat lengthened, and the reference to Brown disappears. It is evident that we should consider the fish described by Linnæus himself in his account of the museum of Adolphus Frederic as the type of his species, rather than the fish of Brown, erroneously included in the synonymy. It seems also that the later omission of the reference to Brown shows that Linnæus had become aware that Brown's fish was not identical with his *Zeus vomer*.

The *Rhomboida alepidota*, &c., of Brown is apparently *Vomer setipinnis*, while the *Zeus cauda bifurca*, the basis of *Zeus vomer*, is evidently *Selene vomer*, as is shown by the very good figure and by the description which I here quote in full:

"**Zeus cauda bifurca.** Art. gen. 50, syn. 28.
"*Gallus marinus f. Faber indicus.* Will. app't. 7.
"*Abacatuaja.* Margr. bras., 161.
"*Brasile* Bristle Fin. Pet. gaz., 3, t. 59, f. 3.

"Habitat in Brasilia.

"Corpus compressum and fere membranaceum ut in Pleuronecte. Color argenteus absque squamis, nitidissimus. Humeri valde gibbi. Linea lateralis valde sursum incurvata in medio.

"Caput maxime declive, a summis humeris linea recta ad os. Membrana branchiostega radiis 6. Maxilla inferior transversa ad os. Pinna dorsi anterior radiis 8, quorum 1 brevis, 2 longissimus, 3 and 4 connexi praecedentibus; 5, 6, 7, 8 brevissimi non connexi. Posterior radiis 22, quorum 1 brevis spinosus, 2 longissimus mollis; 3, 4, 5 minores, reliqui ad huc minores aequales. Pectorales radiis 18 mollibus, lanceolatæ. Ventrales radiis 4, longiores pectoralibus, apice nigricantes. Ani radiis 19, quorum 1 spinosus brevis; 2, 3, 4 longiores, lanceolati. Reliqui aequales. Caudæ radiis 20, valde bifurca. Spina in medio abdominis prominet inter pinnas ventrales, pone anum, bidentata. Spina prima in pinna ani antrorsum prominet basidente aucta." (Linnæus. Museum Adolph. Frederici, p. 67.)

Widely distributed and common as this fish is, it seems to have received no binomial name prior to that given by Mitchill.

58. **Chloroscombrus chrysurus** Linnæus. *Casabe.*

59. **Trachynotus rhomboides** Bloch. *Palometa.*
(*Trachynotus oratus* Poey.)

As already stated by Meek & Goss, the *Trachynotus carolinus* of Poe is the species for which these writers have adopted the name of *Trach notus rhodopus* Gill. The true *T. carolinus* has not yet been found i Cuba.

60. **Oligoplites saurus**, Bloch & Schneider. *Zapatero.*
(*Oligoplites occidentalis* Poey.)

CORYPHÆNIDÆ.

61. **Coryphæna hippurus** L. *Dorado.*

PEMPHERIDÆ.

62. **Pempheris schomburgki** Muller & Troschel. *Catalufa de lo Alto.*
(*Pempheris mulleri* Poey.)

Four examples obtained. These agree well with Poey's descriptio of *Pempheris mulleri* and also fairly with Steindachner's description *Pempheris schomburgki*, both of these accounts being from Cuban spec mens. The original description of *Pempheris schomburgki* is very bri and inadequate, but as it agrees tolerably well with the present specie it seems necessary to regard it as identical with it. *Pempheris poe* Bean appears to be unquestionably different.

In my Catalogue of the Fishes of the Pacific Coast of the United State in the current volume of these Proceedings, I have inadvertently omitte *Pempheris mexicanus*, described from Acapulco by Cuvier & Valencienne An unnamed species of *Microspathodon*, obtained by Professor Gilbe at Panama, should also have been included.

HOLOCENTRIDÆ.

63. **Holocentrum ascensione** Osbeck. *Carajaclo.*
(*Holocentrum matajuelo* Poey.)

This species exhibits much variation in the depth of the body and i the prolongation of the soft parts of the vertical fins. None of the nu merous species described by Poey seem to be identical with *H. ascension* but I doubt if all are distinct from each other.

In life this fish is bright silvery red with pearly streaks above alon the rows of scales; some specimens somewhat darker and tinged wit olive above. Head quite red above. Fins light red, the spinous dors largely golden olive, its edge scarlet. An oblique white stripe acros the cheeks, disappearing in alcohol.

64. **Myriopristis jacobus** Cuv. & Val. *Candil.*
(*Myriopristis lychnus* Poey.)

My numerous specimens of this beautiful fish agree fairly well wit the accounts of *M. jacobus*, and I feel warranted in regarding *M. lychn*

as identical with *M. jacobus*. *Rhinoberyx chryseus* Cope, based on a young *Myriopristis*, is probably not different from *M jacobus*.

In life, deep crimson, paler below; a deep blood-red bar across opercle and base of pectoral, becoming black in spirits. Vertical fins blood-red, with whitish edge. Pectorals and ventrals pale red.

CENTROPOMIDÆ.

65. Centropomus undecimalis Lac. *Robálo.*
(*Centropomus appendiculatus* Poey.)

There seems to be no evidence that this species is not the original *undecimalis* of Lacépède. According to Dr. Vaillant, the specimens examined by Cuvier & Valenciennes have the appendages to the air-bladder which are characteristic of this species.

66. Centropomus pedimacula Poey.

67. Centropomus ensiferus Poey.
(*Centropomus affinis* Steindachner.)

Allied to *C. armatus* Gill of the Pacific coast, but distinct from the latter.

SERRANIDÆ.*

68. Serranus phœbe Poey.

69. Serranus tabacarius Cuv. & Val. *Jacome.*
(*Haliperca jacome* Poey.)

Color in life brownish-red above, with areas of light yellow on sides of back; yellow below eye; sides bright orange-yellow; belly and lower parts of head red; lower fins light orange; caudal red, with two stripes of deep red; dorsal red-shaded, a maroon blotch on each part extending upward from a similar blotch on back; iris yellow.

70. Serranus formosus L. *Serrano.*
(*Diplectrum radians* Poey.)

71. Hypoplectrus indigo Poey. *Vaca.*
(*Hypoplectrus indigo* and *borinus* Poey.)

In life everywhere deep clear blue; body with about eight cross-bars of sky-blue on a ground color of indigo. A broad deep-blue band below the eye, with a paler area on each side of it; fins nearly plain, the pectoral palest, tinged with yellowish. The *H. borinus* of Poey is certainly the adult of this species.

72. Paranthias furcifer Cuv. & Val. *Rabirubia de lo Alto.*
(*Brachyrhinus furcifer* Poey; the name *Brachyrhinus* is preoccupied.)

73. Mycteroperca falcata Poey. *Abadejo.*

74. Mycteroperca tigris Cuv. & Val. *Bonaci Gato.*
(*Trisotropis camelopardâlis* Poey: red variety.)

75. Mycteroperca interstitialis Poey.

* See Jordan & Swain, Proc. U. S. Nat. Mus., 1884, for notes on *Epinephelus* and allied genera.

76. **Mycteroperca bonaci** Poey. *Aguaji Bonaci.*
(*Trisotropis bonaci, brunneus,* and *aguaji* Poey.)

Mycteroperca microlepis Goode & Bean (*Aguaji*) was also seen in som numbers in the markets, but all the specimens had been shipped fro Key West.

77. **Mycteroperca venenosa** Linnæus. *Bonaci de Piedra.*
(*Trisotropis petrosus* Poey.)

78. **Mycteroperca venenosa apua** Bloch. *Bonaci Cardenal.*
(*Trisotropis cardinalis* Poey.)

In a review of the genus *Epinephelus* (Proc. U. S. Nat. Mus., 188 389), Professor Swain and the writer have adopted the name *apua* for species of *Epinephelus*, *E. catus* C. & V.

A careful recomparison of the accounts given by Bloch & Mar grave have convinced me that the original *Bodianus apua* of Bloch i the red variety of *Mycteroperca venenosa*, as suggested by us on pag 391 of the paper cited. The name *apua* has therefore priority ov *Johnius guttatus* Bloch & Schneider, as a varietal name for the Bona Cardenal.

The *Bodianus marginatus* Bloch & Schneider, based on the *Pira apia* of Maregrave, is also the same fish, without doubt.

For the "*Cabrilla*," called by us *Epinephelus apua*, we must eithe adopt the name *guttatus* L., for the reasons given by Goode & Bea or else we must take the name *catus* C. & V., which seems to be th earliest tenable specific name ever given to the species. The nam *Lutjanus lunulatus* of Bloch & Schneider is not available, because it i preoccupied by the same authors higher up on the same page.

79. **Promicrops itaiara** Lichtenstein. *Guasa.*
(*Promicrops guasa* Poey.)

80. **Epinephelus morio** Cuv. & Val. *Cherna Americana; Cherna de Vivero.*

Most of the individuals of this species come into the Cuban marke from Key West; hence the common names heard in the markets.

81. **Epinephelus mystacinus** Poey. *Cherno de lo Alto.*

82. **Epinephelus striatus** Bloch. *Cherna Criolla.*

83. **Epinephelus ascensionis** Osbeck. *Cabra Mora.*
(*Epinephelus punctatus* Poey.)

84. **Epinephelus catus** Cuv. & Val. *Cabrilla.*
(*Epinephelus lunulatus* Poey.)

The reasons for discarding the specific names *apua* and *lunulatus* fo this species have been given above.

85. **Alphestes afer** Bloch. *Guaseta.*
(*Prospinus chloropterus* Poey.)

86. **Enneacentrus guttatus** Linnæus. *Enjambro*
(*Petrometopon apiarius* Poey.)

87. Enneacentrus guttatus coronatus Cuv. & Val. *Enjambro.*
(*Petrometopon guttatus* Poey.)

88 (a). Enneacentrus fulvus Linnæus. *Guativere Amarilla.*
(*Enneacentrus punctulatus* Poey.)

88 (b). Enneacentrus fulvus ruber Bloch & Schneider. *Guativere Colorada.*

88 (c). Enneacentrus fulvus punctatus L. *Guativere.*

These three forms differ strikingly in color and color only. Of these the yellow form is least common, perhaps inhabiting deepest water.

89. Dermatolepis inermis Cuv. & Val.

RHYPTICIDÆ.

90. Rhypticus saponaceus Bloch & Schneider. *Jaboncillo.*

PRIACANTHIDÆ.

91. Priacanthus catalura Poey. *Catalufa.*
(*Priacanthus macrophthalmus* C. & V.; not *Anthias macrophthalmus* Bloch.)

SPARIDÆ.*

92. Lutjanus caxis Bloch & Schneider. *Caji.*

93. Lutjanus jocú Bloch & Schneider. *Jocú.*

94. Lutjanus griseus L. *Caballerote.*
(*Lutjanus caballerote* Poey.)

95. Lutjanus cubera Poey. *Cubera.*
(? *Genyoroge canina* Steindachner.)

96. Lutjanus profundus Poey. *Pargo de lo Alto.*

97. Lutjanus buccanella Cuv. & Val. *Sesi de lo Alto.*

98. Lutjanus synagris L. *Biajaiba.*

99. Lutjanus mahogani Cuv. & Val. *Ojanco.*
(*Latjánus Ojanco* Poey.)

100. Lutjanus aya Bloch. *Pargo Guachinango.*
(*Bodianus aya* Bloch. *Mesoprion vivanus* C. & V. *Mesoprion campechianus* Poey. *Lutjanus blackfordi* Goode & Bean.)

Among the known species of *Lutjanus*, the only one which could be the *Bodianus aya* of Bloch is the present one, and except in the matter of the form of the anal, a detail to which Bloch's artist was not likely to have given close attention, the figure of Bloch represents very fairly the *L. vivanus*. The *Lutjanus aya* of C. & V., which is *L. profundus* Poey, cannot be *aya* of Bloch, as the iris is conspicuously bright yellow in *L. profundus*, while in the *aya* it is said to be red.

* See Jordan & Swain, Proc. U. S. Nat. Mus., 1884, for notes on *Hæmulon* and on the species of *Lutjanus* and allied genera. Also in the same volume of the Proceedings see a review of *Calamus* by Jordan & Gilbert.

101. **Lutjanus analis** C. & V. *Pargo criollo.*

102. **Ocyurus chrysurus** Bloch. *Rabirubia.*

103. **Rhomboplites aurorubens** C. & V. *Cagon.*
(*Rhomboplites elegans* Poey.)

104. **Tropidinius dentatus** Guichenot. *Arnillo.*
(*Tropidinius arnillo* Poey.)

105. **Aprion macropthalmus** Müller & Troschel. *Voraz.*
(*Platyinius vorax* Poey.)

106. **Etelis oculatus** Cuv. & Val. *Cachucho.*

107. **Verilus sordidus** Poey. *Escolar Chino*

A single specimen from deep water, procured for me by my friend Señor Leonel Plasencia.

108 **Orthopristis chrysopterus** L.
(*Orthopristis fulvomaculatus* Poey. *Orthopristis poeyi* Scudder.)

109. **Anisotremus virginicus** L. *Catalineta.*
(*Anisotremus virginicus* and *A. spleniatus* Poey.)

110. **Hæmulon gibbosum** Walbaum. *Jallao.*
(*Hæmulon album* Poey.)

111 **Hæmulon acutum** Poey. *Ronco blanco.*
(*Hæmulon acutum*, *albidum*, and *serratum* Poey.)

112. **Hæmulon carbonarium** Poey. *Ronco Carbonero.*

113. **Hæmulon melanurum** L. *Jenîguana.*
(*Hæmulon dorsale* Poey.)

114. **Hæmulon sciurus** Shaw. *Ronco Amarillo.*
(*Hæmulon luteum* and *Hæmulon multilineatum* Poey ; the latter a color variety.)

115. **Hæmulon plumieri** Lacépède. *Ronco Ronco.*
(*Hæmulon arara* Poey)

116. **Hæmulon flavolineatum** Desmarest. *Ronco Condenado.*

117. **Hæmulon tæniatum** Poey.

118. **Hæmulon aurolineatum** Cuv. & Val. *Jenîguano.*
(*Hæmulon jenîguano* Poey.)

119. **Calamus bajonado** Bloch & Schneider. *Bajonado.*

120. **Calamus calamus** Cuv. & Val.
(*Calamus orbitarius* Poey.)

121. **Calamus proridens** Jordan & Gilbert. *Pez de Pluma.*
(*Calamus megacephalus* Poey, in part, not of Swainson.)

122. **Diplodus flavolineatus** Cuvier & Valenciennes.

Very close to the next species and about equally common. The specimens from Key West formerly referred by me to *D. unimaculatus* all belong to *D. flavolineatus.*

123. Diplodus unimaculatus Bloch. *Saloma.*
(*Sargus caribæus* Poey.)

A more elongate fish than the preceding, the depth $2\frac{1}{2}$ in body, instead of 2. *Diplodus probatocephalus* (*Sargo Raiado*) is occasionally brought into the Havana market from Key West. It does not seem to occur about the coast of Cuba.

APOGONIDÆ.

124. Apogon pigmentarius Poey.

Several specimens. Bright carmine-red, profusely and irregularly covered with small black dots like fly-specks.

MULLIDÆ.

125. Upeneus martinicus Cuv. & Val. *Salmonete Amarilla.*
(*Mulloides flavorittatus* Poey.)

126. Upeneus maculatus Bloch. *Salmonete Colorado.*

SCIÆNIDÆ.

127. Eques punctatus Bloch. *Vaqueta.*

128. Larimus batabanus Poey.

The remarkable species, named by Poey, *Johnius batabanus*, seems to me related rather to *Larimus* than to any other of the current groups of *Sciænidæ*. It is one more of those troublesome intermediate forms which have come in to prevent a satisfactory subdivision of the *Sciænidæ*. I give here a detailed description.

Head, $3\frac{1}{5}$ in length ($3\frac{3}{4}$ with caudal); depth, $3\frac{1}{3}$ (4); D. XI, 27; A. II, 7. Scales 7–50–9 or 10.

Body oblong, rather strongly compressed, the depth about equal from the front of dorsal to opposite the anal, where it is abruptly contracted to the rather short, compressed caudal peduncle. Anterior profile nearly straight from above tip of snout to front of dorsal, the snout gently decurved.

Head rather small, compressed, not evidently cavernous or spongy. Cheeks vertical; interorbital width about equal to length of snout, a trifle more than diameter of eye, about 4 in head. Mouth rather large, terminal, oblique, but much less so than in *Larimus breviceps*, the premaxillary in front on the level of the lower part of pupil, the maxillary extending to below middle of eye. Gape $2\frac{1}{5}$ in length of head. Preorbital narrow, not wider than pupil. Lower jaw slightly included. Teeth slender, of moderate size, those of lower jaw mostly in a single series; those of upper jaw in a narrow band; those in the outer series somewhat enlarged and unequal; some on each side of the symphysis longer than the rest, but still small. Symphysis slightly raised. Chin with four distinct pores, the outer pair largest.

Preopercle entire, the skin on its edge scarcely denticulate.

Gill-rakers slender, of moderate length, about 12 on lower half of anterior arch, the longest a little more than half diameter of pupil.

Scales ctenoid, irregular in size, those on lower part of sides anteriorly and on belly large; scales on breast large; scales above lateral line considerably reduced in size, especially anteriorly. Scales on opercle large; scales on cheeks small; on top of head very small.

Soft parts of dorsal, anal, and caudal nearly covered with rows of small scales.

Lateral line not strongly curved, becoming straight above anal.

Dorsal spines very slender, the longest about half length of head. Soft rays of dorsal about one-third length of head. Caudal rounded, a little more than half length of head. Anal fin small, the second spine moderate, $2\frac{4}{5}$ in head. Last ray of anal a little before last ray of dorsal, the abdomen being very long, its length from ventrals to anal one-fourth more than length of head. Ventrals short, $1\frac{3}{4}$ in head; pectorals, $1\frac{2}{3}$.

Color dusky silvery, brighter below, grayish above, each scale with a narrow, sharply-defined blackish longitudinal mark, these forming more or less continuous streaks along the rows of scales, broadest on those parts of the body where the scales are largest. Those below lateral line, 7 or 8 in number, gently undulated; those above lateral line very irregular, extending backward and upward with sharp angles. Some dark spots behind eye. Fins all dusky, the vertical fins with dark points.

A single specimen, procured for me by Señor Leonel Plasencia.

129. Odontoscion dentex Cuv. & Val. *Corvina.*

130. Sciæna ronchus Cuv. & Val. *Corvina.*

131. Micropogon fournieri Desmarest. *Verrugato.*
(*Micropogon undulatus* Poey, not of Linnæus.)

GERRIDÆ.*

132. Gerres plumieri Cuv. & Val. *Patao.*

133. Gerres brasilianus Cuv. & Val. *Patao.*
(*Gerres brasilianus* and *G. patao* Poey.)

134. Gerres olisthostoma Goode & Bean. *Moharra.*

135. Gerres rhombeus Cuv. & Val. *Moharra.*

Both this species and the preceding are common in the Havana markets. The distinctions between them were overlooked by Poey, as the external resemblance of the two species is strong.

136. Gerres cinereus Walbaum. *Moharra de Casta.*
(*Eucinostomus zebra* Poey.)

137. Gerres gula Cuv. & Val. *Moharra de Ley.*
(*Eucinostomus gulula* Poey.)

* For an account of the species of *Gerrida* collected by me in Havana, see a paper by Evermann & Meek in the current volume of the Proc. Ac. Nat. Sci., Phila.

138. Gerres gracilis Gill. *Moharra de Ley.*

This species, apparently corresponding to Poey's No. 724, was not clearly distinguished by him from *E. pseudogula*, although perhaps more common than the latter.

139. Gerres dowi Gill.

Less common.

140. Gerres pseudogula Poey. *Moharra de Ley.*
(*Gerres jonesi Günther.*)

Not rare.

141. Gerres lefroyi Goode.
(*Eucinostomus productus* Poey.)

LABRIDÆ.*

142. Lachnolæmus maximus Walbaum. *Perro-perro.*

143. Bodianus rufus L. *Perro Colorado.*

Considered by the fishermen as a hybrid between *Lachnolæmus* and *Scarus*. ("Engente del Perro y de la Vieja.")

144. Clepticus genizara Cuvier. *Rabirubia Genizara.*

145. Platyglossus radiatus L. *Doncella.*
(*Chærojulis cyanostigma* Poey.)

This is the *Julis crotaphus* of Cuvier, Règne Animal, based on the Doncella of Parra. The *Julis crotaphus* of Cuv. & Val. seems to be *Platyglossus caudalis* Poey.

146. Platyglossus dimidiatus Agassiz.
(*Chærojulis internasalis* Poey.)

147. Platyglossus garnoti Cuv. & Val.
(*Julis cinctus* and *ruptus* Poey.)

148. Platyglossus bivittatus Bloch.
(*Chærojulis birittatus, humeralis,* and *arangoi* Poey.)

My Cuban specimens are all much paler than any obtained in Florida, but are otherwise entirely similar. The changes in color due to age are in this species very great. Young specimens from Florida correspond to *Chærojulis arangoi* Poey.

149. Cryptotomus beryllinus Jordan & Swain.

150. Cryptotomus dentiens Poey.
Calliodon dentiens Poey. Memorias de Cuba, II, 1861, 422 (Havana). Synopsis, 1868, 344. Enumeratio, 1875, 115.
? *Calliodon retractus* Poey. Synopsis, 1868, 345 (Havana) Poey. Enumeratio, 1875, 116.

A single specimen of this species was obtained in Havana. It was overlooked at the time of the publication of our Review of the Scaroid

*For an account of the Cuban species of *Scarus*, *Sparisoma*, and *Cryptotomus*, see Jordan & Swain, Proc. U. S. Nat. Mus., 1884.

Fishes. I therefore give here the full synonymy and a description of the species:

Head, 3 in length ($3\frac{1}{2}$ with caudal); depth, 3 ($3\frac{1}{2}$). Length of specimen described, 8 inches.

Body less elongate than in *C. beryllinus*, more compressed, the back more elevated.

Jaws pale, the median suture in each more evident than in *C. beryllinus*; upper jaw laterally, with a continuous cutting edge of coalesced teeth, as in *C. beryllinus;* this edge is even for most of its length, but has anteriorly one or two small denticles and posteriorly three or four. In front are on each side two strong canines, directed forward and somewhat outward, and diverging. These are very much larger than the anterior teeth in *C. beryllinus* and quite different in form and direction. A strong posterior canine tooth directed outward and backward near the angle of the mouth. This canine is well developed on but one side in the specimen examined.

Lower jaw with its teeth larger, less regular, and less closely set than in *C. beryllinus;* some of those in front and those toward the angle of the mouth larger than the others; those in front in two irregularly alternating series and directed strongly forward. These largest teeth have each a central brown spot.

Jaws subequal. Upper lip double for its entire length. Lips and isthmus as in *C. beryllinus.*

Eye moderate, 6 in head, the head deeper and the profile considerably steeper than in *C. beryllinus.* This is associated with the greater depth of the preorbital, the distance from the eye to the angle of the mouth being $2\frac{3}{5}$ in the length of the head, while in *C. beryllinus* the same distance is contained $3\frac{2}{5}$ times. Mouth lower than in *C. beryllinus*, the maxillary reaching but half way to front of eye.

Structure and numbers of scales, fin-rays, &c., exactly as in *C. beryllinus.* Caudal truncate rather than rounded, the length of the outer rays $1\frac{2}{3}$ in head.

Color in spirits olive-green, greener than in *C. beryllinus*, each scale of back and sides with a brown central blotch; these blotches less conspicuous than in *C. beryllinus.* Head nearly plain brownish-olive. Lower jaw plain brown, with indistinct darker oblique streaks. Vertical fins greenish, blotched with brown, the membrane of the first and second dorsal spines blackish. Pectorals pale, the upper rays somewhat dusky.

According to Poey (*denticus*) the colors in life are as follows: "Body bluish rather than greenish, white below; dorsal and anal wine-color, with dashes of deeper hue; caudal wine-color, with bluish vertical bars; pectoral greenish; ventrals pale."

This is, I think, the species described by Poey under the name of *Calliodon denticus*, although Poey's description of the teeth does not fully agree with the example before me. As, however, in this specimen

there is considerable difference in the dentition of the two sides of the jaw, it is probable that the number, size, and direction of the canine teeth is variable.

The description of *Calliodon retractus*, Poey is very scanty and contains nothing whatever which is tangible. It probably refers to the same species.

The *Calliodon auropunctatus* of Cuv. & Val. seems to be a different species, more nearly allied to *C. beryllinus*, from which it would appear to be distinguished by the presence of a posterior canine.

The specimen from San Domingo mentioned by Cuvier & Valenciennes as destitute of canines, probably belongs to *C. beryllinus*, or perhaps to *C. roseus*, Cope.

151. Sparisoma xystrodon Jordan & Swain.

152. Sparisoma abildgaardi Bloch. *Vieja.*
(*Scarus abildgaardi* and *S. oxybrachius* Poey.)

153. Sparisoma aurofrenatum Cuv. & Val.
(*Scarus miniofrenatus* Poey.)

154. Sparisoma lorito Jordan & Swain.

155. Sparisoma chrysopterum Bloch & Schneider.
(*Scarus lateralis* Poey.)

156. Sparisoma frondosum Cuv. & Val.
(*Scarus brachialis* Poey.)

157. Sparisoma flavescens Bloch & Schneider. *Vieja.*
(*Scarus squalidus* Poey.)

158. Scarus tæniopterus Desmarest.
(*Scarus punctulatus* C. & V. *Pseudoscarus diadema* Poey.)

The descriptions of Desmarest's type of *Scarus tæniopterus*, as given by Valenciennes, and by Guichenot, agree fairly with *Scarus punctulatus* except in regard to the markings of the head and in the coloration of the fins.

The markings on the head grow faint in specimens long preserved in alcohol, and they are perhaps less distinct in adult examples than in the young. The changes due to the alcohol may also account for the markings on the fins being brown in *tæniopterus*, while in *punctulatus* they are bright green, even in alcoholic specimens.

It is probably safe to adopt the name *tæniopterus* in place of the less characteristic *punctulatus*, under which name it is described by Jordan & Swain. *Scarus diadema* C. & V. may be the same species, but this is less certain.

159. Scarus virginalis Jordan & Swain. *Loro.*
(*Pseudoscarus psittacus* Poey; not of Linnæus nor of Forskål.)

160. Scarus croicensis Bloch. *Bullon.*
(*Pseudoscarus sanctæ crucis* and *Ps. lineolatus* Poey.)

161. Scarus cœruleus Bloch. *Loro.*
(*Pseudoscarus cæruleus, obtusus,* and *nuchalis* Poey.)

162. Scarus guacamaia Cuvier. *Guacamaia.*

CICHLIDÆ.

163. Astronotus tetracanthus Cuv. & Val. *Viajaca.*
(*Acara fuscomaculata* Poey.)

If Steindachner is correct in uniting the groops called *Heros*, *Acara*, *Uaru*, *Hygrogonus*, &c., in one genus, the earliest name for the group is *Astronotus* Swainson (= *Hygrogonus* Gthr.). If the groups be separated, the name *Cichlasoma* should be retained for the present species and its Brazilian allies.

EPHIPPIDÆ.

164. Chætodipterus faber Broussonet.

CHÆTODONTIDÆ.

165. Chætodon capistratus L. *Parche. Isabelita.*

166. Chætodon ocellatus Bloch. *Parche o Isabelita de lo Alto.*
(*Sarothrodus bimaculatus* Poey.)

167. Holacanthus tricolor Bloch. *Vaqueta de dos Colores.*

168. Pomacanthus aureus Bloch. *Chirivita.*

ACANTHURIDÆ.

169. Acanthurus cœruleus Bloch. *Barbero.*
(*Acanthurus cæruleus, Acanthurus brevis,* and *Acronurus cæruleatus* Poey.)

170. Acanthurus tractus Poey.
(*Acronurus nigriculus* Poey.)

171. Acanthurus hepatus L. *Barbero.*
(*Acanthurus chirurgus, Acanthurus phlebotomus,* and *Acronurus carneus* Poey.)

A young specimen referable to *Acronurus carneus* I regard as without doubt a larval form of *Acanthurus hepatus*. For the synonymy of these species and notes on the material collected by me, see a paper by Meek & Hoffman, Proc. Ac. Nat. Sci. Phila., 1884. The change of the name of this genus from *Acanthurus* to *Teuthis*, as made by Gill and by Meek seems unnecessary. The name *Teuthis* was based by Linnæus on *T. hepatus* and *T. javus*. Its first restriction was to the latter species, a representative of the *Teuthis* of Günther, the *Siganus* of Forskål.

MALACANTHIDÆ.

172. Malacanthus plumieri Bloch. *Carajuelo Blanco.*

GOBIIDÆ.

173. Gobiomorus dormitator Lacépède. *Guarina.*

174. Guavina guavina Cuv. & Val. *Guavina.*

175. Eleotris pisonis Gmelin. *Guarina.*
(*Eleotris gyrinus* Poey. *Culius perniger* Cope.)

These three species are common in the Rio Almendares near Havana, from which locality many specimens were obtained. My material has been discussed in a paper on the *Eleotridinæ* by Eigenman and Fordice in the Proc. Ac. Nat. Sci. Phila., 1884.

176. Erotelis smaragdus Cuv. & Val.
(*Erotelis valenciennesi* Poey.)

A marine species.

177. Gobius oceanicus Pallas. *Esmeralda*
(*Gobionellus lanceolatus* and *Gobionellus bacalaus* (♂) Poey.)

178. Gobius smaragdus Cuv. & Val.

Less common. A specimen identical with these from Cuba was obtained at Saint Augustine, Fla., by Prof. O. P. Hay. This is the first record of the species from the coast of the United States.

179. Gobius stigmaticus Poey.

Common.

Gobius encœomus Jordan & Gilbert is very close to this species, the only tangible differences being in the color.

180. Chonephorus* taiasica Lichtenstein.
(*Rhinogobius bucculentus* and *Rh. contractus* Poey. *Gobius banana* and *martinicus* C. & V.)

Common in the Rio Almendares.

I am unable to see any specific difference between my Cuban specimens and others from Lower California and the West Indies. Sexual variations in the size of the mouth and head seem to account for the supposed distinctions between *Gobius banana*, *Gobius martinicus*, *Gobius dolichocephalus* Cope, *Rhinogobius bucculentus*, and *Rhinogobius contractus*. The name *Arraous* has been adopted for this subgenus by Gill and defined by Bleeker, but "les Arraous" of Cuvier & Valenciennes is evidently a gallicised vernacular name, never intended as a scientific name of a genus.

181. Gobius soporator Cuv. & Val.
(*Gobius mapo* Poey.)

182. Lophogobius cyprinoides Pallas.

Common.

183. Microgobius signatus Poey.

Large numbers obtained with *Gobius oceanicus* from a fisherman who had taken them in a seine.

Dark gray in life, a vertical stripe at the shoulder light-blue, edged with dark. Sky blue and orange markings under the eye. Fins pale, dusky.

*The genera *Chonephorus* and *Lophogobius* are of doubtful value, but pending investigation we may admit them.

To this genus *Microgobius* should be referred *Gobius emblematicus* Jordan & Gilbert, from Panama, and *Gobius thalassinus* J. & G., from Charleston.

SCORPÆNIDÆ.

184. Scorpæna grandicornis Cuv. & Val.

185. Scorpæna plumieri Bloch & Schneider. *Rascacio.*
(*Scorpæna rascacio* Poey.)

TRIGLIDÆ.

186. Cephalacanthus volitans L. *Murcielago.*

187. Prionotus rubio Jordan, nom. sp. nov. *Rubio Volador.*
(*Prionotus punctatus* Cuv. & Val. (in part?). *Prionotus punctatus* Poey and late authors; not *Trigla punctata* Bloch, which is probably *P. scitulus* Jordan & Gilbert.)

A description of this species is given in Jordan & Gilbert's Synopsis Fish N. A., p. 956.

In life, dark olive, with rivulations of light green; sides shaded with pale salmon color. Edge of pectoral light blue; ventrals reddish. Upper fins marked with different shades of brown.

The *Trigla carolina* of Bloch (not L.), seems to me to be evidently our *Prionotus scitulus*. The *Trigla punctata* of Bloch, if we except the bright red coloration, which belongs to no known species of *Prionotus*, is, as has been suggested by Cuvier & Valenciennes, most probably intended for the same species as his other figure. If *Prionotus scitulus* occurs in the West Indies, the name *Trigla punctata* could be assigned to it without much hesitation. In any case, I do not believe that this name was given to the Rubio Volador of the Cuban waters, and for this species I suggest the name of *Prionotus rubio*.

BATRACHIDÆ.

188. Batrachus tau L. *Mapo.*

BLENNIIDÆ.

189. Scartella microstoma Poey. (Genus nova.)

Head, 4 in length (5 with caudal); depth, $3\frac{5}{6}$ ($4\frac{2}{3}$). D. XI, 14. A. 15 or 16. Length of specimen about $3\frac{1}{4}$ inches.

Body rather stout, compressed posteriorly. Head short, the anterior profile straight and very steep, almost vertical from tip of snout to above eye, where a sharp angle is formed with the straight line of the back. Eye large, longer than snout, $3\frac{1}{4}$ in head. Mouth moderate, the maxillary reaching to below front of pupil, its length $3\frac{1}{5}$ in head. Teeth as usual in *Isesthes*. No posterior canines in either jaw. A small tufted or multifid cirrus over each eye, its length less than diameter of pupil. A row of about 3 short, slender cirri along each side of nape. Gill membranes broadly united, free from the isthmus. Lateral line extending

about to end of pectoral, each pore with a short, simple branch above and below, directed outward and backward. Some conspicuous pores radiating from eye.

Dorsal fin low, subcontinuous, the spines rather slender, lower than the soft rays, the middle spines not much higher than the last. Longest rays of dorsal about half as long as head. Caudal free from dorsal and anal, a little shorter than head. Anal low. Pectorals slightly longer than head. Ventrals 1⅓ in head. The fins are somewhat shrivelled, so that the count of the rays is made with difficulty and may not be perfectly exact.

Color very dark olive-brown, paler below. Head and anterior half of body plain; posterior half sprinkled with sharply-defined dots of a vivid sky-blue color, becoming white in alcohol. About six obscure round darker blotches in a longitudinal series along sides posteriorly. Fins dusky olive, mottled with darker, the caudal obscurely barred, the anal with a pale edge. Spinous dorsal, nearly black.

A single specimen given me by a fisherman.

If the genera *Isesthes* and *Hypleurochilus* are to be retained as distinct from *Blennius*, this species will form the type of a fourth group, *Seartella* (σκαδτης, a leaper), having the free gill membranes of *Blennius* and the even teeth of *Isesthes*.

BROTULIDÆ.

190. Brotula barbata Bloch. *Brótula.*

PLEURONECTIDÆ.

191. Platophrys lunatus L. *Lenguado.*

Color dark olive, with many rings, partial rings, curved spots, and small round spots of sky-blue, edged with darker on body, these largest near middle of sides, where some of them are as large as the eye. Three obscure blackish blotches on straight part of lateral line. Head and vertical fins with sharply-defined blue spots, which are mostly round. Spots on opercle and interopercle larger and curved. Pectorals with dusky cross-bars.

Profile in advance of eyes not prominent, slightly concave, forming a conspicuous re-entrant angle with the projecting snout. No spines on preorbital in either sex. Snout with a blunt projection in the male. Pectoral filamentous in the male, shorter in the female, the interorbital space rather narrower in the latter. Teeth small, in one irregular series in each jaw.

Dorsal rays about 93; A. 70. About 90 tubes in lateral line. Head, 3⅓ in length; depth, 2. Maxillary, 3 in head. Arch of lateral line about half length of head, its chord three times its height.

192. Platophrys ellipticus Poey.

A second species of *Platophrys* probably corresponds to Poey's *ellipticus*, although its coloration differs somewhat from Poey's description.

Color reddish-gray, much paler than in *Platophrys lunatus*, the body everywhere covered with rings formed of round sky-blue spots, which are not confluent and not edged with black. These are smaller than in *P. lunatus* and less sharply defined. There are besides these very few detached blue spots or other blue markings. Head with similar blue spots, but no rings. Area inclosed in the blue rings, not different from the ground color. Caudal with blue spots. Other vertical fins with none, the dorsal and anal mottled and with faint round dark blotches placed at intervals. A large diffused dusky blotch at beginning of straight part of lateral line. Another better defined on middle of lateral line, a very faint one toward base of caudal peduncle. Pectoral grayish, with dark cross-bars.

General form elliptical ovate, more regular than in *P. lunatus*, as the profile in front of the interorbital area is regularly convex, scarcely forming an angle at the base of the very short snout. Mouth small, oblique, the maxillary $3\frac{2}{5}$ in head. Teeth in a narrow band above, in two series below. Snout very short, 4 in head. Interorbital area $3\frac{3}{4}$ in head. Eye 4.

Arch of lateral line short and high, its length $1\frac{4}{5}$ times its height and $2\frac{2}{5}$ in head.

Numerous irregular sharp tubercles on orbital rim in front of each eye and on snout (characters of males).

Filamentous rays of pectorals reaching very nearly to last rays of dorsal.

Gill-rakers, as in *P. lunatus*, few, short, and small.

D. about 90; A. 70. Lat. l. about 88. Head, 4; depth, $1\frac{5}{6}$. Length of specimen about 10 inches.

Platophrys nebularis Jordan & Gilbert, from Key West, is allied to this species, but deeper in body and differently colored. It may prove to be the young of *P. maculiferus* Poey, but if so it must undergo a considerable change in color, and there is also some notable difference in the radial formula. In *P. nebularis* the depth is usually about $1\frac{2}{3}$ to $1\frac{3}{4}$ in the length; the outline of the snout is much as in *P. ellipticus*, and the curve of the lateral line is twice as long as high.

193. Citharichthys æthalion Jordan, sp. nov.
(Subgenus *Hemirhombus* Bleeker.)

Head, $3\frac{3}{5}$ in length ($4\frac{1}{8}$ with caudal); depth, $2\frac{1}{4}$ ($2\frac{3}{4}$). D. 92; A. 64. Scales, 18–65–18. Length of specimens, 6 to 7 inches.

Color in life dark brown, darker than in *Citharichthys spilopterus*, with many rings and spots of light gray and blackish, some of the black rings with a black central spot. A diffuse dusky blotch on lateral line above pectoral, and one near base of caudal peduncle. Fins with numerous small inky spots and dark mottlings. Blind side pale. Coloration less variegated than in *Platophrys nebularis*, but similar in style.

Form regularly elliptical, less compressed than in *Platophrys*, the profile evenly convex to the end of the snout.

Eyes large, separated by a narrow, sharp ridge, which, in specimen examined, is not so wide as the pupil. Anteriorly the interorbital ridge is widened, and has a second smaller ridge above the first. Eyes even in front, their diameter 4 in head.

Mouth small, the maxillary reaching to below middle of eye, its length 3 in head. Teeth small, slender, in two rows above, in one row below, the outer series in upper jaw somewhat enlarged, but hardly canine-like. Snout, $4\frac{3}{4}$ in head. Gill-rakers very short, hardly twice as long as broad, not one-fifth length of eye.

Lateral line nearly straight. Scales along lateral line with many accessory scales, those on other parts of body with very few or none. Fins scaly; snout naked; fins rather low. Pectoral, two-thirds length of head, its upper rays slightly filamentous.

This specimen is perhaps a female. If so, the male may have the pectoral longer and the interorbital area broader, or even concave, but this is to be doubted, as in this specimen the upper ridge becomes fully confluent with the lower above the middle of the eye.

Vertebræ, $9 + 24$.

This species, of which I obtained three specimens in the markets of Havana, has been left unnoticed by Poey, who did not distinguish between it and his *Hemirhombus fuscus*, which is *Citharichthys spilopterus*. It is closely related to *Hemirhombus ovalis* Günther, from the Pacific coast of Mexico and Panama.

194. Citharichthys spilopterus Günther. *Lenguado.*
(*Hemirhombus fuscus* Poey.)

Very common. Not distinguishable from Pacific coast specimens. I have no doubt that this is Poey's *fuscus*, but the description of the teeth and the count of the scales of the lateral line do not agree with my specimens. I find no inner row of teeth in the upper jaw and the scales are from 45 to 50.

SOLEIDÆ.

195. Aphoristia plagiusa Linnæus. *Acédia.*
(*Aphoristia ornata* Poey.)

Common. As has been already elsewhere stated in these Proceedings, there is some reason for thinking this species the original *Pleuronectes plagiusa* of Linnæus. The original type of Linnæus, as stated by Goode & Bean, Proc. U. S. Nat. Mus., 1885, 196, may not have come from the Carolina coast. It is a slenderer fish than the one found on our coast (*A. fasciata* Holbrook), with larger scales, about 77 in a longitudinal series. A specimen before me, from Cuba, has 77 scales in the lateral line, and the depth 4 in length. I venture, therefore, to identify with this Cuban fish the *plagiusa* of Linnæus.

Omitting the aberrant *A. nebulosa* Goode & Bean from the Gulf Stream, a species with keeled scales, and probably the type of a dis-

tinct genus, the four American species of *Aphoristia* are very closely related, perhaps to be considered geographical varieties of a single one. Some of their salient characters are given in the following analysis:

a. Vertical fins jet black posteriorly, this color forming a strong contrast to the color in front.

b. Body most elongate the depth 4½ in length (to base of caudal); scales small; lat. l. 98. Panama ..... *elongata* Günther.

bb. Body less elongate; depth about 4 in length; scales larger; lat. l. 77. West Indies ..... *plagiusa* L.

bbb. Body still less elongate; depth 3⅓ in length; narrow longitudinal streaks along edges of rows of scales; scales small; lat. l. 105. Lower California. *atricauda* Jordan & Gilbert.

aa. Vertical fins not black posteriorly; body least elongate, the depth 3¼ in length; dark cross-bands more distinct than in other species; scales small; lat. l. about 90. South Atlantic and Gulf coasts of the United States. *fasciata* Holbrook.

The description of *Aphoristia ornata* given by Dr. Günther fits *A. fasciata* better than *A. plagiusa*. The scanty description of *Achirus ornatus* given by Lacépède may refer to either.

MALTHIDÆ.

196. Malthe vespertilio L. *Diablo.*

Two large specimens with the rostral projection very long.

OSTRACIIDÆ.

197. Ostracion bicaudale L. *Chapin.*

198. Ostracion trigonum L. *Chapin.*

199. Ostracion tricorne L. *Toro.*
(*Acanthostracion quadricorne* Poey.)

BALISTIDÆ.

200. Balistes vetula L. *Cochino.*

201. Balistes macrops Poey. *Sobaco.*

Apparently a valid species. *Balistes tæniopterus* and *B. nebulosus* Poey seem to correspond respectively to the adult and young of *B. carolinensis.*

TETRODONTIDÆ.

202. Sphæroides testudineus L. *Tambor.*
(*Tetrodon punctatus* Poey.)

203. Sphæroides spengleri Bloch.
(*Tetrodon turgidus* Poey; not of Mitchill. *Tetrodon nephelus* Goode & Bean.)

The *Tetrodon nephelus* of authors is one of the forms of *Sphæroides spengleri*, a species which is excessively variable in respect to the dermal appendages, spines and cirri.

DIODONTIDÆ.

204. Diodon hystrix L. *Erizo.*

(*Diodon holacanthus L. Diodon liturosus* Shaw. *Diodon maculatus* and *D. spinosissimus* Günther.)

The specimens here referred to are considered by Poey the young of *Diodon hystrix*, which they probably are.

Of the species above enumerated the following do not seem to have been noticed or properly distinguished by Professor Poey. They are therefore additions to the list of Cuban fishes:

Gerres dowi Gill.
Gerres gracilis Gill.
Gerres olisthostoma Goode & Bean.
Cryptotomus beryllinus Jordan & Swain.
Sparisoma xystrodon Jordan & Swain.
Sparisoma lorito Jordan & Swain.
Uitharichthys æthalion Jordan.

INDIANA UNIVERSITY, *November* 5, 1885.

A REVIEW OF THE GENERA AND SPECIES OF JULIDINÆ FOUND IN AMERICAN WATERS.

By DAVID S. JORDAN and ELIZABETH G. HUGHES.

In the present paper we have attempted to collect the synonymy of the American species of *Labridæ* belonging to *Platyglossus* and related genera, and to give analytical keys by which these species may be distinguished. The specimens examined belong to the U. S. National Museum and to the museum of the Indiana University.

The subfamily or group of *Julidinæ*, as here understood, may be characterized as follows:

Labridæ with the body oblong, more or less compressed, covered with scales which are large (*Platyglossus*, *Thalassoma*, &c.) or small (*Julis*, *Coris*, *Hologymnosus*, &c.), the lateral line continuous, but abruptly bent downward under the last rays of the dorsal. Head naked or nearly so. Preopercle entire. Teeth large, each jaw with 2 to 4 strong canines in front (usually 2 above, 4 below), and sometimes an antrorse posterior canine. Dorsal spines slender, stiff or flexible, 8 or 9 in number; the outline of the dorsal fin continuous. Anal spines 3, graduated, weak. Gill membranes slightly joined to the narrow isthmus. Gill-rakers weak. Lower pharyngeals T-shaped or Y-shaped, with rounded teeth; those on the cross-piece larger. Bright-colored fishes of the tropical seas.

The American species of this group are certainly very closely related, and might without violence be all placed in a single genus (*Thalassoma*), as the characters separating the current genera are to some extent artificial and of slight importance, and not altogether constant in individuals. In such large groups, however, subdivision becomes very convenient, and on the whole it is perhaps best to continue to regard the American species as belonging to four genera, for which the names *Platyglossus*, *Oxyjulis*, *Pseudojulis*, and *Thalassoma* should be used. These may be thus defined:

ANALYSIS OF GENERA.

a. Scales large, 25 to 30 in the course of the lateral line; no scales on head; canine teeth $\frac{2}{2}$ or $\frac{2}{4}$, none of them directed strongly outwards or backwards; scales on the breast not larger than the others; snout of moderate length; dorsal rays about VIII or IX, 11 or 12; anal, III, 12.

b. Dorsal spines normally 9 (rarely 8).

c. Posterior canine tooth present ..... PLATYGLOSSUS, 1.

cc. Posterior canine tooth wanting (or reduced to a rudiment).

d. Dorsal spines flexible; body elongate ..... OXYJULIS, 2.

dd. Dorsal spines pungent; body oblong ..... PSEUDOJULIS, 3.

bb. Dorsal spines 8; no posterior canine tooth; dorsal spines pungent. THALASSOMA, 4.

Genus 1. PLATYGLOSSUS.

> Platiglossus Klein, Pisces, Missus, IV, 40, 1741 (*marginatus*, &c.).
= Halichœres Rüppell, Neue Wirbelthiere, Fische, 16, 1835 (*bimaculatus*, &c.), (name preoccupied, as *Halicharus* for a genus of seals).
= Halichœres Günther, Ann. Mag. Nat. Hist., 1861, VIII, 386.
> Halichœres Bleeker, Proc. Zool. Soc., Lond., 1861, 411 (sense restricted).
? Platyglossus* Bleeker, Proc. Zool. Soc. Lond., 1861, 411 (*marginatus*).
= Platyglossus Günther, Cat. Fish. Brit. Mus., IV, 1862, 143, and of most subsequent authors.
? Macropharyngodon† Bleeker, l. c., 412 (*geoffroyi*).
? Güntheria ‡ Bleeker, l. c., 413 (*cærulcovittatus*).
? Hemitautoga§ Bleeker, l. c., 413 (*centiquadrus*).
> Chœrojulis Gill, Proc. Acad. Nat. Sci. Phila. 1862, 142 (substitute for *Halichœres*).

The genus *Platyglossus*, as left by Günther, does not appear to require any further subdivision. The American species are certainly all very closely related and belong to the same group, apparently that called *Halichœres* by Rüppell and Bleeker, and *Chœrojulis* by Gill. We have not examined any specimens of the groups called *Platyglossus*, *Macropharyngodon*, *Güntheria*, and *Hemitautoga*; but as Günther lays no stress on the distinctions pointed out by Dr. Bleeker, they are probably of insignificant value. If these subordinate groups are regarded as genera the American species are all referable to *Chœrojulis*, distinguished from *Güntheria* and *Hemitautoga* by the naked head, from *Platyglossus* by the absence of a scaly sheath at base of dorsal and anal, and from *Macropharyngodon* perhaps by the form of the pharyngeals. Without further information as to the East Indian species we cannot admit these nominal genera.

The generic names, *Chloriehthys* and *Ichthycallus* of Swainson, based in part on species of *Platyglossus*, but distinguished by imaginary characters, and including species of earlier genera, have been very properly set aside by Dr. Gill as synonyms of *Coris* and *Julis*.

Platyglossus is defined as follows by Bleeker: "Squamæ corpore 27 ad 30 in linea laterali. Pinnæ dorsalis et analis basi squamatæ. Maxilla superior dente angulari. Corpus oblongum. Dentes maxillis uniseriati."

Platyglossus Klein (sp. typ., *Julis* [*Halichœres*] *annularis* K. v. H.).

†*Macropharyngodon* is thus defined by Dr. Bleeker: "Os pharyngeale inferius corpore margine posteriore valde convexo, corpore ipso dentibus 3 tantum, et horum medio molari maximo. Squamæ 28 in linea laterali. Pinnæ dorsalis et analis basi alepidotæ. Maxillæ superior dente angulari. Dentes canini in maxilla superiore 4, maxilla inferiore 2. Dentes intermaxillares cristales, ad maxillam adnati vix conspicui. Corpus oblongum."

Macropharyngodon Blkr. (sp. typ. *Julis geoffroyi* Q.).

‡ *Güntheria* is thus defined by Bleeker: "Squamæ capitis in operculo superne tantum."

Güntheria Blkr. (sp. typ. *Halichœres cærulcovittatus Rüpp.*).

§ *Hemitautoga* is defined by Bleeker as follows: "Squamæ capitis in regione postoculari et operculo superne tantum."

Hemitautoga Blkr. (sp. typ. *Labrus centiquadrus* Comm., Lac.).

Of the brilliant life-coloration in the species of this genus, specimens preserved in alcohol unfortunately retain few traces. The features of coloration noted in the following key are for the most part persistent.

ANALYSIS OF AMERICAN SPECIES OF PLATYGLOSSUS.

a. Caudal fin very slightly concave, the middle rays shortest; body robust, the depth about $2\frac{3}{4}$ in the length; ventral fins with the outer ray produced, more than twice as long as inner ray; scales before dorsal not crossing the median line, and arranged in about 5 series; color bluish or bronze, with many sky-blue spots, most distinct posteriorly; sky-blue spots and streaks on head; a stripe passing from snout to nape through upper part of eye; fins with blue stripes; a dark axillary spot; end of pectoral dusky.....RADIATUS, 1.

aa. Caudal fin rounded or subtruncate; the outer rays not produced, shorter than the middle rays.

b. Scales before dorsal reduced in size, extending across the median line and in 10 to 13 rows; ventral short, its rays not filamentous; snout rather blunt; body moderately elongate, the depth $3\frac{3}{4}$ in length; color olivaceous, with some blue and bronze markings; males with a broad indigo-blue cross-band behind pectorals; females with inky spots on the scales of the upper posterior part of back; pectorals yellow, with a black axillary spot.....SEMICINCTUS, 2.

bb. Scales* before dorsal large, in 5 or 6 rows, not crossing the median line; snout moderately pointed.

c. Ventral finst with the outer rays produced, more than twice the length of the inner.

d. Sides without conspicuous dark lateral band and with a dark vertical bar, more or less distinct, extending downward from spinous dorsal; axillary spot obscure.

e. Body rather deep, the depth $3\frac{1}{2}$ in length; profile rather steep; posterior canines very strong; no black spots on head; caudal fin nearly plain; vertical bar obscure.....NICHOLSI, 3.

ee. Body rather elongate, the depth about $3\frac{3}{4}$ in length; profile not steep; posterior canines rather small; head with black streaks and spots above; caudal sharply barred; vertical dark bar distinct. GARNOTI, 4.

dd. Side with a broad blue-black lateral band extending from eye to tip of caudal.

f. Spinous dorsal fin with no conspicuous black spot; a dark stripe from eye to nape; fins mostly dark, with pale edgings; axil and tip of pectoral dark; profile rather steep; body rather robust, the depth $3\frac{1}{3}$ in length.....DIMIDIATUS, 5.

ff. "Spinous dorsal fin with a conspicuous blue-black spot between the fifth and seventh spines; a dark spot under last dorsal ray; a blue band from snout through eye; another from eye upward and backward through operculum; three bluish bands across nape and three white ones across cheek; base of pectoral with a small black spot." (Günther.).....MACULIPINNA, 6.

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* The character has not been verified in *P. nicholsi* nor in *P. maculipinna*, both of which we place provisionally in this group.

† Not verified in *P. maculipinna*.

cc. Ventral fin with the outer rays not produced, its length not half more than that of inner ray: body slender, the depth 4 in length; opercle with a conspicuous black spot; a blue-black band from snout through eye to base of caudal; a narrower and fainter band from lower base of pectoral to above anal, these bands growing fainter with age and sometimes disappearing; no axillary spot; fins mostly pale, with bright colors in life; angles of caudal black in adult; lower pharyngeals T-shaped, the anterior limb shorter than any other species examined ..... BIVITTATUS, 7.

aaa. Caudal fin double concave, the median portion convex, the outer rays somewhat produced.

g. A round jet-black spot on lateral line below fourth and fifth dorsal spine; no spot behind eye; ventrals with the outer ray little produced, not reaching nearly to tips of pectorals; body rather stout, the depth about $3\frac{1}{2}$ in length: profile steep; snout moderately pointed; scales before dorsal in about 6 rows; a variegated blotch behind pectorals; fins mostly pale, with paler streaks; no axillary spot ..... DISPILUS, 8.

gg. A round jet-black spot close behind eye; no spot on lateral line; ventrals with the outer rays somewhat produced, reaching to opposite tips of pectorals, but scarcely twice length of inner rays; body slender, the depth 4 to $4\frac{1}{4}$ in length; profile not steep; snout pointed; eye rather large; scales before dorsal in 7 rows, not crossing median line; sides with an orange band and numerous sky-blue spots; fins pale, with many streaks of orange and blue; no axillary spot ..... CAUDALIS, 9.

1. Platyglossus radiatus. *Pudding-wife; Doncella.*

Pudiano verde Maregrave, Hist. Pisc. Brasil., 146, 1648 (Brazil; on a drawing by Prince Maurice, of Nassau).

Turdus oculo radiato (Pudding-wife) Catesby, Nat. Hist. Carol., II, 12, tab. xii, fig. 1, 1743 (Bahamas).

Labrus radiatus Linnæus, Syst. Nat., ed. X, 288, 1758 (based on Catesby).

Platyglossus radiatus Günther, Cat. Fish. Brit. Mus., IV, 163, 1862 (copied); Jordan, Proc. U. S. Nat. Mus., 135, 1884 (Key West); Jordan, Proc. U. S. Nat. Mus., 194, 1884 (identification of Catesby's figure); Jordan, Bull. U. S. Fish Com., 78, 1884 (Key West); Jordan, Cat. Fish. N. Am., 98, 1885; Jordan, Proc. U. S. Nat. Mus., 1885 (Havana).

Chœrojulis radiatus Goode, Bull. U. S. Nat. Mus., V, 35, 1875 (Bermudas).

Doncella Parra, Desc. Dif. Piez. Hist. Nat. Cuba, 95, lam. 37, fig. 1, 1787 (Havana).

Labrus brasilienus Bloch, Ichth., taf. 280, about 1787 (Brazil; on a drawing by Prince Maurice, of Nassau, of the Pudiano Verde); Bloch & Schneider, Systema Ichthyol., 242, 1801 (copied).

Chlorichthys brasiliensis Swainson, Class. Fish., &c., 232, 1839 (name only).

Julis crotaphus Cuvier, Règne Anim., ed. II, 1828 (based on Doncella of Parra; no description).

Julis cyanostigma Cuv. & Val., Hist. Nat. Poiss., XIII, 391, 1839 (Martinique).

Platyglossus cyanostigma Günther, Cat. Fish. Brit. Mus., IV, 161, 1862 (Caribbean Sea); Cope, Trans. Am. Phil. Soc., 461, 1870 (St. Croix); Günther, Shore Fishes, Challenger, 4, 1880 (St. Paul's Rocks, mid-Atlantic).

Chœrojulis cyanostigma Poey, Synopsis Pisc. Cub., 334, 1868 (Havana); Poey, Enumeratio, 1875, 107 (Havana).

Julis opalina Cuv. & Val., Hist. Nat. Poiss., XIII, 392, 1839 (Martinique).

Platyglossus opalinus Günther, Cat. Fish. Brit. Mus., IV, 163, 1862 (copied).
Julis patatus Cuv. & Val., Hist. Nat. Poiss., XIII, 398, 1839 (Martinique, Cuba).
Julis principis Cuv. & Val., Hist. Nat. Poiss, XIII, 402, 1839 (Bahia).
Platyglossus principis Günther, Cat. Fish. Brit. Mus., IV, 164, 1862 (copied).

Habitat.—West Indian fauna; Florida Keys to Brazil.

This is the largest in size of the American species of this genus, and one of those most readily recognized. It has been well described by Professor Goode, who has noted the variations due to age, and by Professor Jordan (Proc. U. S. Nat. Mus., 1884, 194), who has indicated the several variations in the adult.

This species is evidently the Pudiano Verde of Maregrave, the Pudding-wife of Catesby, and the Doncella of Parra.

The *Labrus radiatus* of Linnæus, in the tenth edition, is based solely on the Pudding-wife of Catesby. The Linnæan name, *radiatus*, must therefore be taken for this species. In the twelfth edition the *Labrus radiatus* disappears, and the Pudding-wife appears as a doubtful synonym of a *Sparus radiatus*, which is based on a specimen of *P. bivittatus* sent by Dr. Garden from South Carolina.

The *Labrus brasiliensis* of Bloch is a fairly good figure of the female of this species, except that the coloration is made bright yellow and orange, rather than olive and bronze.

The *Julis crotaphus* of Cuvier is based solely on a reference to Parra's Doncella, and must therefore be referred to this species, although the fish subsequently described as *Julis crotaphus* by Valenciennes seems to be our *P. caudalis*. The names *cyanostigma*, *patatus*, and *principis* are regarded by Goode as referring to different stages in the growth of this species. This view seems to be correct, and we may add *opalina* also as apparently the adult female.

The specimens of this species examined by us are all adult (15 to 18 inches long) and are from Key West and Havana.

2. Platyglossus semicinctus. *Kelp-fish.*

Julis semicinctus Ayres, Proc. Cal. Acad., 32, 1859 (Cerros Island; male).
Platyglossus semicinctus Günther, Cat. Fish. Brit. Mus., IV, 161, 1862 (copied); Steindachner, Ichthy. Beiträge, V, 151, 1876 (San Diego); Jordan & Gilbert, Proc. U. S. Nat. Mus., 455, 1880 (San Pedro); Jordan & Gilbert, Proc. U. S. Nat. Mus., 10, 1881 (Wilmington, Cal.); Jordan & Gilbert, Proc. U. S. Nat. Mus., 52, 1881 (Santa Catalina, San Pedro); Jordan & Gilbert, Synopsis Fish., N. Am., 603, 1883; Jordan, Cat. Fish. N. Am., 99, 1885.
Chærojulis semicinctus Gill, Proc. Ac. Nat. Sci. Phil., 223, 1863 (no description).

Habitat.—Lower California fauna; Los Angeles to Panama.

This species reaches a length of about a foot. It has been described with sufficient accuracy by Steindachner and by Jordan & Gilbert (Synopsis). The coloration is comparatively plain, but that of the female is notably different from that of the male.

The specimen before us is from San Diego.

3. Platyglossus nicholsi.

Platyglossus nicholsi Jordan & Gilbert, Proc. U. S. Nat. Mus., 231, 1881 (Braithwaite Bay, Socorro Isl.); Jordan, Proc. U. S. Nat. Mus., 384, 1885 (name only).

Habitat.—Revillagigedo Islands; one specimen known.

Of this species only the original type is known. This is dull in color and is, perhaps, a female faded in alcohol.

4. Platyglossus garnoti.

Julis garnoti Cuv. & Val., XIII, 390, 1839 (Martinique); Guichenot in Sagra, Hist. de Cuba, 218, about 1855 (Havana).

Platyglossus garnoti Günther, IV, 162, 1862 (Martinique); Jordan, Proc. U. S. Nat. Mus., 1885 (Havana).

Julis cinctus Poey, Mem. Cuba, II, 211, tab. 13, fig. 19, 1860 (Havana).

Chærojulis cinctus Poey, Synopsis, 334, 1868 (Havana); Poey, Enumeratio, 108, 1875 (Havana).

Julis ruptus Poey, Mem. Cuba, II, 212, tab. 13, fig. 20, 1860.

Charojulis ruptus Poey, Synopsis, 334, 1868 (Havana).

Platyglossus ruptus Cope, Trans. Am. Phil. Soc., 464, 1870 (St. Croix).

Habitat.—West Indian fauna.

Of this small species we have but two specimens, each about 8 inches long, from Havana. Poey notes that this species varies much in color-markings, and includes in his Enumeratio his *Julis ruptus* as a synonym of *Julis cinctus*. After making reasonable allowance for variation in specimens, and for the lack of detail in description, we see no reason why the *Julis garnoti* may not be the same species, and we therefore so regard it.

The life coloration in our specimens of *Pl. garnoti* was as follows:

Head olive, shaded with brown; bright violet-blue on the lower jaw. Dark violet dots and streaks behind and above eye. Shoulders deep yellow-olive; behind this a blackish cross-band, behind which the back and the base of the dorsal is a rich maroon-crimson; body below this livid purplish, shaded with olive. Spinous dorsal olive, with blue dots; soft dorsal bluish, banded with bronze, and edged with dusky. Caudal bluish-gray, with sharply-defined, narrow bronze bands. Anal olive-reddish, with streaks of crimson, violet, and blue. Pectorals light reddish, their tips black; axil violet. Ventrals pale. A diffuse dusky spot at upper base of caudal.

5. Platyglossus dimidiatus.

Julis dimidiatus Agassiz, in Spix, Pisc. Braz., 96, pl. 53, 1829 (Brazil); Cuv. & Val., XIII, 407, 1839 (Martinique; Brazil).

Ichthycallus dimidiatus Swainson, Class. Fish. &c., 232, 1839 (name only).

Platyglossus dimidiatus Jordan, Proc. U. S. Nat. Mus., 1885 (Havana).

Julis internasalis Poey, Mem. Cuba, II, 421, 1860 (Havana).

Platyglossus internasalis Günther, Cat. Fish. Brit. Mus., IV, 164, 1862 (Caribbean Sea); Cope, Trans. Am. Phil. Soc., 463, 1870 (St. Martin's).

Charojulis internasalis Poey, Synopsis, 334, 1868 (Havana); Poey, Enumeratio, 108, 1875 (Havana).

Habitat.—West Indian fauna; south to Brazil.

There seems to be no important reason for regarding the Cuban *internasalis* as different from the Brazilian *dimidiatus*, the alleged differences in color being doubtless due to omissions in the original description. The colors in all these fishes rapidly fade in dried or preserved specimens, and descriptions or figures drawn from such cannot be closely compared with fresh examples.

Two male specimens of *P. dimidiatus* from Havana are each about 15 inches in length. In life they showed the following coloration:

Deep light olive-green on head and back, the head bluer, then a broad lateral band of deep indigo, below this light clear green, then darker bluish-green; clear blue on lower jaw below, and clear greenish-blue on lower part of cheek; lateral band becoming faint on head; a dark streak along profile from snout to nape; a dark bluish band upward and backward from eye to nape, rather conspicuous, narrowed posteriorly; dorsal indigo, edged with sky-blue; caudal green, indigo in center, yellowish at tip; anal indigo, then dull orange, then sky-blue; ventrals green; pectorals plain greenish, indigo above; axil dark.

6. Platyglossus maculipinna.

Julis maculipinna Müller & Troschel in Schomburgh, Hist. Barbadoes, 674, 1848 (Barbadoes).

Platyglossus maculipinna Günther, Cat. Fish. Brit. Mus., IV, 1862, 165 (Trinidad); Jordan, Cat. Fish. N. Am., 1885, 99 (Beaufort, N. C.); Jordan, Proc. U. S. Nat. Mus., 1885 (Beaufort).

Chærojulis maculipinna Poey, Synopsis, Pisc. Cub., 1868, 336; Poey, Enumeratio, 109, 1875 (Havana).

*Pusa** *radiata* Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 374 (Beaufort).

Habitat.—West Indian fauna; north to Beaufort.

This species is known to us chiefly from descriptions. A small example taken by Professors Jordan & Gilbert at Beaufort in 1877† is regarded as belonging to it, but this individual is now destroyed, and we are unable to verify this identification. No other known species has, however, the black dorsal spot.

The character of the predorsal scales and of the ventrals should be known before the place of this species in our analytical key can be given.

* The rather curious blunder involved in the use of the name "*Pusa*" for this genus came about in this way: Professor Gill once informed the writer that the name *Pusa* of Scopoli must probably supersede *Halichœrus*, the latter being a genus of seals. The writer adopted the statement as referring to *Halichœres*, the genus of fishes.

† The life colors of this specimen were thus described: "Bright green; a dark brown lateral band covering two rows of scales; above this three bronze bands, with green interspaces, below it a band of crimson; these bands running forward and meeting on the snout; dorsal fin bright vermilion, with a large blue spot, ocellated with yellow near its middle; a smaller dark blue spot at base of last dorsal ray and another at base of caudal: anal red, with a yellowish streak; caudal nearly plain; iris red. Length, 1½ inches."

7.—Platyglossus bivittatus. *Slippery Dick; Doncella.*

Sparus radiatus Linnæus, Syst. Nat., ed. XII, 472, 1766 (Carolina; based on a specimen from Charleston, sent by Dr. Garden); Gmelin, Syst. Nat., 1278, 1788 (copied); Walbaum, Artedi Piscium, 289, 1792 (copied); Bloch & Schneider, Syst. Ichth., 207, 1801 (copied), (not *Labrus radiatus* L., ed. X).

Platyglossus radiatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 608, 1882 (Charleston).

Labrus birittatus Bloch, Ichth., taf. 284, fig. 1, about 1787 (from a painting by Plumier, made at Martinique).

Ichthycallus birittatus Swainson, Class. Fish. &c., 232, 1839 (name only).

Platyglossus birittatus Günther, Cat. Fish. Brit. Mus., IV, 164, 1862 (Jamaica); Steindachner, Ichth. Notiz., VI, 49, 1867 (Barbadoes and Surinam); Cope, Trans. Am. Phil. Soc., 463, 1870 (St. Martin's); Jordan, Proc. U. S. Nat. Mus., 40, 1884 (foot-note); Jordan, Proc. U. S. Nat. Mus., 136, 1884 (Key West); Bean & Dresel, Proc. U. S. Nat. Mus., 153, 1884 (Jamaica); Jordan, Bull. U. S. Fish Com., 79, 1884 (Key West); Jordan, Cat. Fish. N. Am., 98, 1885; Jordan, Proc. U. S. Nat. Mus., 1885 (Havana).

Charojulis birittatus Poey, Syn., 335, 1868 (Havana).

Labrus psittaculus Lacépède, Hist. Nat. Poiss., III, 522, 1800 (Martinique; from a copy of Plumier's painting).

Julis psittaculus Cuv. & Val., Hist. Nat. Poiss., XIII, 387, 1839 (Martinique and Surinam).

Julis humeralis Poey, Mem. Cub., II, 212, 1860 (Havana).

Chærojulis humeralis Poey, Syn., 335, 1868 (Havana); Poey, Enumeratio, 108, 1875 (Havana).

Platyglossus humeralis Günther, Cat. Fish. Brit. Mus., IV, 165, 1862 (Cuba); Jordan & Gilbert, Syn. Fish. N. Am., 603, 1882.

Chærojulis humeralis Goode & Bean, Proc. U. S. Nat. Mus., 338, 1879 (Clear Water Harbor).

Charojulis grandisquamis Gill, Proc. Acad. Nat. Sci. Phil., 206, 1863 (Beaufort, N. C.).

Pusa grandisquamis Jordan & Gilbert, Proc. U. S. Nat. Mus., 374, 1879 (Beaufort).

Platyglossus grandisquamis Jordan & Gilbert, Syn. Fish. N. Am., 603, 1882 (copied).

Charojulis arangoi Poey, Enumeratio Pisc. Cub., 109, 1875 (Havana).

Platyglossus florealis Jordan & Gilbert, Proc. U. S. Nat. Mus., 287, 1882 (Pensacola).

Habitat.—West Indian fauna; Beaufort, N. C., to Brazil. Excessively abundant along rocky or weedy shores and reefs.

This species reaches a smaller size than any other of our representatives of the genus. It is also by far the most common in the waters of Florida and Cuba, and its range extends considerably farther north than any of the others.

The variations due to age and to character of the bottom are very considerable, having caused the establishment of several nominal species. In the descriptions above mentioned by Professors Jordan & Gilbert of specimens from Charleston, Pensacola, and Key West these variations have been sufficiently indicated. Our Cuban specimens (from coral sand) are much paler in color than those from farther north. The dark markings, however, remain similar. In old examples the

dark lateral bands fade, sometimes becoming more or less broken; the corners of the caudal become dark, and there is usually a dark spot at base of last dorsal ray.

The earliest specific name, *radiatus*, is untenable, because preoccupied. The name next in date, *bivittatus*, is based on a rather poor figure, which could, however, have been intended for no other known species. This name must therefore be retained. The name *psittaculus* is said to be based on the same figure. The *humeralis* of Poey seems to be unquestionably the adult of this fish, common in the Havana markets, and his *arangoi* is a young example of the same, from different bottom, and showing a coloration more like our Florida specimens. The *granaisquamis* of Gill is based on an adult example in which the coloration is less sharply defined, and finally the *florealis* of Jordan & Gilbert is the gaily-colored young. None of this synonymy seems to us subject to any serious question.

8. Platyglossus dispilus.

Platyglossus dispilus Günther, Proc. Zool. Soc. London, 25, 1864 (Panama); Günther, Fish. Cent. Am., 447, 1869 (Panama); Steindachner, Ichth. Beiträge III, 64, 1875 (Acapulco); Jordan & Gilbert, Bull. U. S. Fish Com., 108, 1882 (Mazatlan); Jordan, Proc. U. S. Nat. Mus., 384, 1885 (Mazatlan; name only); Jordan, Cat. Fish. N. Am., 99, 1885.

Habitat.—Panama fauna; Mazatlan to Panama.

This species has been well figured and described by Dr. Günther. It was found by Dr. Gilbert to be rather common in the rock-pools about Mazatlan. It reaches but a small size. The characters in our analysis of species are taken from the figure of Dr. Günther.

9. Platyglossus caudalis.

Julis crotaphus Cuv. & Val., Hist. Nat. Poiss., XIII, 395, tab. 395, 1839 (Bahia), (not of Cuvier).

Platyglossus crotaphus Günther, Cat. Fish. Brit. Mus., IV, 163, 1862 (Bahia, Jamaica); Cope, Trans. Am. Phil. Soc., 463, 1870 (St. Croix).

Charojulis crotaphus Poey, Enumeratio, 109, 1875 (Havana).

Julis caudalis Poey, Mem. Cuba, II, 213, 1861 (Havana); Günther, Cat. Fish. Brit. Mus., IV, 191, 1862 (copied).

Platyglossus caudalis Günther, Cat. Fish. Brit. Mus., IV, 166, 1862 (copied); Jordan & Gilbert, Proc. U. S. Nat. Mus., 286, 1882 (Pensacola); Jordan, Proc. U. S. Nat. Mus., 37, 1884 (Pensacola).

? *Julis pictus* Poey, Mem. Cuba, II, 214, 1861 (Havana).

? *Platyglossus pictus* Günther, Cat. Fish. Brit. Mus., IV, 166, 1862 (Cuba).

? *Platyglossus pocyi* Steindachner, Ichth. Notiz., VI, 49, 1867 (Surinam).

Habitat.—West Indian fauna; Pensacola to Bahia.

This species is known to us only from several specimens taken in deep water near Pensacola by Mr. Silas Stearns, and described as *Platyglossus caudalis* by Jordan & Gilbert.

The synonymy of the species is not wholly satisfactory. The original descriptions of *crotaphus*, *caudalis*, *pictus*, and *pocyi* all show some of the distinctive characters of our specimens; but these specimens, while agreeing closely with each other, all diverge more or less from

all the above-mentioned accounts. It is possible that three or four species of this type exist, but our knowledge of the variations in *P. bivittatus* leads us to doubt this, and to regard all as one. *Platyglossus pictus* seems the most different from our examples of any of these nominal species.

We have rejected the name *crotaphus*, because in the Règne Animal, where the name first appears, it is accompanied only by a reference to the Doncella of Parra, which is *P. radiatus*.

Genus 2. OXYJULIS.

Oxyjulis Gill, Proc. Ac. Nat. Sci. Phila., 1863, 330 (*modestus*).

This group is intermediate between *Platyglossus* and *Pseudojulis*, differing from either only in trifling respects. The single known species is very slender, with very feeble dorsal spines, and with the posterior canine characteristic of *Platyglossus* either represented by a small rudiment or else altogether wanting. Occasionally but eight dorsal spines are present, as in *Thalassoma*. The genus seems, however, to be as well worthy of retention as many others among the *Labridæ*.

ANALYSIS OF SPECIES OF OXYJULIS.

a. Body elongate, strongly compressed, the back not elevated, the head slender and sharp; depth, 4½ in length of body; snout 3 in head; eye 5; posterior canine weak or wanting, rarely present on both sides; scales before dorsal much reduced, in 10 to 12 rows, those on breast considerably smaller than those on sides: caudal truncate; ventrals short, the first ray not twice the length of the inner ray; dorsal spines flexible; olive-brown; centers of scales orange-brown; belly cream color; sides of head with alternate streaks of bluish and brown; a large inky blotch at base of caudal, covering one-third the fin; membrane of base of spinous dorsal largely indigo-blue; fins otherwise pale; lower pharyngeals formed as usual in Platyglossus, the large teeth less obtuse.

CALIFORNICUS, 10.

10. Oxyjulis californicus. *Señorita; Pesce Rey.*

Julis modestus Girard,. Proc. Ac. Nat. Sc. Phil., VII, 151, 1854 (copied); Girard, U. S. Pac. R. R. Sur. Fish., 163, 1859 (San Diego, Monterey, San Miguel); Gill, Proc. Ac. Nat. Sci. Phil., 142, 1862 (foot-note), (not *Julis modestus* Bleeker).

Pseudojulis modestus Günther, Cat. Fish. Brit. Mus., IV, 168, 1862 (San Diego): Jordan & Gilbert, Proc. U. S. Nat. Mus., 455, 1880 (Monterey, San Diego): Jordan & Gilbert, Proc. U. S. Nat. Mus., 10, 1881 (Monterey, Santa Barbara); Jordan & Gilbert, Proc. U. S. Nat. Mus., 225, 1881 (Guadalupe Isl.); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 604; Jordan, Cat. Fish. N. A., 99, 1885.

Oxyjulis modestus Gill, Proc. Ac. Nat. Sci. Phil., 331, 1863 (coast of California).

Halichares californicus Günther, Proc. Zool. Soc. London, 1861 (name only; substitution for *Julis modestus* preoccupied).

Habitat.—Coast of California; Monterey to Guadalupe Island.

This pretty little fish is well described in the Synopsis of the Fishes of North America above cited. It is common in the kelp along the coast of

Lower and Southern California and reaches a length of 7 inches. On the rule that "once a synonym, always a synonym," now adopted by most American ornithologists and ichthyologists, the name *modestus* must give place to *californicus*.

Genus 3. PSEUDOJULIS.

Pseudojulis Bleeker, Proc. Zool. Soc. London, 1861, 412 (*girardi*).

This genus contains two or three species similar to *Platyglossus* in all respects except in the absence of the posterior canines. From *Oxyjulis* they differ in having the dorsal spines sharp. But one American species is known.

ANALYSIS OF AMERICAN SPECIES OF PSEUDOJULIS.

a. Caudal fin rounded; ventral fin with the outer ray not produced, its length not nearly twice that of inner ray; its tip not reaching tip of pectoral; scales before dorsal in about six series; body rather stout, the depth $3\frac{2}{3}$ in the length; snout pointed; profile not steep; dorsal spines pungent; olive, young with a silvery lateral streak; back with four or five indistinct broad dark cross-bands, these forming blotches on the dorsal fin, one of these on the first three soft rays, largest and black; angles of caudal pale; ventrals whitish, with a broad black outer margin ..... NOTOSPILUS, 11.

11. Pseudojulis notospilus.

Pseudojulis notospilus Günther, Proc. Zool. Soc. London, 26, 1864 (Panama); Günther, Fish. Cent. Am., 447, 1869 (Panama); Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 108 and 111 (Mazatlan, Panama); Jordan, Proc. U. S. Nat. Mus., 1885, 384 (Mazatlan, Panama); Jordan, Cat. Fish. N. Am., 99, 1885.

Habitat.—Panama fauna; Mazatlan to Panama.

This species reaches a length of about 4 inches. Several specimens were taken by Dr. Gilbert in the rock-pools about Mazatlan, and others were found at Panama. As these specimens are not now accessible to us we have taken our analysis from the description and figure of Dr. Günther.

Genus 4. THALASSOMA.

Julis species, Cuvier & Valenciennes, XIII, 1839 (not type).

Thalassoma Swainson, Nat. Hist. Class'n Fishes, II, 1839, 224 (*purpureus*).

Chlorichthys* Swainson, l. c., II, 1839. 232 (*bifasciatus*, &c.).

Julis Günther, Cat. Fish. Brit. Mus., IV, 1862, 179 (not of Cuvier nor of Swainson).

This genus as here understood comprises numerous species, similar in most respects to the species of *Platyglossus*, but with only 8 spines in the dorsal fin and without posterior canines. The species belong mostly to the Pacific and Indian Oceans, those of the Atlantic being few.

The group *Thalassoma* of Swainson, distinguished by him from

* "*Chlorichthys* and *Ichthycallus*, confused jumbles of species, may well be disposed of as synonyms of *Thalassoma* and *Coris*, respectively, although several other genera are represented in each." (Swain, Proc. Ac. Nat. Sci. Phila., 1882, 275.)

Xyrichthys by the form of the head, the position of the eyes, &c., was based on ignorance. *Thalassoma* is, however, the oldest generic name applied to any members of the present group, and it must be retained. If the group be reunited with *Platyglossus*, &c., the name *Thalassoma* should be used for all.

The generic name *Julis* was first given by Cuvier especially to the *Labrus julis* of the Mediterranean, a species referred by Dr. Günther to the genus *Coris* of Lacépède. Numerous other species were included in the group by Cuvier, but by Swainson all these others were removed, leaving *Labrus julis* as the sole species of *Julis*. Whether *Julis*, as thus restricted, is distinguishable from *Coris* or not we cannot say, and this question does not concern the American species. All the American *Julidinæ* have large scales, while most of those found in the eastern Atlantic (*Julis*, *Coris*) have the scales small.

Of the American species of *Thalassoma*, but one (*lucasanum*) has been examined by us. The characters given below are, therefore, drawn entirely from descriptions.

ANALYSIS OF AMERICAN SPECIES OF THALASSOMA.

a. Caudal subtruncate, the outer rays not at all produced; body slender, the depth about 4 in length; ventrals shorter than pectorals; upper half of body dark purplish, lower half becoming abruptly rosy; dorsal dark, margined with whitish; anal brownish, outer half pale; caudal yellowish, with two purplish bands; axil with a purple dot.....LUCASANUM, 12.

aa. Caudal sublunate, the lobes very slightly produced; body slender, compressed, the depth about 4 in length; no posterior canine; dorsal spines pungent; ventrals much shorter than pectorals; top of head and back brilliant yellow, this color extending on sides of head and to ventrals; a large yellow blotch on caudal fin; lower parts rosy white; a maroon band backward from eye, breaking up on body into a series of six quadrate spots of bottle-green, the last blotch extending on outer rays of caudal; dorsal mostly greenish, with pale margin, a dark blotch between second and fifth spines; pectorals pale; ventrals yellow (*Goode*).....NITIDUM, 13.

aaa. Caudal forked, the lobes much produced.

b. Pectoral without conspicuous dark spot; anterior half of body deep blue; head paler; posterior half of body bottle-green; a deep blue band across body covered by pectoral; a fainter one behind gill-opening, the two perhaps sometimes coalescing; spinous dorsal dark; tip of pectoral dark; caudal pale, its lobes dark blue on the outer part; soft dorsal greenish; anal and ventrals bluish.....BIFASCIATUM, 14.

bb. Pectoral fin with a conspicuous spot of indigo-blue behind its middle; head and caudal fin entirely violet-blue; obscure paler streaks on side of head; breast violet, paler than the head; body violaceous, its anterior third paler, the scales posteriorly edged with dull violet (*Steindachner*).....MELANOCHIR, 15.

Thalassoma lucasanum.

Julis lucasanus Gill, Proc. Ac. Nat. Sci. Phil., 142, 1862 (Cape San Lucas); Günther, Cat. Fish. Brit. Mus., IV, 184, 1862 (Cape San Lucas); Jordan & Gilbert, Proc. U. S. Nat. Mus., 367, 1882 (Cape San Lucas); Jordan & Gilbert, Bull. U. S. Fish Comm., 1881.

Thalassoma lucasanum Jordan. Cat. Fish. N. Am., 98, 1885; Jordan, Proc. U. S. Nat. Mus., 1885, 384 (Mazatlan).

Habitat.—Gulf of California.

This little fish was found in some abundance at Cape San Lucas by Xnatus and at Mazatlan by Gilbert. It reaches a length of about 3 inches.

Thalassoma nitidum.

Julis nitida Günther, Cat. Fish. Brit. Mus., IV, 190, 1862 (Jamaica).
Julis nitidissima Goode, Am. Jour. Sci. and Art, 293, 1877 (Bermuda).

Habitat.—West Indian fauna.

This species is unknown to us. In describing *J. nitidissima*, Professor Goode indicates his suspicion that it is identical with *Julis nitida*. One can hardly think otherwise on comparing his description, taken from a single fresh specimen, with that of Dr. Günther, taken from three preserved examples. The agreement seems to us perfect, when we take into account the variations to which the *Labridæ* are subject. The only tangible distinction would be in the length of the ventrals, two thirds the pectorals in *J. nitida* and three-sevenths in *J. nitidissima*.

Thalassoma bifasciatum.

Labrus capite obtuso Gronow, Zoophyl., No. 243, 1781 (Antilles).
Labrus bifasciatus Bloch, Ichthy., 131, pl. 283, about 1787 (East Indies); Bloch & Schneider, Syst. Ichthy., 243, 1801 (after Bloch).
Chlorichthys bifasciatus Swainson, Nat. Hist. Class'n. Fish., II, 1839, 232 (name only).
Julis bifasciata Günther, Cat. Fish. Brit. Mus., IV, 186, 1862 (Jamaica).
Julis bifasciatus Poey, Enumeratio, 107, 1875 (Jamaica).
Labrus bifasciatus var. *torquatus* Bloch & Schneider, Syst. Ichth., 1801, 243 (Antilles; after Gronow).
Julis detersor Cuv. & Val., Hist. Nat. Poiss., XIII, 408, 1839 (San Domingo, Martinique); Günther, IV, 186, 1862 (copied).
Labrus ornatus Gronow, Syst., ed. Gray, 83, 1854 (Antilles; after *Labrus capite obtuso*), (not of Carmichael).
Julis gillianus Poey, Mem. Cuba, II, 214, 1860 (Cuba); Poey, Syn., 332, 1868 (Cuba).

Habitat.—West Indian fauna.

There seems to be little room for doubt that the *Julis detersor* is identical with *Th. bifasciatum*. The agreement is, as Poey has noticed, very close in all respects, except that implied in the remark of Valenciennes that the "spinous dorsal is low and scaly" ("basse et couverte d'écailles"). This expression, if intended to mean that the fin is scaly, must be an error.

Thalassoma melanochir.

Julis melanochir Bleeker, "Act. Soc. Sc. Indo-Nederl., II, Amboyna, VIII, 77, 1859, and Atl. Ichth., 89, tab. 33, fig. 2, 1862;" Günther, Cat. Fish. Brit. Mus., IV, 182, 1862 (Amboyna); Steindachner, Ichth. Beiträge, III, 63, 1875 (Acapulco, Sandwich Isl.). *Thalassoma melanochir* Jordan, Proc. U. S. Nat. Mus., 1885, 384 (name only).

Habitat.—Pacific Ocean, East Indies, and Sandwich Islands; a single specimen recorded from Acapulco.

Dr. Steindachner observes, "An example caught at Acapulco agrees on the whole so closely with *Julis melanochir* that I can only, on account of its color, regard it as a variety of that species."

"*Julis melanochir* comes very abundantly on the coast of the Sandwich Islands, and it may from thence extend its range to the west coast of North America, which, on the whole, possesses but few Labroids."

The characters in our analysis are taken from Steindachner's account of the specimen from Acapulco.

RECAPITULATION.

The following is a list of American species of *Julidinæ* admitted by us. The distribution of each is indicated by the letters W. (West Indian fauna), P. (Panama fauna), C. (Lower California fauna), U. (coasts of United States):

1. PLATYGLOSSUS (Klein) Bleeker.

§ *Chærojulis* Gill.

1. Platyglossus radiatus L. (W. U.)
2. Platyglossus semicinctus Ayres. (C. U.)
3. Platyglossus nicholsi Jordan & Gilbert. (P.)
4. Platyglossus garnoti Cuv. & Val. (W.)
5. Platyglossus dimidiatus Agassiz. (W.)
6. Platyglossus maculipinna Müller & Troschel. (W. U.)
7. Platyglossus bivittatus Bloch. (W. U.)
8. Platyglossus dispilus Günther. (P.)
9. Platyglossus caudalis Poey. (W. U.) (Perhaps more than one species included in the synonymy.)

2. OXYJULIS Gill.

10. Oxyjulis californicus Günther. (C. U.)

3. PSEUDOJULIS Bleeker.

11. Pseudojulis notospilus Günther. (P.)

4. THALASSOMA Swainson.

12. Thalassoma lucasanum Gill. (P.)
13. Thalassoma nitidum Günther. (W.)
14. Thalassoma bifasciatum Bloch. (W.)
15. Thalassoma melanochir Bleeker. (P., East Indies.)

LIST OF NOMINAL SPECIES, WITH IDENTIFICATIONS.

The following is a list of the nominal species of American *Julidinæ*, arranged in order of description, together with our identification of each. Tenable specific names are indicated by a star (*):

Nominal species.	Year.	Identification.
Labrus radiatus,* Linnæus	1758	Platyglossus radiatus.
Sparus radiatus, Linnæus	1766	Pl. bivittatus.
Labrus brasiliensus, Bloch	1787	Pl. radiatus.
Labrus bifasciatus,* Bloch	1787	Thalassoma bifasciatum.
Labrus bivittatus,* Bloch	1787	Pl. bivittatus.
Labrus psittaculus, Lacépède	1800	Pl. bivittatus.
Julis cyotaphus, Cuvier	1828	Pl. radiatus.
Julis dimidiatus,* Agassiz	1829	Pl. dimidiatus.
Julis garnoti,* Cuv. & Val	1839	Pl. garnoti.
Julis cyanostigma, Cuv. & Val	1839	Pl. radiatus.
Julis opalina, Cuv. & Val	1839	Pl. radiatus.
Julis crotophus, Cuv. & Val	1839	Pl. caudalis.
Julis patatus, Cuv. & Val	1839	Pl. radiatus.
Julis principis, Cuv. & Val	1839	Pl. radiatus.
Julis detersor, Cuv. & Val	1839	Th. bifasciatum.
Julis maculipinna,* Müller & Troschel	1848	Pl. maculipinna.
Julis modestus, Girard	1854	Oxyjulis modestus.
Labrus ornatus, Gronow	1854	Th. bifasciatum.
Julis semicinctus,* Ayres	1859	Pl. semicinctus.
Julis melanochir,* Bleeker	1859	Th. melanochir.
Julis cinctus, Poey	1860	Pl. garnoti.
Julis ruptus, Poey	1860	Pl. garnoti.
Julis humeralis, Poey	1860	Pl. bivittatus.
Julis caudalis,* Poey	1860	Pl. caudalis.
Julis gillianus, Poey	1860	Th. bifasciatum.
Julis pictus, Poey	1860	Pl. caudalis.
Julis intermasalis, Poey	1860	Pl. dimidiatus.
Halichœres californicus,* Günther	1861	Ox. californicus.
Julis lucasanus,* Gill	1862	Th. lucasanum.
Julis nitida,* Günther	1862	Th. nitidum.
Chœrojulis grandisquamis, Gill	1863	Pl. bivittatus.
Platyglossus dispilus,* Günther	1864	Pl. dispilus.
Pseudojulis notospilus,* Güntber	1864	Pseudojulis notospilus.
Platyglossus poeyi, Steindachner	1867	Pl. caudalis.
Chœrojulis arangoi, Poey	1875	Pl. bivittatus.
Julis nitidissima, Goode	1877	Th. nitidum.
Platyglossus nicholsi,* Jordan & Gilbert	1881	Pl. nicholsi.
Platyglossus florealis, Jordan & Gilbert	1882	Pl. bivittatus.

INDIANA UNIVERSITY, *December* 15, 1885.

ON THE VALUE OF THE FIN-RAYS AND THEIR CHARACTERISTICS OF DEVELOPMENT IN THE CLASSIFICATION OF THE FISHES, TOGETHER WITH REMARKS ON THE THEORY OF DEGENERATION.

By JOHN A. RYDER.

As stated by me in various notices heretofore published, *the most primitive arrangement of the rays of fishes is a continuous one, such as is permanently retained by the Dipnoïns.** Since this conclusion has been reached, further investigation and comparison has shown that in the most primitive types of the fins there are no interradial spaces, such as are found between the rays of the fins of Teleosts. This general truth, completely verified by embryology, seems to lead to results of some significance in taxonomy. For instance, the two groups, Dipnoï and Holocephali, which have the least differentiated system of rays in the fins, are also amongst the lowest and most archaic in their organizations, for in neither are there any true interradial spaces such as are found in the members of the Ganoid and Teleostean series.

The Dipnoï, as respects the fins, are nearer to the Teleostei than to the Squali, because their membranous fin-rays (horn fibers of authors), or actinotrichia, properly speaking, are in a single series on either side of the mesoblastic core of the fins, the same as in Teleostean embryos, and are not made up of several superimposed rows, as in the Sharks.

Since the foregoing was written, a memoir† of the greatest value, by Dr. Meyer, has appeared on the development of the median fins of Elasmobranchs, in which it is also shown that in the embryos of this series there is but a single row of actinotrichia on either side of the

*1. An Outline of a Theory of the Development of the unpaired Fins of Fishes. Am. Nat., Jan., 1885, pp. 90–97, 8 figs.

2. The Development of the Rays of Osseous Fishes. Am. Nat., Feb., 1885, pp. 200–204, 5 figs.

3. On Certain Features of the Development of the Salmon. Proc. U. S. Nat. Mus., 1885, pp. 156–162, pl. XII. (The word *actinotrichia* was proposed for the first time in this paper as a general term for the "horn fibers" or embryonic fin-rays of fishes.)

4. On the Availability of Embryological Characters in the Classification of the Chordata. Am. Nat., Aug. and Sept., 1885, pp. 815–819 and 903–907.

5. The Archistome-Theory. Am. Nat., Nov., 1885, pp. 1115–1121.

6. On the Origin of Heterocercy and the Evolution of the Fins and Fin-rays of Fishes. In press. 12 plates.

N. B.—The new terms which will be met with in the following are defined in the context. Fuller definitions will be found in the author's papers cited above.

†7. Die Unpaaren Flossen der Selachier, von Paul Meyer. Mitth. aus der zoolog. Station zu Neapel, VI., pp. 215–281, pls. 15–19. (Dated latter part of May, 1885.)

unpaired fins. It follows, therefore, that the superimposed rows of actinotrichia found in the fins of many of the Sharks is an advance upon the primitive single-rowed arrangement seen in Dipnoï, Holocephali, and Teleostei. There have, therefore, been two lines or routes of specialization in the development of actinotrichia, viz, (1) that characteristic of Elasmobranchia and (2) that distinctive of Teleostei.

Only amongst the Rays and Skates do we find an approximation to the arrangement met with in Dipnoï and embryo Teleostei. In the Rays, however, the actinotrichia are quite rudimentary—embryonic—in the paired fins, so much so that they are confined to a very narrow marginal portion of the pectoral, for example, not over an eighth of an inch in width in specimens a little over a foot in length. This shortness and rudimentary condition of the actinotrichia in the paired fins of the Rays is correlated with the great length of the actinophores or cartilaginous rays supported by the pro-, meso-, and metapterygium, themselves formed by the fusion of the proximal ends of actinophores.

The only fins found in the Teleostei which retain the primitive features of the continuous ones of the Dipnoï are the so-called "adipose fins" of Salmonoids, Nematognaths, Characinids, &c., but in them a primitive structure is retained by the posterior dorsal only. But these "adipose fins" are part of a discontinuous system of vertical fins, a portion of which is developed to the degree characteristic of Teleostei with interradial spaces. The adipose fins represent, in fact, the survival of a Dipnoän character as a part of a Teleostean organization.

The theory according to which such a survival was brought about seems to be the following: Inasmuch as "adipose fins" are embryonic in structure, just in the same way as the radii of the fins of Dipnoï are permanently embryonic, we are forced to infer that such fins, co-existing as they do with others in the same fish, having well developed membranous, radial interspaces and ossified rays, have been retarded in development so as to retain embryonic characters. The degeneration, or rather retardation, of development of the second dorsal, which is apparent in the Salmonoids, has been completed in the Cyprinoids, a group which has entirely lost the posterior soft dorsal, retaining only the anterior dorsal, with bony rays of the Teleostean type. The Cyprinoid series has, however, acquired other structural specializations, such as the development of a system of auditory ossicles, coincidently with which the anterior portion of the vertebral column has been modified. Turning now to the Nematognaths, a majority of them have retained the "adipose" second dorsal, supported by actinotrichia, while they have acquired two new structures not met with in the less modified and older Salmonoid organization, viz, the system of maxillary, mental, and nasal barbels, supported even in the embryo by cartilage, and ossicula auditus, and often a peculiarly modified air-bladder, bifurcate anteriorly and coming into close contact laterally and anteriorly with the skin in the fore part of the body-cavity, so as to ap-

parently form a kind of tympanic membrane on either side just behind the scapular arch.

It is thus rendered evident that the mutations of development of three or four structures may be sufficient to supply characters of ordinal value to the taxonomist; that, in fact, we may get a far greater variety of small differences between the many species belonging to the orders, founded on such a small number of prominent characters, than might be supposed possible if it was assumed that a permutation of the number of characters used in the ordinal definitions would give the number of species to be included by the supposed orders, for each character is capable, within very wide limits, of infinitely small amounts of variation, which may serve as the marks of species or varieties. We are thus forced to infer that in the "genesis of species" we are dealing with a permutation, the exact number of terms in which, and in which the capacity for the variation of each term is unknown, so that it would, if all the structural characters of a group were given, be impossible to predicate how many species or possible combinations of characters that group was capable of yielding under the stress of environing influences competent to produce changes in the relative development of parts.

For instance, the one feature which *Cyprinus* and *Amiurus* retain in common is the possession of a barbel at the angle of the mouth, yet the one has no cartilaginous basis and appears late, whereas the other has at first a cartilaginous support which afterwards ossifies at its base. Now it is absolutely no proof whatever that these structures in the two forms are not indicative of affiliation, if we assume that this is so, because in the one there is no skeletal support, while it is present in the other. Because, if we attended to the development of both forms we might find reasons for the belief that what had failed to develop in the one was nevertheless possibly as salient a feature in the ancestor of *Cyprinus* as in *Amiurus*, and that the tendency to suppress or retard the development of the barbels in the one and exaggerate them in the other was due to the operation of the very forces which we found capable of producing a complex series of permutations. This idea may be rendered somewhat clearer if we bear in mind that it seems to be a frequent embryological rule that structures which are disappearing in an organism disappear part by part in an order just the reverse of that in which they are normally developed to their fullest importance.

This principle in embryology may be very clearly illustrated by the succession of events in the course of the development of the rays of the median fins of a few types in which the gamut of changes traversed by the process of development is analyzed.

(1) Taking the Dipnoï as the lowest and simplest type, it seems that the following is the method of development of the median fins which will be found to exist: First, a perfectly cradiate, lophocercal, median fin-fold, into which mesoblast is proliferated, between which and the epidermis a single row of actinotrichia are developed on either side of

the continuous fin which extends uninterruptedly along the back, over the tail, forward to the vent. No interradial spaces ever developed and no further differentiation of the actinotrichia, except augmentation in size and strength, and vastly more numerous than the serially arranged actinophores or interspinous elements. The latter are cartilaginous, with a membranous osseous investment, while the actinotrichia are purely membrane and not cartilage, as asserted by Günther. No sign of atrophy of any part of the azygous fin-system is evident unless it may be that there is an anterior portion of the dorsal and a preanal portion which disappears.

(2) The Holocephali, during development, probably approximate the preceding type up to a certain point, when they diverge by differentiating atrophied intervals, especially between the dorsal fin and the epaxial part of the caudal, and in some species the tail-fold seems to atrophy over the posterior portion of the chorda, so as to give rise to a nearly cylindrical appendage without rays extending beyond the true tail, and which may be called an opisthure. (See No. 1.*)

(3) The next grade of differentiation of the fins is that seen in the Elasmobranchs, in which, instead of there being a single row of actinotrichia under the epidermis on either face of the fins, there are several superimposed. A tendency to form true permanent rays is also apparent in large specimens, though the simpler Dipnoän arrangement of the actinotrichia is very apparent in very young specimens and in cases where those have become rudimentary. There is also a less obviously wide and continuous median fin-fold than in Teleostean embryos, and a pronounced tendency to differentiate a caudal, dorsal, and anal fins, with intervening atrophied intervals between them.

(It is very remarkable that Parapodoid structures should exist in the embryos of *Scyllium*, as noted by Meyer (No. 7, pp. 219–229), whose figures also show that there is at first an archicercal terminal part of the embryonic axis projecting beyond the point where median fin-folds are developed, thus giving rise to a degenerate worm-like tail, such as has been described by me as an opisthure (No. 1, p. 94). Such data as Meyer has presented are sufficiently conclusive, it seems to me, to add great force to some of the conclusions reached by the writer in No. 5, pp. 1119–1121, but which were formulated still earlier upon other grounds by Dohrn.†)

The fourth grade of radial development in which several salient characters appear for the first time is represented by the Chondrosteans, Holostei, Crossopterygians, and Teleostei, which form a very natural group for other reasons, in like manner based on data which embryological investigation has supplied.

* The papers cited will be referred to by number.

† 8. Studien zur Urgeschichte des Wirbelthierkörpers. VI. Die paarigen und unpaaren Flossen der Selachier. Mitth. zool. Stat. Neapel, V, 1884, pp. 161–195, pls. 8, 9.

The new features which appear in the differentiation of the rays of these forms are four in number, viz:

(*a*) The atrophy of a number of actinotrichia at the bases or along the whole width of the fin-folds, as a result of which absolutely eradiate interradial spaces are formed.

(*b*) The coalescence of a number of actinotrichia and their fusion within a membranous matrix in order to form a basis for the ossification of the "soft rays" or malacopterygian type of fin-ray.

(*c*) The dichotomy of the soft rays due to the manner in which the actinotrichia are fused and drawn together antero-posteriorly at their proximal ends.

(*d*) The segmentation of the soft rays, the segments increasing in number with age, so that it seems that the segmentation is due to a kind of transverse fracture during their development due to use in swimming, as would seem to be indicated by a microscopic examination of the articulating ends of the segments, which seem to be widened terminally by the pressure on alternate sides brought to bear upon them.

Another advance is made in the development of the acanthopterygian type of fin-rays or "spines," which are mainly confined to the Physoclistous types of Teleosts, where they develop in more or less clearly distinct epiblastic pockets in advance of the continuous fold which gives rise to the malacopterygian, dichotomous type of rays. Good examples of this style of development of spinous rays are seen in *Lophius* and *Gasterosteus*. It is doubtful if spinous, simple rays are developed from actinotrichia at all, but from membrane formed by the mesoblast and molded upon the inner walls of epiblastic pockets.

While the Teleostean series, as a rule, develops a lophocercal stage, there are notable exeeptions, and it frequently happens that when the median continuous fold is formed the actinotrichia are not developed simultaneously throughout its whole extent. Only in types which are apparently primitive, such as the Salmon, do the actinotrichia of the entire fold develop so as to be visible along its whole extent. But the continuity of the fold is soon interrupted by the atrophy of the intervals between the median fins.

It is thus made obvious to the discriminating student that embryology is just as capable of supplying data of taxonomic value as a study of outwardly palpable features or as a study of the anatomy of a series of forms. But the obvious disadvantage under which anatomy labors is that it cannot safely surmise what genetic relations are indicated by the morphology of the completed or adult organism, for the reason that it cannot indicate the order and method according to which the various parts made their appearance. The blundering on the part of anatomists in this respect is notorious, and is only excelled by the careless taxonomist who is in search of differences for the sake of discriminating new species, while he is in absolute ignorance of how such differ-

ences arose. Happily such taxonomic methods are becoming a matter of the past, and it will not be long before it will not be the misfortune of the conchologist to name the "spat" stages of the oyster as distinct species, or for the ichthyologist to erect "families" upon the characters presented by larval fishes.

The truth is, that if embryological, internal or external, anatomical characters are each taken separately they will lead to diverse results, and just in proportion to the superficiality of the characters upon which names are based in just that proportion will there be uncertainty as to the relations of the discriminated forms in the minds of subsequent investigators who may have other forms to compare or better specimens to study. So it will not be by means of embryology through a study of a single character or group of characters or with the help of external or of internal anatomy alone that we can be guided, but by all three combined, with such help from distribution in space as may be accessible in the case of living organisms. The method of the palæontologist is necessarily different, but even that does not afford an apology for the treatment of now-living forms according to a widely prevalent but fundamentally wrong method.

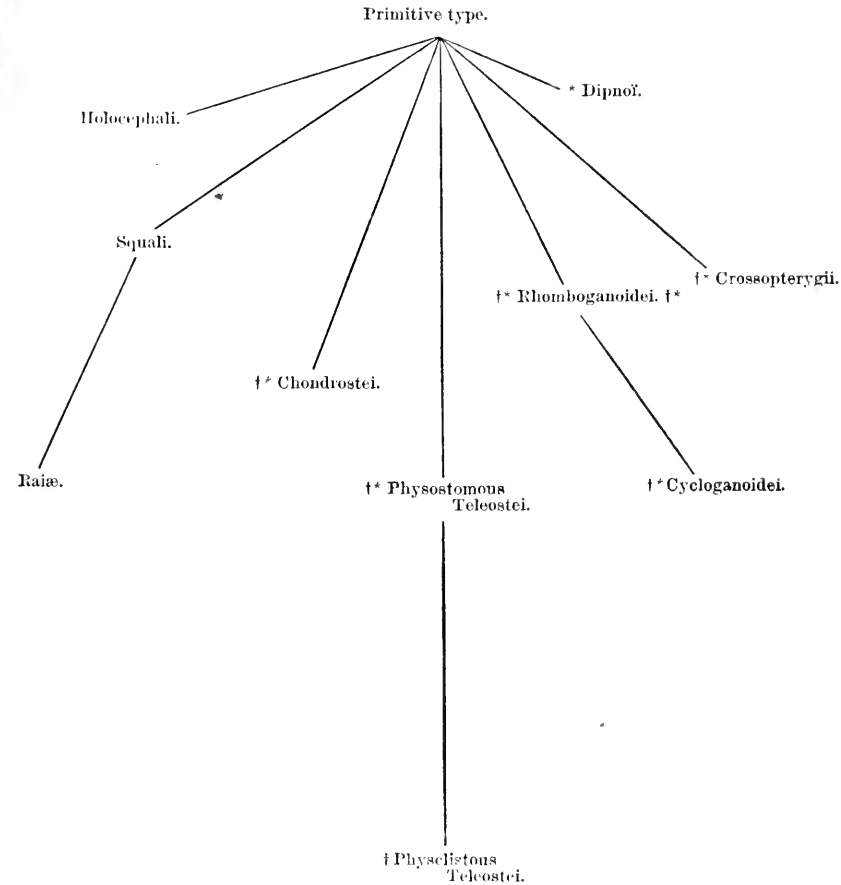
To cite an instance in illustration, most persons would suppose that there was no reason to suspect that the ventral fins of a Sea-robin or a Toadfish had not always been inserted in advance of the pectoral. There have been theorists who have thought differently, Owen amongst the number, but it was not until the embryological observations of A. Agassiz put us in possession of the data from which to formulate it as a fact that in some instances at least the ventral fins of the embryos of Physoclist fishes originate behind the pectorals and are suddenly shoved forward, below and in advance of the pectoral. This information gained, we are in a position to state with positive certainty that the relative position of the paired fins of Physoclist fishes was preceded in time by one in which they were more nearly in the same relative position as in the existing physostomous forms. No possible construction of the facts of the anatomy of the adults could have given such conclusive evidence in favor of what becomes an obvious truth in the light of ontogenetic investigation. Moreover, the facts of the anatomy of Physoclists become at once of greater interest, for the crossing of the nerves which supply the paired fins is satisfactorily explained.

To return, however, to the discussion of the fact that parts of structures vanish in an order exactly the reverse of that in which they appeared, we may recur to the Salmon, in which the preanal fin-fold atrophies or disappears in a manner exactly the reverse of that presented by its appearance. During its outgrowth it slowly widens or becomes higher, while during its atrophy it becomes gradually lower and narrower, until all outward evidence of its existence vanishes.

Where new complications of development occur, when new structural details are added to pre-existing ones, as in the case of the fins, it is very clear that this process is often actually accompanied by one of atrophy,

for it is found, in the first place, that, as a rule, the median fins, for example, begin their development as uninterrupted folds. Only one type, the Dipnoï, has retained this pre-eminently embryonic character, all other fish-like branchiferous Chordata (not considering the Leptocardians and Marsipobranchs) very soon show a tendency to depart from such a primitive condition. In consequence there is atrophy of certain portions of the fold, while others hypertrophy, and the included actinotrichia become involved, and new features arise from primitive ones, some being actually superimposed upon older ones.

It is difficult to arrange the groups of fishes in a satisfactory way by the help of any one character or group of characters, and it is especially difficult to indicate by the help of an ideal tree what seem to be their actual genetic relationships. The best way to indicate changes in the grade of development would be to consider the most embryonic form nearest to an ideal type from which there has been divergence and specialization in various directions, thus:



The groups indicated by an asterisk are physostomous, and in the diagram the length of the diverging lines is intended to show the de-

gree of morphological differentiation of the fins, or the approximate extent of departure from the primitive type in reference to this one feature. The groups indicated by the mark † are those in which true interradial spaces are developed, these being the least prominent in the Chondrostei, which therefore depart least from the still more primitive Dipnoï. Objections may be raised as to the plan of this diagram as indicating relations, but it seems to me to be far more in keeping with legitimate scientific method to refrain from indicating phyletic relations until our knowledge is comprehensive enough to include an analysis of *all* the characters of a series of groups, so as to be able to represent their true relations. This diagram aims only to illustrate the relations which appear to subsist between ten of the major groups of fishes, as indicated by the development and morphology of the fins and fin-rays.

The Rays have been placed higher than the Sharks in the diagram because their horn-fibers or actinotrichia are degenerate in the paired fins and their organization otherwise specialized. If, however, I were to consult the mode of outgrowth of the other elements of the paired fins in the Rays, during which these organs maintain their primordial relations to a greater extent than in other Elasmobranchs, I would be obliged to rank them much lower than the Sharks. If, therefore, we take development as a guide, we are often forced to admit that one set of organs has advanced in organization or has remained stationary, or even may have become more or less degenerate and thus reverted in that feature to an older and more embryonic type. The question which then arises in estimating the value of such characters in taxonomy is in which one of these three ways the characters of the forms under consideration have arisen.

This is not always an easy matter, as we will find if we turn for a moment to the consideration of the three above-specified methods, according to which single organs and groups of organs are developed in some given form.

(*a*) Taking the first case, or that of advancement, we may find that a process of *evolution* has specialized one feature, which in turn has clearly exerted a stunting influence, or one of *retardation*, upon another, or the reverse. In this way new features arise upon which new species may be founded.

(*b*) In the second case no evolution, accompanied by the addition of new elements of complication to already existing, fully-developed, or partially degenerate organs, is taking place, and we may designate such a state as one of fixity or *stable equilibrium*. Such an attained equilibrium of the working of the life forces of an organism as a whole, as is shown by adult forms, enables the naturalist to discriminate *species*, otherwise a taxonomy would be logically impossible, because there could then be no such thing as *species*. An orderless, lawless variation of organisms would then make an end of all taxonomic method.

(*c*) The third case is one which is often difficult to distinguish from a case of *evolution* or one of *stable equilibrium* for reasons presently to be given. This case is often designated by the terms *degeneration*, *degradation*, *retrogressive development*, *retardation*, and other like words and phrases. But at the very outset we may be confronted by an inquiry as to how such degeneration arose, and also be asked how we know that it is an actual degeneration. A study of development indicates that anatomists have often used the terms indicative of degeneration hastily and in an ill-considered sense. In order that my meaning may be made clear it will be necessary to consider the possible ways in which degeneration, real or apparent, may arise, and in this quest embryology will be our best guide. In order to make our meaning the more directly applicable here the illustrations used will also be drawn from studies upon fins and similar processes of the bodies of fishes. What holds there is applicable as a general principle elsewhere. As it is, it is evident that there are several types of degeneration, so called, some of which cannot be properly included under the one same term.

(*aa*) True or *actual* degeneration may be defined as that sort which is witnessed when, for example, the preanal fin-fold of the Salmon is developed to the protopterygian stage, with a row of actinotrichia on either side, but is soon after absorbed so as to disappear completely, and long before the animal is fully developed. Another illustration is that of the suctorial disk of *Lepidosteus*, which disappears in like manner, leaving but very slight traces of its existence in the adult. Such a method of degeneration, which involves the total atrophy of a structure, embraces, for the most part, in the range of its action only so called larval characters. This type of degenerative action is operative within the life-time of an individual.

(*bb*) The next subtype of apparently retrogressive development is probably not actually retrogressive, if it is intended to apply the expression in its strictly literal meaning, but is only apparently so, at least in many cases. An instance of that is the "adipose fins" of fishes. These have developed as far as to the stage represented by the fins of the Dipnöi, but have been arrested at that stage and have advanced no farther. It would therefore be pure hypothesis, unsupported by any evidence whatever, to assume that that type of fin had been derived by *degradation* from a dorsal in which there were wide interradial interspaces between true bony rays. Far rather let us suppose that the development has been so *retarded* in its advance toward the evolution of the Teleostean type of fin as to preserve the older Dipnöan condition. The term *retardation*, so often used by Cope, expresses the facts of the case far better than to say *degeneration*. This applies, however, so far as we can see, only to individual development, beyond which embryology, it must be admitted, does not afford anything more than hypothetical clews.

In many cases degradation of some structure has, however, certainly occurred. A most notorious case of this kind is that of the Whales, which have lost their functional hind limbs. On investigating the condition of the *vestiges** of these limbs we find that the skeletal parts have actually been arrested, as to the *extent* of their development, at a point corresponding to an early embryonic stage, beyond which they fail to advance. We are now ready to ask where this curtailment of development began, and we find that there is logically no way out of the difficulty except to admit that the retrogressive metamorphosis must have begun after birth in each and every one of the series of individuals constituting the race, because there could be no equilibration between extrinsic forces on the one hand and intrinsic or organic forces on the other as long as the fœtus was protected and incapable of free movement *in utero*. I see no escape, therefore, from the conclusion that the second sort of *degeneration*, designated by the word *retardation* for embryological reasons, has actually arisen in many instances through a very slowly acquired undoing of development or loss of parts through an extended series of adults which have as slowly transmitted these increments of loss or degradation, which so far as we can see is now tolerably stable, though far less so than the development of functional structures, as has been shown by the researches of Struthers.

The distinction between the type of degradation under *aa* and that under *bb* is that in the first the atrophy or loss of a part is an *ontogenetic* process, while in the other the degree of degradation of a part is acquired and becomes fixed by hereditary transmission, and is therefore presumably a *phylogenetic process*, because we see no evidence of any gradual atrophy of such parts in the course of the ontogeny of the animal.

Another illustration of the use of the method of embryology is found amongst the Catfishes. The genus *Noturus* has the adipose dorsal fin adnate and continuous with the caudal, while in the genus Amiurus there has been a decided advance upon the former arrangement, for the reason that in it the adipose dorsal is separated by a wide interval from the caudal. *Amiurus*, during its development, actually recapitulates very closely the stage represented by *Noturus*, which indicates that the latter is taxonomically lower in rank than the former. And just in this instance we also have a very good illustration of a principle of development which ought to make anatomists cautious in the use of the word "degeneration." While I see no evidence whatever of degeneration in *Noturus*, I do see very obvious evidence of arrest or retardation of development of its adipose fin at a point corresponding to a transient stage in *Amiurus*. That is to say, this fin in *Noturus* has been perma-

* Structures which are disappearing should be called *vestiges*. Structures which are still imperfect but are appearing ought to be called *rudiments*. As it is, the word rudiment is usually misapplied, so far as concerns its literal sense, when speaking of "rudimentary organs." Such a distinction it seems to me is important.

nently arrested and held at a certain point in the developmental scale of *Amiurus* without any very obvious signs of concomitant atrophy. The phylogenetic as well as ontogenetic modes of degeneracy are therefore both obvious in the adipose dorsal of *Amiurus*, but neither mode is more than faintly evident in that of *Noturus*, where the fin in question is large, and permanently, or almost perfectly, retains its embryonic proportions.

The median fin-folds of the lowest Chordata, viz, *Branchiostoma* and *Petromyzon*, are not supported by actinotrichia, but in the last, especially, by dichotomous median cartilaginous rods wholly of mesoblastic origin in the median tract. The Amphibia agree with them so far as to have no actinotrichia, as far as known, in the median fin-folds of the larvæ, and are without cartilaginous supports for the same parts. Whether the actinotrichia have degenerated in these last or not it is now impossible to decide, because if they are totally wanting, as they seem to be, it is now quite impossible to prove that they ever existed in their ancestors from any evidence based on now living species, unless the fossil remains of this type may have preserved evidences of their presence in the older and presumably more fish-like forms. If the Amphibia arose from some generalized type which gave rise to the fishes also, or to the most generalized of the latter, then it would seem not unreasonable to expect to find traces of the most primitive of all the types of fin-rays, namely, actinotrichia, preserved in some of the Permian or Carboniferous Amphibian remains.

A structure may, however, be completely suppressed, and for so long a period in some forms that their development will no longer recapitulate the complete story of their phylogeny. This is illustrated for Physostomous as well as for Physoclistous forms in the genera *Gambusia* and *Hippocampus*. Both of these last named genera have tended in fact to revert very early to what I have called the archicercal stage, the latter the most completely so of all known fishes except, perhaps, *Chimæra monstrosa* and *Gastrostomus*.

With this I may conclude the presentation of the evidence in favor of the use of embryological characters in the classification of fishes. Such characters, it appears to me, may be used with just as much propriety as any others; in fact with more, because the only possible way in which the genesis or origin of any and all characters can ever be properly understood is through a study of development. I have heard it stated by systematists that embryological characters were of little or no value in taxonomy; in fact I once thought so myself, but upon a wider acquaintance with the phenomena of development in certain groups I believe I am warranted in saying that just in proportion as our knowledge becomes more detailed and exact in reference to the small groups, just in that proportion will we be able to avail ourselves of such characters in taxonomy, and to appreciate exactly what is meant when we speak of degeneration or specialization.

It will be noticed that the results arrived at in respect to the taxonomic value of the characteristics of the development of the rays of fishes of the different groups are essentially in accord with the views of the best American authorities on the subject. The results here given re-enforce, it seems to the writer, in a remarkable way the views of Gill and Cope as to the systematic relations of the larger groups, and serve at the same time to indicate that the group Palæichthyes of Günther must be looked upon as a thoroughly unnatural assemblage of forms.

ON FULGURITES.

By GEORGE P. MERRILL.

(With one plate.)

Numerous papers on this subject have from time to time appeared, the more recent being those of Wichmann,* Diller,† and Rutley,‡ the last two treating principally of fulgurites formed on solid rock while the first named describes both those formed on the solid rock and the tubular varieties formed in loose sand. The subject is by no means a new one. The earliest notices I am able to find relating to it are those given in the Transactions of the London Philosophical Society for 1790, and in the papers of Fiedler and Gilbert in the Annalen der Physik for 1817 and 1819. Since then periodic papers have appeared in various journals, not all of which I have had access to and concerning whose contents I have to judge from notices given of them in subsequent publications.

So far as I am able to learn the most extensive notices regarding the mode of occurrence of tubular fulgurites (those formed in loose sand) are those given by Fiedler,§ Gilbert, Darwin, and Roemer, while the chemical and microscopic side of the question, that relating to the composition and structure of the resultant glass, is most fully discussed by Gumbel, || Harting,** and Wichmann.††

Unfortunately none of these gentlemen made complete chemical analyses of the purely glassy portion of the fulgurite, and though their papers are full of interest as showing *something* of the actual composition and structure of the glass, none of them give any information regarding this composition relative to the sand in which they were formed.

The National Museum has recently received from Mr. Silas Stearns, of Pensacola, Florida, Messrs. E. L. and A. N. Abbott, of Union Grove, Whitesides County, Illinois, and Mr. C. T. Mason, of Sumter, South Carolina, some very interesting fulgurites of the tubular variety, formed by the lightning striking in loose sand. As these gentlemen furnished full notes regarding the localities and mode of occurrence of these, I have decided to publish in full what information I can glean from them, together with such notes on chemical tests as have been possible under the circumstances, even at the risk of duplicating in part the work of previous observers.

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* Zeit. der Deut. Geol. Gesell., XXXV, p. 487.

†Am. Jour. Sci., XXVIII, 1884, p. 252.

‡ Quar. Jour. Geol. Soc., May, 1885, p. 152.

§ See bibliography at end of this article.

‖ Zeit. der Deut. Geol. Gesell., 1882, p. 647.

**Ann. de Mines, vol. VIII, 1825, p. 200.

†† *Op. cit.*

The tubes received from Mr. Stearns were two in number, each some 50 mm in length and 10 mm in greatest diameter, tapering gradually toward one end. One of these was still in the form of a cylindrical tube, while the second was completely collapsed, so that its internal walls were in contact. Both were of very light gray color, with numerous slight corrugations on their outer surfaces, but, with all, smooth and glassy throughout, with no unfused particles sticking to their outer surfaces, as is commonly the case. The tube walls are about a half millimeter in thickness, and are pierced by numerous minute holes, the edges of which are rounded from fusion. Interiorly the tubes are brightly glazed, while exteriorly they are dull and somewhat rough. Under the microscope, as noted by Diller,* they appear, for the most part, of a perfectly clear and amorphous glass, with only here and there a faint brownish stain from the presence of an iron oxide in the sand. There are also a few remnants of unfused quartz grains embedded in the glass, but they are not abundant. Concerning the occurrence of these Mr. Stearns writes me as follows:

"I had been noticing fragments of this peculiar substance (the fulgurites) among the sand dunes of Santa Rosa Island in this vicinity for a long time, when in the fall of 1882 I discovered the solution of the problem. Near the center of the island, at a point about 35 miles from Pensacola, and on the side of a sand hill, stood a small pine tree that had not long before been shattered by lightning, and about 40 feet away, on a low, level, and moist area, was a crooked interrupted line of fulgurite. One viewing the fragments from a little distance could readily make out the path of the electric fluid as it came from the tree. Upon leaving the low basin for the dryer sandy slope beyond there were no traces of fulgurites to be found.

"The hill upon which the tree stood is a sand dune, formed, as usual, of the very finest white (siliceous) sand. It had been long built, and being somewhat protected from the winds by inner and outer rows of dunes, had gathered a considerable vegetation in the form of stunted trees, bushes, and coarse grass. The low part, or basin, was so situated between the hills that a strong draft of wind always drew over it, keeping the sand from filling it up. During the rainy season such places are covered by 6 or 12 inches of water, and even in the dry summer months they are rather damp, being very near the level of the sea. * * * As to the space occupied by this particular phenomenon, I would say that the pine was 35 feet in height, the distance from the tree to the first fragment of fulgurite was 40 feet, interrupted in one place by a knoll. A considerable quantity of the material was secured when discovered, but it seems all but the pieces forwarded have disappeared."

A series of over fifty fragments of tubes were received from Messrs. E. L. and A. N. Abbott, some of which present very interesting features.

* *Loc. cit.*, p. 253.

Like those from Santa Rosa, they were formed by the lightning striking in loose sand, but while the inner surface was glazed the outer was covered with a rough coat of grains of siliceous sand, iron oxides, and organic matter, rendering the tube entirely opaque instead of translucent, as in the case already mentioned. The surfaces were also very deeply corrugated, as will be noticed in the plate. With considerable difficulty there were prepared some cross-sections of these, which were submitted to microscopic examination. The tube wall was found to be 1 or 2 millimeters in thickness, the inner portion of which consisted of a true amophous glass, colorless or stained brownish in streaks, and inclosing innumerable bubbles and a few black opaque grains, which are probably iron oxides. Fully three-fourths of the tube wall is glass, with a narrow margin of sand grains adhering to the outer portion by means of the glassy cement. No such radial arrangement of elongate bubbles as described by Wichmann and Gumbel* could be seen, neither could I find such arrangement in a cross section prepared from other fulgurites received from Sumter, S. C.† The sand in which they were found was largely siliceous, with a few feldspathic grains and iron oxides, together with a little organic matter. The following in regard to the mode of occurrence of the specimen is from Mr. Abbott's letter:

"The locality is the top of a sand knoll, and includes in area a spot about 50 feet square. Besides the tubes there was found an irregular mass, fused together, which would weigh several ounces. This mass had no connection with anything else, for it had no broken edges. The largest tube was about 3½ inches in diameter, but the glassy lining was so thin and fragile that no sections could be removed. The next in size was about 2 inches across. This was convoluted and irregular in section, giving it an appearance not unlike the rough bark of a tree. * * * This fulgurite was traced into the sand 7 feet, increasing somewhat in size *from above downward.* In common with all others found, its course was nearly straight and vertical. On this and several other of the specimens were found small flat branches running horizontally for several feet. These were about one-fourth of an inch wide and half as thick, the greater diameter being horizontal, and the longitudinal hole being quite small and entirely absent toward the end, which terminated abruptly. Of a different nature was a short branch on the specimen, about the size and shape of a man's thumb; this was inclined slightly upward. A number of other fulgurites were found ranging in diameter down to a quarter of an inch, but having the same general features, except that they were more regular and cylindrical in section. * * * One peculiar fulgurite was found having bulb-like enlarge-

* *Op. cit.*, p. 852 and 648.

† The gift of Mr. C. T. Mason. These last were very thick and strong, and were stated by Mr. Mason to have been found while digging a well, at a depth of 20 feet below the surface. The thickness of the glassy lining was in one case nearly 2 mm. These lacked the wing-like corrugations shown in the plate, but had more the knotted appearance compared by Gumbel to that of stag-horns.

ments. The tube was about three-eighths of an inch in diameter and the enlargements about three-fourths of an inch in diameter (see Fig.—), and their distance apart about 4 inches. They corresponded to the stratification of the sand, and were without doubt caused by it." (See Fig. 2 of plate.)

To ascertain the comparative composition of the glass and sand a quantity of fragments were taken, and after pulverization and separation in the usual manner by the double iodide of mercury and potassium solution, the glass, together with a portion of the sand in which they were formed, was submitted to Professor Clarke, of the Geological Survey, for examination, with the results given below:

	Fulgurite glass.	Sand.
Ignition	.33	1.01
SiO_2	91.66	84.83
Fe_2O_3*Al_2O_3	6.69	9.88
CaO	.38	1.16
MgO	.12	.13
K_2O	.73	1.13
Na_2O	.77	1.50
	100.68	99.64

* Wichmann found the silica percentage of fulgurite glass from Senner Heide to be 96.44; from Elspect, 94.26; from Starczynon, 91.23. He does not give the composition of the sand in which they formed (*op. cit.*, p. 854).

Harting gives the composition of the Elspect fulgurites (presumably both fused and unfused portions) as follows: SiO_2, 90.2 per cent.; Al_2O_3, 0.9 per cent.; Fe_2O_3, 0.7 per cent.; CaO, 0.1 per cent.; MgO, 0.5 per cent.; KO, 0.5 per cent.; NaO, 0.6 per cent; Insol.—HCl, 0.9 per cent.; carbonaceous matter, 5.6 per cent. In the Annual Record of Science and Industry for 1874, p. 228, it is stated that analyses of fulgurites made by Scholz showed them to consist essentially of "carbonates of the alkaline earths, about 85 per cent. being carbonate of lime and 11 per cent. carbonate of strontia." (?)

The results being somewhat different from what was anticipated, and fearing there had been some mistake, and that the sand was not the same as that in which the fulgurite formed, I wrote again to the Messrs. Abbott, one of whom kindly visited the locality a second time and obtained a further supply of material. He also visited another sand bank about 1 mile distant, and obtained there also samples of both sand and fulgurite. These last were very frail, about 1^{cm} in diameter, quite cylindrical, and free from corrugations. Mr. Abbott states he does not consider them "main tubes," but as branches; moreover, they did not pass perpendicularly into the sand, nor was their angle of dip constant, but varied from a few degrees from the perpendicular at the surface to within 10 or 15 degrees of the horizontal. The two branches were about 2 rods apart, one dipping to the southwest and the other almost to the east.

These branches were followed down to distances of 3 or 4 feet below the surface, and samples of both fulgurite and the inclosing sand forwarded to the Museum. Portions of these were pulverized as before and separations made. Some difficulty was experienced in getting a sufficient quantity of material for analysis, since, owing to the varying specific gravity of different portions of the glass caused by the included cavities, portions came down with the still unfused quartz kernels, while others floated to the very last. Two precipitations were made and laid

aside as of not sufficient purity, but the third was almost pure colorless glass with only rarely a stain from iron oxides. This had a specific gravity 2.197, and yielded Professor Clarke 95.91 per cent. of silica, while the sand gave but about 90 per cent.

The results shown by the two analyses are peculiar, and at first glance may seem difficult to account for. Had the lightning shown no selective power the resultant glass would possess the same composition as the sand in which it formed. Had it exercised such power one would naturally expect those minerals which are, under ordinary conditions, most fusible, *i. e.*, the feldspars and iron oxides, to be first acted upon, and hence that the glass would approach them in composition.*

In the case in hand the reverse of this *seems* to have taken place, the ordinarily infusible quartz having been most acted upon, while the other constituents in large part escaped,† thus yielding a glass from 5.91 to 6.83 per cent. richer in silica and relatively poorer in potash, soda, lime, iron, and alumina than the sand in which it formed. Conceding that the results obtained are correct, and that the composition of the sand examined is the same as when the fulgurites were formed, they may, perhaps, be accounted for as follows: When the lightning strikes a heterogeneous mass, as a bed of sand, the various grains or particles composing it will become unequally heated in proportion to their conducting powers, those substances which are the best conductors escaping with least injury while the poorer conductors present so strong a resistance as to become heated even to the point of fusion, hence the composition of the glass will depend upon the relative conductivity of the components of the sand, regardless of their fusibility.‡

Accepting the above as correct, it follows as a legitimate conclusion that the quartz grains composing the sand were poorer conductors of the electric fluid than either the iron oxides or the feldspar. The subject of the relative conductivity of minerals has, however, been too little investigated to afford reliable data for the confirmation or refutation of this.

The fulgurites from which the second silica tests were made were very thin walled and fragile, with scarcely a trace of the convolutions present in the larger forms. These also increased slightly in size from above downward, but grew correspondingly thinner and more fragile. This lack of corrugation even in so frail tubes I was at first inclined to

* "So far as observations have yet been made upon the production of fulgurite by the fusion of a heterogeneous rock it appears that the amount of melting experienced by each ingredient depends chiefly upon its degree of fusibility." (Diller, *op. cit.*, p. 258.)

† So at least it would appear to the writer, rather than as suggested by Mr. Abbott and others, that certain of the more basic substances had been volatilized by the extreme heat engenerated.

‡ The extraordinarily brief duration of the flash and consequent heat would, it seems to me, render it extremely improbable that any one mineral of comparative easy fusibility served as flux and thus aided in reducing the more refractory, as suggested by Wichmann and Harting.

believe to be due, as suggested by Mr. Abbott, to their having been formed at such a depth below the surface that the compactness of the sand prevented their collapsing. Further examination caused me to doubt this for reasons to be noted later.

Accompanying the tubes were several small irregularly rounded lumps of fulgurites without the tubular openings, resembling nothing more than as if a ladle of the molten matter had been poured out upon the ground and "spattered," as suggested by Mr. Abbott. The largest of these was some 2^{cm}. broad, and 5 to 6^{mm}. in thickness, and weighed about 2½ grams. An average of four determinations on these blebs gave a specific gravity of 2.07.

A thin section of the largest sample showed it to be completely amorphous, with only here and there a small grain of sand adhering to its outer surface. This glass is nearly colorless, with occasionally a brownish or yellowish stain from iron oxides, and carries many bubbles. In a few instances what appears like fluidal structure was observed, but the appearance was not as if any considerable portion of the mass had moved, but rather as if the sudden expansion of a steam bubble had pushed the still fluid or plastic material to one side, causing a local development of very limited area. The size of this mass led me to look with considerable care for the presence of products of crystallization. None such, however, were observed, either in the isolated blebs or the glass of the tube walls, my own observations agreeing in this respect with those of Diller, Wichmann, and others.

The peculiar corrugations, or wing-like projections from the sides of the tubes, I cannot (in company with Wichmann) believe to be due in all cases to the partial collapsing of the tube through pressure from without, but rather to inequalities in the sand, together with, perhaps, unequal contraction due to rapid cooling. I cannot conceive how pressure, however applied, could give rise to such peculiar forms which have an appearance, as suggested by Darwin and Fiedler, closely resembling a shrunken vegetable stalk or the bark of the elm or cork tree (Figs. 1 and 3). The fact that these, although usually extending in a direction approximately parallel to the length of the tube, start out at any point in such a very irregular manner, and occasionally at very nearly right angles to the length of the tube, seems in itself a sufficient objection to this idea. Is it not more probable that they are formed by the lightning's following out the path of least resistance, causing the bore to be enlarged here and contracted there in accordance with the conductibility of those portions through which it passed (and the amount of moisture they contained), and that the small branches and wings, sometimes mere points, are lateral offshoots? The absolute contact, in some cases, of the inner walls of the wings, together with the fluidal structure extending from within outward, as noted by Wichmann, would, it seems to me, tend to prove that they are original structures, and in no way caused by a subsequent collapsing. I fail, moreover, to see that we have any grounds for expecting the bore of lightning to be evenly cylindrical,

although observations on this point are lacking. In this connection Fig. 4 is of interest, being an accurate representation, natural size, of the holes made by lightning in a hollow copper ball or globe that formerly surmounted a flag-staff on the Old Capitol Prison in this city, but is now in the collection of the National Museum. Four holes were made in all within a space of some 2 by 6 inches. Two considerably larger than the others and more nearly circular in outline, while the two smaller had the form shown in the cut. Their resemblance to the outline of a cross-section of some of the fulgurites is quite striking.*

On the whole, it appears to the writer that the irregularity in outline of the tubes near the surface is due to the exceeding energetic action of the current during the first part of its course and the lack of homogeneity in the conducting material. At greater depths, where the force has been to some extent reduced and the sand is more compact and homogeneous, the tube is therefore more nearly cylindrical. In Fig. 1 it will be noticed the tube at the very top is about 12^{mm} in diameter, but almost immediately enlarges to about 35^{mm}, whence it again gradually tapers off to a diameter (not including the wings) of about 10^{mm}. This enlargement is not merely superficial, but the tube walls remain approximately of a thickness throughout. In Fig. 2 the bulb-like enlargement, which Mr. Abbott says corresponds to the stratification of the sand, I find to be filled with a firm nearly white quartz sand, with but a small hole or rift on one side, through which a portion of the electric fluid seems to have passed without fusion, while the whole inner wall of the bulb itself is glazed like the rest of the tube. Another interesting fragment is 3^{cm} long and about as broad, and only about 1^{cm} in thickness. In this there is a single orifice at the top and two at each corner of the bottom, the one at the lower left-hand corner being the largest. Held to the light the fragment is found to be riddled with small holes as though made by the point of a pin.

Aside from the interest on account of the peculiar form of the fulgurites and the composition of the glass, the case is remarkable on account of the number of specimens occurring in so limited an area, Mr. Abbott stating that he found "several pairs or couples (of tubes) situated only a few inches apart." Concerning a similar occurrence at Maldonado, Darwin expressed the opinion that the flash for some unknown reason was divided into several branches prior to striking the sand, rather than that the several bores were caused by distinct flashes. Facts given concerning the Whitesides County tubes would seem to show that while the closely adjoining ones may have been formed by a single flash, yet throughout the region examined there were at least three independent sets of tubes that must have required as many distinct discharges for their production.

* In each of these cases the fused copper has run back upon the outer surface of the globe, and the appearance of the hole itself is as though no other agency than that of heat had been employed in their production.

The cause of this frequent striking of lightning in similar situations has been discussed by Dr. Fiedler and others in the papers noted below.

SUPPLEMENTARY NOTE.—Since the above was written we have received from Mr. S. T. Walker, Milton, Florida, two fragments of fulgurite from that place. These are each some 65^{mm} in length by 10^{mm} in greatest diameter, being both somewhat flattened. Exteriorly they resemble those from Sumter, South Carolina, lacking the deep corrugations or wings, but being very rough and scoriaceous. The color varies from gray to dull ferruginous red, while the glassy lining, which in some places is 5^{mm} in thickness, is a dull lusterless black. Under the microscope this lining displays the properties of a true glass beautifully streaked with deep smoky brown. The many steam cavities show no definite order of arrangement, though the smaller ones are often grouped in dense aggregates, while the larger ones, often 1^{mm} across, are usually single. These show a peculiar corona of brownish streaks and clouds as if the coloring matter had been suddenly injected into the glass by the development and bursting of the bubble. The glass, with the exception of a few very minute faintly polarizing specks, is entirely black between crossed nicols and shows no colors such as might be produced by stain or partial crystallization.

The following is the bibliography of fulgurites so far as I have been able to gather it from available literature:

WITHERING, WILLIAM. [On Fulgurites.]

Trans. Philos. Soc. Lond., 1790, p. 293.

Gives an account of the fusion of quartz pebbles by lightning at Aylesford, England.

FIEDLER, Dr. K. G.

Ueber Blitzröhren und ihre Entstehung. Ann. der Physik, vol. 55, 1817, p. 121–164. With two plates.

(Ein Nachtrag zu seinem Aufsatze über Blitzröhren in dieser Annalen J. 1817, S. 2, od. B. 55, S 121). *Ibid.*, pp. 235 to 248, and one plate.

Gives a very full account of the occurrence and description of fulgurites at Senner Heide, Nietleben, bei Halle, Drigg, and Aylesford, England. Discusses their origin and composition.

Gives an account of fulgurites found at Rheine, and further discusses their origin. Mentions also the finding of fulgurites on the sand hills near Blankenburg, in the Harz, and near Bahia, in Brazil.

GILBERT, Dr. L.

Noch einiges von den Blitzröhren. Ann. der Physik, vol. 61, 1819, pp. 249–262.

Gives a history of the finding of fulgurites by Pastor Hermann at Massel in Silesia, in 1706 and 1707. Credits Hentzen with having first pointed out their probable origin, and Fiedler with having first *proven* this in a satisfactory manner. Also further describes the fulgurites from Bahia, Brazil, already noted by Fiedler, and makes remarks on their origin. Describes also the fulgurites found on elevated peaks of the Mexican Cordilleras by Humboldt.

Nachtrag zu dem Aufsatze von den Blitzröhren, S. 262. *Ibid.*, pp. 315, 316.

Brief note on the Mexican fulgurites before mentioned.

Sur des tubes vitreux qui paraissent produits par des coups de foudre. Ann. de chimie et de physique, vol. xxi, 1821, pp. 290–303.

A résumé of the subject up to 1821. Compiled mainly from the papers of Fiedler and Gilbert.

DARWIN, CHARLES. [Fulgurites from Maldonado, South America.

Voyage of H. M. S. Beagle, 1833, p. 53, 54.

Gives a detailed account of the occurrence and appearance of fulgurites found by himself at Maldonado, South America.

FIEDLER, K. G.

Comptes Rendus, vol. 17, 1843.

Describes briefly a fulgurite found in a vineyard on the right bank of the river Elbe.

COBB. [Fulgurite from Northfield Farms, Mass.]

Am. Jour. Sci., vol. xxxi, 1861, p. 302.

A brief notice of a fulgurite found by a Dr. Cobb, at Northfield Farms, Mass.

SAINTER. [Fulgurite from Macclesfield, England.]

Geol. Mag., vol. ii, 1865, p. 368.

Describes briefly a fulgurite found in a bed of dry sand at Macclesfield, England.

HARTING.

Soc. Batav. Amsterdam, 1873, p. 13.*

ROSE, G.

Zeit. der Deutschen Geol. Gesellschaft, vol. lxv, 1873, p. 112.

A brief note on the fulgurites from Little Ararat, in Armenia, and Nevado de Toluca, in Mexico.

Composition of fulgurites, Ann. Record of Sci. and Ind., 1874, p. 228. Gives a note of the chemical composition of fulgurite. Taken from the Polytechnisches Journal, ccxi, 408.

HARTING.

Ann. de Mines, vol. viii, 1875, p. 700.

Gives a description and the chemical composition of fulgurite formed at Elspect in 1872, and a brief résumé of the subject up to date.

ROEMER, F.

Ueber ein Vorkommen von Blitzröhren, oder Fulguriten, bei Starczynow, unweit Olkutz, in Königreich Prussia. Neues Jahrbuch für Mineralogie, &c., 1876, p. 33.

Describes the occurrence and appearance of fulgurites found at Starczynow.

GÜMBEL.

Ueber die Bildung der Stylolithen und über Fulgurite.

Zeit. der Deutschen Geol. Gesellschaft, xxxiv, 1882, p. 642.

Describes fulgurites from the Libyan desert between Dachel and the Ammon Oasis, and considers them to be a true quartz glass.

WICHMANN, A. Ueber Fulgurite.

Zeit. der Deutschen Geol. Gesellschaft, xxxv, 1883, pp. 849–859. One plate.

Discusses the conclusions of Gümbel regarding the composition of fulgurites, and proves by analysis that those of Senner Heide, Starczynow, and Elspect are not true quartz glass. Describes the microscopic structure of fulgurites formed in the sand and on rock. One plate, with four figures.

DILLER, J. S. On Fulgurite from Mt. Thielson, Oregon.

Am. Jour. Sci., vol. xxviii, 1884, pp. 252–258.

Describes in detail the structure, both micro- and macroscopically, of fulgurites from the above locality, and gives results of complete chemical analysis. Also mentions fulgurites formed in loose sand at Santa Rosa Island, Florida. Five figures, showing microscopic structure.

RUTLEY, F. On Fulgurites from Mt. Blanc.

Quar. Jour. Geol. Soc., xli, 1885, p. 152.

Describes the micro- and macroscopic structure and pyrognostic properties of fulgurites as above. One plate and five figures, illustrating microscopic structure.

* I have not seen this paper.

DESCRIPTIONS OF SOME NEW SPECIES OF BIRDS, SUPPOSED TO BE FROM THE INTERIOR OF VENEZUELA.

By ROBERT RIDGWAY.

The birds here described as probably new to science were found attached to a bead belt belonging to the Ethnological Department of the National Museum, which was kindly submitted to me for examination by Prof. O. T. Mason, curator of that department. The origin of the belt was unknown, but it is supposed, judging from the birds which were suspended from it as ornamental appendages, to have come from some portion of the Upper Orinoco region, in Venezuela, or contiguous portion of the Rio Negro basin.

1. Pyroderus masoni, sp. nov.

SP. CHAR.—Most like *P. orenocensis* Lafr., but plumage much darker beneath, the throat and jugulum nearly uniform dull brownish red, the breast and abdomen dark brownish chestnut.

Adult (type, No. 106,051, U. S. Nat. Mus.; locality and collector unknown): Entire upper parts, sides of head and neck, chin, upper portion of throat, and anterior portion of malar region (for .60 of an inch backward from the malar apex), uniform deep black; flanks and lower portion of abdomen duller black. Throat and upper portion of jugulum nearly uniform "dragon's blood" red, the feathers uniform ferruginous beneath the surface; lower portion of jugulum (for the space of about .75—1.00 inch) uniform dark ferruginous, bordered below by a band of dull black, the feathers of which are broadly but indistinctly tipped with very dark ferruginous. Lower part of breast and greater portion of abdomen uniform ferruginous-chestnut. Under wing-covets ferruginous, some of the feathers with the inner webs slate-dusky. Bill dull brown (in dried skin).

The specimen being without wings, tail, or feet, and the bill broken, measurements cannot be given.

Another specimen (No. 106,050) is essentially similar, but has the red of the throat and jugulum lighter and of a more rufous tint.

There being, apparently, no comparative diagnoses extant of the species of this genus, and having at the present moment examples of all of them before me, the following synoptical table of their distinctive characters is presented for the convenience of the student:—

a^1. Gorget clear rufous-orange, the feathers tipped with bright scarlet.

b^1. Breast and abdomen only very slightly mixed with ferruginous; bill, from nostril, more than 1 inch. *Habitat*—Brazil, south of the Amazon; Paraguay. P. SCUTATUS (Shaw).

b^2. Breast and abdomen largely mixed with ferruginous; bill, from nostril, less than 1 inch, rather more compressed. *Habitat*—Columbia; Venezuela?

P. GRENADENSIS (Lafr.)

a^2. Gorget rufous, the feathers tipped with brownish red.

b^1. Feathers of gorget abruptly tipped with brownish red; breast and abdomen clear ferruginous. *Habitat*—Venezuela; Colombia?

P. ORENOCENSIS (Lafr.)

b^2. Feathers of gorget indistinctly tipped with darker brownish red: breast and abdomen dark ferruginous-chestnut. *Habitat*—Head-waters of Orinoco?

P. MASONI Ridgw.

The four forms characterized above appear to be divisible into two groups, each apparently representing a distinct species, with two geographical races. If this view of their relationship is correct, they should stand, respectively, as follows: (1) *P. scutatus* (Shaw); (2) *P. scutatus grenadensis* (Lafr.); (3) *P. orenocensis* (Lafr.); (4) *P. orenocensis masoni* Ridgw. The intergradation of *P. scutatus* and *P. grenadensis* is strongly indicated, if not proven, by a specimen in the National Museum (No. 105,850), said to be from Venezuela, which is exactly intermediate in coloration between a Brazilian example (No. 21,858) and one from Bogota (No. 100,296).

2. Aulacorhamphus dimidiatus, sp. nov.

SP. CHAR.—Similar to *A. atrogularis* (Sturm), but with the bill very much shorter, the gonys very little longer than the ramus of the mandible, instead of nearly twice as long, and black stripe along edge of maxilla much broader.

Adult (type, No. 106,052, locality and collector unknown): Bright parrot-green, the lower parts inclining to glaucous-green; chin and upper part of throat black, narrowly and rather indistinctly bordered posteriorly by dull blue. Tail darker blue than the back, shaded with blue, and each feather, except outer pair, broadly tipped with deep chestnut; under tail-coverts bright rufous. Upper mandible deep yellow, tinged with green on lateral portions; basal portion of culmen with a cuneate blackish spot, and edge of the mandible, except at tip, marked with a broad stripe of black, averaging about .15 of an inch wide, except at the base, where the black extends upward nearly to the nostril; the color along the edge of this black stripe, or where adjoining the yellow, decidedly green for the greater portion; base of upper mandible with a marginal bar of dull yellowish, about .12 of an inch broad. Lower mandible deep black, with a dull white basal margin, this about .35 of an inch wide at the broadest portion. Culmen, 2.25; gonys, 1.42; ramus of lower mandible, 1.20; tail, 5.15, graduated for 2.40. (Wings and feet wanting.)

Another specimen (No. 106,053) is, in general, similar, but has the green above more tinged with olive, and the black on edge of upper mandible connected, near the base of the mandible, with the black spot on sub basal portion of the culmen; the latter marking is broader, and rounded, instead of pointed, anteriorly. Culmen, 2.20; gonys, 1.30; rami of lower mandible, 1.25.

Myiopsitta lineola (Cass.)?

Three adults and one young of what is apparently this species, or one very closely related, were found attached to the belt and removed. The young example I am unable to distinguish satisfactorily from specimens of the Mexican bird in the same stage, of which there are three in the National Museum collection, but, unfortunately, no adults. The type of *Psittacula lineola* Cass. appears to have been immature, since the description agrees substantially with the presumed young in the National Museum collection. I have endeavored to borrow the two specimens mentioned by Mr. Cassin, but am informed that they cannot now be found in the Academy of Natural Sciences' collection.

The points of difference between the adult and immature birds are as follows:

Adult: Upper tail-coverts yellowish green, heavily blotched with black, the blotches decidedly longitudinal; middle pair of tail-feathers wholly black for the exposed portion, or else with only a very little green showing along the edge.

Young: Upper tail-coverts duller and less yellowish green, each tipped with a small deltoid spot of black, having a transverse rather than longitudinal direction; middle pair of tail-feathers mostly green for the exposed portion, the tip and a streak along the shaft only being black. General plumage less vivid, with the black bars less distinct.

Differences are appreciable between the young bird of supposed South American habitat and those from Mexico, but with only a single specimen it cannot be determined to what extent the observed differences may be individual in character. They consist chiefly in the larger size and generally darker coloration of the southern specimen.

ON ÆSTRELATA SANDWICHENSIS Ridgw.

By ROBERT RIDGWAY.

In "Water Birds of North America," vol. ii, p. 395, I referred, with much doubt, to *Æstrelata hæsitata* (Kuhl), a Petrel from the Sandwich Islands (No. 61259, U. S. Nat. Mus.; V. Knudsen, coll.), which appeared to agree better in its characters with that species than with any other, but whose characters differed in so many respects from those ascribed to *Æ. hæsitata* that I was led to suggest its probable specific distinctness, and propose for it the name *Æ. sandwichensis*.

Through the kindness of Mr. George N. Lawrence I have been able to make a direct comparison between this specimen and the type of that gentleman's "*Procellaria meridionalis*," generally conceded to be the same as *P. hæsitata* Kuhl, and have found them to be very distinct from one another, as the following comparative diagnoses will serve to show:

Æ. hæsitata. White of the neck almost meeting behind (sometimes completely confluent); upper tail-coverts and basal half, or more, of tail white; middle rectrices broad and rounded at tips. Culmen, 1.20; depth of bill through base, .60; through angle, .52; through middle portion, .40; tarsus, 1.38; middle toe, 1.80; wing, 11.50; tail, 5.25, graduated for 2.00. *Hab.* Atlantic Ocean.

*Æ. sandwichensis.** White of neck confined to the anterior half (or less); upper tail-coverts dusky for exposed portion, but abruptly white beneath the surface; extreme base only of tail white; middle rectrices narrow, almost acuminate at tips. Culmen, 1.22; depth of bill at base, .57; through angle, .45; through middle portion, .40; tarsus, 1.35; middle toe, 1.55; wing, 11.70; tail, 5.80, graduated for 2.30. *Hab.* Pacific Ocean (vicinity of Sandwich Islands).

Additional differences which hold good, so far as comparison with the type of "*Procellaria meridionalis*" is concerned, are the following: The entire forehead is white, quite abruptly defined against the dusky of the crown, which reaches no further forward than on a line with the anterior angle of the eye. (In "*P. meridionalis*" the forehead is spotted with dusky medially quite to the base of the bill.) The bill is wholly deep black (in "*meridionalis*" the terminal half has a decidedly horn-whitish or glaucous cast). The sides are sparsely marked with rather broad, irregular, or zigzag bars of slate color (immaculate white in "*meridionalis*").

There are so many points of discrepancy between the *Procellaria meridionalis* of Lawrence and *P. hæsitata* Kuhl, as described and figured

* *Œstrelata sandwichensis* Ridgw., in Water B. N. Am. ii. 1884, 395 (in text).

by various authors, that it may possibly prove to be a distinct species; but in the absence of an opportunity for comparing it with specimens of the latter I refrain from expressing an opinion in the matter.

ADDITIONAL NOTE.—Since the above was submitted for publication the writer has examined a good series of *Æ. hæsitata*, and has been thereby led to adopt the generally accepted view of the specific identity of this species and *Procellaria meridionalis* Lawr. The latter represents a special phase, but whether an individual variation or dependent on difference of age cannot at present be determined. The series in question removes all possible doubt as to the status of *Æ. sandwichensis*, but I now have a suspicion that the latter is the same as *Æ. phæopygia* Salv. (Trans. Zool. Soc. Lond., vol. ix, part ix, May, 1876, p. 507, pl. 88, fig. 1), from the Galapagos. At any rate, the two should be carefully compared.

DESCRIPTION OF A NEW GENUS AND SPECIES OF MOLE, DYMECODON PILIROSTRIS, FROM JAPAN.

By FREDERICK W. TRUE.

Seven years ago, at the request of Prof. E. S. Morse, the authorities of the Boston Society of Natural History sent to the National Museum two specimens of mammals in alcohol, from Yenosima, at the mouth of the Bay of Yeddo, Japan. The bottle in which they were contained having been misplaced, they have remained unidentified until the present time. One of the specimens is a common house-rat, *Mus decumanus;* the other is an insectivore belonging to a genus hitherto undescribed.

The latter specimen closely resembles *Urotrichus talpoides* in general appearance, but differs in dentition as well as in proportions.

Diagnosis.

DYMECODON,* new genus.

General appearance of *Urotrichus*. Dentition as follows:

$$\text{I.}\ \frac{3}{2}\quad \text{C.}\ \frac{1}{1}\quad \text{PM.}\ \frac{3}{3}\quad \text{M.}\ \frac{3}{3}\times 2=38.$$

Anterior incisors broad, spatulate.

DYMECODON PILIROSTRIS, new species.

General appearance of *U. talpoides:* Tail vertebræ almost exactly one-half the length of the head and body; with the hairs, two-thirds the same length. Soles and palms entirely covered with scales; snout with rather long, fine, dark hairs.

General description.

The chief differences separating this animal from *Urotrichus* and *Neürotrichus* lie in the form and number of the teeth. The first superior incisor is low and broad, and resembles the teeth of *Phocæna* in appearance. It is the broadest tooth anterior to the true molars. The second incisor is nearly as large as the first, and resembles it in shape. The third incisor is very small—about one-fourth the size of the first. The crown is simple and rounded. The canine resembles the third incisor in size and shape. The first premolar is intermediate in size between the first and second incisors, and is conical and pointed. The second premolar is smaller than the second incisor, and rounded. The third premolar and the true molars are as in *Urotrichus*.

*Teeth of two lengths—from δύο, two; μῆκος, length: ὀδούς, tooth. Refers to the alternation of large and small teeth in the lower jaw.

The anterior lower incisor is like the first upper incisor in form and shape. The second approaches the first in size, but is procumbent and bears a triangular accessory cusp posteriorly. The canine is minute and simple. It is procumbent, as are also the premolars. The first premolar is larger than the first incisor and bears a rounded accessory cusp posteriorly. The second is small and simple. The third is the largest tooth anterior to the true molars. It has a prominent posterior accessory cusp. The molars resemble those of *Urotrichus*.

The snout is covered with short dark hairs like those of the body. The soles and palms are entirely scaly throughout. The tail is half as long as the head and body, and is well clothed with hairs about 7^{mm} long. Its scales, as well as those of the feet, are dark-brown. The hair of the body is about 5^{mm} in length, of a dark-brown color, with strong greenish metallic luster in reflected light.

Measurements of alcoholic specimens.

Measurements.	15291. Dymecodon pilirostris ♂.		13713. Urotrichus talpoides ♀.		10717. Neürotrichus Gibbsii ♂ juv.	
	mm.	100*ths.*	*mm.*	100*ths.*	*mm.*	100*ths.*
Length of head and body	66	100.0	80	100.0	53	100.0
Length of tail vertebræ	35	53	34	42.5	33	62.2
Length of tail with hairs	45	68.2	42	52.5	38	71.7
Extremity of snout to eye	15	22.7	17	21.25	13	24.5
Extremity of snout to ear (anterior angle)	25	37.9	28	35.0	21	39.6
Fore foot with claws	11	16.6	12	15.0	10	19.0
Length of longest claw	4	6.1	4	5.0	3.5	6.6
Hind foot with claws	15	22.7	17	21.25	14	26.4
Length of longest claw	3	4.6	2.5	3.25	3.5	6.6
Length of auricular opening	4	6.1	5.5	6.9	3.0	5.6

In dentition *Dymecodon* most closely approaches *Neürotrichus*, but has an additional premolar on each side of the upper jaw. The thick, well-clothed tail resembles that of *Urotrichus*.

The genus is described from a single alcoholic specimen, No. $\frac{15291}{221139}$, from Yenosima, at the mouth of the Bay of Yeddo, Japan.

WASHINGTON, *December* 23, 1885.

REVIEW OF JAPANESE BIRDS.

By LEONHARD STEJNEGER.

I.—THE WOODPECKERS.

(With a colored plate.)

When Capt. Thomas Blakiston two years ago presented his magnificent collection of Japanese birds to the United States National Museum he also had the kindness to place his manuscript notes and catalogues in the hands of the present writer, for the purpose of publishing a complete hand-book of the ornis of Japan.

It is my intention to write a comprehensive and reliable guide to Japanese ornithology, with ample descriptions of all the known forms, from original Japanese specimens. At first it was thought that the material at my disposal, consisting of the collections of Blakiston and Jouy, would be sufficient for the purpose. During the progress of my investigations, however, I found that much more is needed, if the work shall have any claim to completeness.

Formerly it was sufficient to know that a bird was from "Japan." If the description of a Japanese species was found to fit a Japanese specimen approximately, the latter was identified as that species without further comparison. If the original specimen was described from Nagasaki, and the second one, believed to be the same, came from North Yesso, the habitat of the species was given as embracing the whole of Japan. The first collections were made in the southern part, in the island of Kiusiu, and the new forms deposited in the museum in Leyden and described by Temminck. The next collections of any importance, viz, those of Blakiston and Whitely, were made at the northern extremity of the Empire, in the neighborhood of Hakodadi, and went to England. It was taken for granted that the species from the north were identical with those from the south. On the other hand, when, later on, forms similar to those occurring in Yesso were discovered in the Middle Island, or Hondo, as it should now be called, they were unhesitatingly referred to the same species. During his second sojourn in Japan, however, Captain Blakiston discovered that many Siberian forms were found only in Yesso, while, on the other hand, numerous species inhabiting Hondo never crossed the Tsugaru Strait regularly, and furthermore, that several representative forms occur on both sides of this strait which forms a zoogeographical line separating the Siberian and Manchurian subregions, and which has fitly been termed "Blakiston's line." Most of the identifications of the specimens collected by him were made by

Swinhoe, however, many important forms being overlooked or misunderstood, and it is but fair to state that Mr. Blakiston himself was aware of many of these distinctions, neglected by the British ornithologist, as sufficiently proved by numerous notes in his manuscripts. He has also hinted at the line Owari-Tsuruga being a dividing line separating off zoogeographically the southwestern part of Hondo, but this is as yet a hypothesis, the collections from the portion of Hondo in question, which have reached ornithologists, being too small and sporadical to allow of any sure conclusions.

A careful comparison of the Blakiston collection, which consists chiefly of specimens from Yesso, with the fine collections from the central part of Hondo, sent home by Mr. P. L. Jouy, has made it clear to me that there is a much greater diversity between the birds from the different parts of Japan than has hitherto been supposed. But in such a case it is necessary that large series of birds from all parts of the country be brought together before its ornis can be satisfactorily treated of. Notwithstanding the excellent work done so far, our knowledge of Japanese ornithology is only fragmentary, for not only are the northern and southwestern parts of Hondo, as well as the large island of Shikoku, nearly unexplored, but the entire western slope of Hondo, that is, the whole portion of it which faces the Sea of Japan, is a complete *terra incognita*, ornithologically speaking. If we take into consideration the great difference in the climate between the eastern and the western shore of this great island, we must concede that we have no right to conclude that a species also occurs on the western side, opposite the locality where it has been collected on the eastern shore.

American ornithologists will not wonder at hearing that species apt to break up into local forms have done so in a group of islands which in extent corresponds to the coast from the Gulf of California to Vancouver Island, or from the southern extremity of Florida to Nova Scotia, with a variation of climate fully as great as that of the two last mentioned localities; with high mountain ranges, and studded with volcanoes eight thousand to twelve thousand feet high; with a vegetation "one of the richest and most varied on the globe," characterized in the south by the bamboo, the rice, the mulberry tree, and the tea-plant, while in the north the firs form extensive forests, and with "a temperature ranging from the almost Siberian winters of Yesso to the tropical heats of Kiu-Shiu," it would indeed be an extraordinary phenomenon, and quite reverse to what takes place in other countries of similarly varying conditions, were the birds of Japan uniform all through that empire.

The trinominal system of nomenclature cannot be applied in most cases, inasmuch as the intermediate localities are as yet unexplored, and may yield intermediate forms. It is my principle to admit trinominals only where intergradation is unquestionable, and, hence, for the present, I chiefly apply binominals. As to the necessity of distinguish-

ing allied forms, be the difference ever so slight, I may simply refer to what I have said on several other occasions.*

On account of this unsatisfactory state of things, I have resolved to publish preliminary reviews of some of the most perplexing groups in order to solicit specimens and advice from fellow ornithologists, and to induce those who have the opportunity to attempt the solution of some of the questions, if possible, in the field. *My remarks should be regarded and criticized as tentative essays, and their conclusions as merely hypothetical and provisional.*

Ornithologists interested in Japanese ornithology are therefore earnestly requested to assist in gathering a material that will enable me to satisfactorily fulfill the task of writing a complete hand-book of the Japanese ornis. The United States National Museum is willing to procure by exchange specimens necessary for elucidating the fauna, and such examples which the owner is unwilling to part with, will be returned as soon as possible, without expense to him. The present writer is also willing to identify any collection of Japanese birds which may be submitted to him for inspection, and due credit will always be given for any favor rendered. He is also desirous of obtaining all publications, even the smallest notice, relating to the birds of Japan, and offers in exchange his own publications as far as the supply reaches, or such publications of the Smithsonian Institution and the National Museum as may be desired.

All packages and specimens should be addressed to the Smithsonian Institution; books, letters, and other communications, to the writer.

The Code of Nomenclature adopted by the American Ornithologists' Union is adopted. The number in parenthesis in front of the names refers to Blakiston and Pryer's list (1882), from which are also derived the Japanese names. All references are verified by myself unless the number of the page or plate is included in parenthesis. The measurements are in millimeters unless otherwise stated.

Order PICARIÆ.

Six families of Picarians have representatives in Japan. The different forms known to occur there may be referred to their respective families by means of the following artificial key:

a^1. Secondaries nine or more, much longer than the primary coverts.
  b^1. First primary longer than secondaries.
    c^1. Two toes behind, two in front ..... CUCULIDÆ.
    c^2. One toe behind, three in front.
      d^1. Anterior toes not soldered together.
        e^1. Anterior toes at base united by a pliable membrane; middle claw pectinated ..... CAPRIMULGIDÆ.
        e^2. Anterior toes free to the base; middle toe not pectinated. CORACIADIDÆ.

* Proc. U. S. Nat. Mus., VII, 1884, pp. 78–80. Res. Ornith. Explor. Kamtsch., pp. 345–348.

d^2. Anterior toes soldered closely together for the greater part of their length (syndactylous) ..... ALCEDINIDÆ.

b^2. First primary much shorter than secondaries.

c^1. Three toes in front ..... UPUPIDÆ.

c^2. Two toes in front ..... PICIDÆ.

a^2. Secondaries not more than seven, much shorter than the primary coverts. MICROPODIDÆ.

By taking anatomical characters into consideration a more natural classification may be obtained (cf. L. Stejneger in Stand. Nat. Hist., IV, 1885, pp. 371 *seqq.*):

a^1. Ambiens muscle present (superfamily *Cuculoideæ*) ..... CUCULIDÆ.

a^2. Ambiens muscle absent.

b^1. Semitendinosus muscle present.

c^1. Deep plantar tendons sympelmous.

d^1. Dorsal feather-tract furcate between the shoulders (superfamily *Coraciadoideæ*).

e^1. Ten tail feathers ..... CAPRIMULGIDÆ.

e^2. Twelve tail feathers ..... CORACIADIDÆ.

d^2. Dorsal feather-tract simple between the shoulders (superfamily *Alcedinoideæ*) ..... ALCEDINIDÆ.

c^2. Deep plantar tendons schizopelmous (superfamily *Upupoideæ*) ..... UPUPIDÆ.

c^3. Deep plantar tendons antiopelmous (superfamily *Picoideæ*) ..... PICIDÆ.

b^2. Semitendinosus muscle absent (superfamily *Micropodoidea*) ..... MICROPODIDÆ.

FAMILY PICIDÆ.

The family of Woodpeckers may be divided naturally into two subfamilies, the Wrynecks and the Woodpeckers proper, the Japanese forms of which may be easily distinguished as follows:

Jynginæ: Tail-feathers soft, rounded at the ends.
Picinæ: Tail-feathers stiff, pointed towards the ends.

SUBFAMILY JYNGINÆ, WRYNECKS.

JYNX LINN.

=1758.—*Jynx* LINN., S. N. 10 ed., I, p. 112 (type *J. torquilla*).
=1760.—*Torquilla* BRISSON, Ornith., IV, p. 3 (same type).
=1766.—*Yunx* LINN., S. N. 12 ed., I, p. 172 (emend.).
=1800.—*Iynx* RETZIUS, Fauna Suecica, p. 160 (emend.).
=1854.—*Iunx* REICHENBACH, Handb. Spec. Ornith., p. 431 (emend.).
=1863.—*Iunx* CABANIS and HEINE, Mus. Hein., IV, p. 4 (emend.).

(174) **Jynx torquilla** LINN.

Wryneck. Arisu.

1758.—*Jynx torquilla* LINN., S. N., 10 ed., I, p. 112.—*Yunx t.* LINN., S. N., 12 ed., I, p. 172 (1766).—TEMM., Man. d'Orn., 2 ed., III, p. lij. (1835).—TEMM. & SCHLEG., Fauna Jap. Aves (p. 75) (1849).—BLAKIST., Amend. List. B. Jap., p. 47 (1884).—*Jynx t.* SEEBOHM, Ibis, 1884, p. 180.

1826.—*Picus jynx* PALLAS, Zoogr. Ross. As., I, p. 416.

1831.—*Jynx arborea* BREHM, Handb. Vög. Deutschl., p. 203.

1831.—*Jynx punctata* BREHM, Handb. Vög. Deutschl., p. 203.

1850.—*Yunx japonica* BONAPARTE, Consp. Av., I, p. 112.—SWINHOE, Ibis, 1874, p. 162.—BLAK. & PRYER, Ibis, 1878, p. 229.—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 209.—*Id.*, *ibid.*, X, 1882, p. 136.

1855.—*Jynx major* BREHM, Naumannia, 1855, p. 274.

1866.—*Jynx torquilla* forma *septemtrionalis* SUNDEVALL, Consp. Picin., p. 108.

1866.—?*Jynx torquilla* forma *meridionalis* SUNDEVALL, Consp. Picin., p. 108.

Bonaparte originally separated the Japanese Wryneck, as *Yunx japonica* (Consp. Av., I, p. 112), from the western *J. torquilla*, on account of its alleged *much* smaller size and lighter colors. Swinhoe also insists that the eastern bird is smaller (P. Z. S., 1863, p. 267; 1871, p. 393; Ibis, 1874, p. 162). Sundevall, on the other hand, says that the Japanese specimen in the Leyden Museum (the type of Bonaparte?) apparently differs in no respect from a German specimen, but he divides the species in two "forms," a northern and a southern one, those breeding in the north being apparently paler and less yellowish than those passing the summer in the south.

The material at my disposal is too scanty to allow of any sure conclusions, and I very much regret that our museum possesses no specimen of this common bird from Japan. I am especially unable to decide as to the size of the eastern bird. According to Captain Blakiston's MS. notes, all the five specimens which he collected in Yesso (males and females, in April and May) had the wing 80^{mm} long, a measurement considerably smaller than the average of European birds as given below, viz, 85^{mm}, and still more so if he when measuring flattened the wing by pressing it against the scale; but a specimen from Canton, on the other hand (cf. table below), agrees in size pretty well with the western examples.

As to the alleged deeper coloration of the southern specimens my series tends to corroborate Sundevall's view, but inasmuch as the data concerning localities and dates of my specimens are vague or entirely missing, the evidence is quite unsatisfactory. The four last birds of the series measured below are suffused with a much stronger wash of yellow, which makes them separable from the rest at the first glance, but the measurements are practically identical with those of the pale birds.

Judging from Bonaparte's original description and Sundevall's remarks, quoted above, the Japanese bird belongs to the paler form, which is the typical *J. torquilla*. The Wryneck is known to breed in Yesso, and is also recorded as inhabiting Hondo and Kiusiu, but whether breeding in the latter I think is rather doubtful. Of course, the existence of the pale specimens from Nagasaki may prove nothing beyond the fact that this form migrates through Nagasaki on its way southward or northward. But if the Wryneck breed in Southern Japan, and if the dark form is separable as *J. torquilla meridionalis*, the occurrence of the latter in Kiusiu would not be surprising. This only as a question and a suggestion to local ornithologists, and I shall feel much obliged for any material which will throw light on the subject.

Measurements.

U. S. Nat. Mus. No.	Collector.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers	Exp. culmen.	Tarsus.	Ant. ext. toe without claw.	Remarks.
77786	H. Gätke	♂ ad.	Heligoland, Germany	Apr., 1877	87	60	12	19	16	Pale.
9188	.....	♂ ad.	Nurnberg, Germany	1852	87	55	13	20	.....	Do.
105593	Tschusi	♂ ad	Pirano, Istria	Apr. 5, 1882	80	65	11	19	17	Do.
105592	do	♀ ad	Austria	Apr. 5, 1882	88	63	12	20	18	Do.
56740	Schlüter	♀ ad.	Saxony, Germany	.....	82	62	12	....	.....	Do.
96533	Whitely	.. ad.	England	Apr., 1863	85	64	12	19	.....	Do.
96455	.....	♂ ad.	Canton, China	Nov.	83	68	13	.	.....	Dark.
37763	Tristram	♂ ad.	Mt. Carmel, Palestine	Apr. 22, 1864	85	62	11	21	.....	Do.
18710	.....	♂ ad.	Europe	.....	84	61	.	20	18	Do.
18711	.....	♀ ad.	.....do	.....	86	64	13	20	.....	Do.
	Average measurements of nine Western specimens				85	63	12	20	17	

SUBFAMILY PICINÆ, WOODPECKERS.

SYNOPSIS OF THE GENERA OCCURRING IN JAPAN.

a^1. Gonys much shorter than half the commissure; lateral ridge of bill very close to culmen, rather obsolete anteriorly; color, green, with or without red..... *Picus*, p. 104.

a^2. Gonys not shorter than half the commissure; lateral ridge of bill more distant from the culmen, anteriorly reaching nearly or quite to the tomium; color, black, or black and white, with or without red.

b^1. Gonys equals half the commissure; outer hind toe shorter than outer fore toe; neck slender, elongated; lateral ridge of bill at base nearer the culmen than the tomium..... *Dryocopus*, p. 123.

b^2. Gonys longer than half the commissure; outer hind toe longer than outer fore toe; neck not slender, and shorter; lateral ridge of bill at base nearer the tomium than the culmen.

c^1. Gonys distinctly angular and ridged..... *Dryobates*, p. 108.

c^2. Gonys not angular nor ridged..... *Yungipicus*, p. 120.

PICUS LINN.

< 1758.—*Picus* LINN., S. N., 10 ed., I, p. 112.—*Id.*, S. N., 12 ed., I, p. 173 (1766), (type *P. viridis* L., cf. Mus. Hein., IV, p. 30, note).

= 1828.—*Colaptes* BREHM, Isis, 1828, p. 1274 (same type), (nec. Sw. 1827).

< 1831.—*Gecinus* BOIE, Isis, 1831, p. 542 (same type).

< 1837.—*Brachylophus* SWAINSON, Classif. B., II, p. 308.

< 1849.—*Chloropicos* MALHERBE, Mém. Acad. Metz, 1849–1850, p. 348 (same type).

< 1850.—*Chloropicus* MALHERBE, Nouv. Classif. Pic., 2 ed., Sept., 1850 (emend.).

= 1862.—*Gecinetes* ALTUM, Bericht xiv Ornith. Vers., p. 36 (emend.).

SYNOPSIS OF THE JAPANESE SPECIES OF THE GENUS *PICUS*.

a^1. Cervix and malar stripe red..... *P. awokera*.

a^2. No red on cervix nor on malar stripe..... *P. jessoensis*.

The Japanese species may be distinguished from allied species of the adjacent regions as follows:

a^1. Malar stripe red ..... *P. awokera*, Japan.
a^2. Malar stripe black.
b^1. Occiput and hind neck grayish or greenish the former sometimes streaked with black.
c^1. Occiput and sides of head tinged with green ..... *P. jessoensis*, Japan.
c^2. Occiput and sides of head gray, not tinged with green ..... *P. perpallidus*, N. China? Manchuria.
b^2. Occiput and middle of hind neck black.
c^1. Pileum solid black, not streaked with gray .... *P. taeeola*, Formosa, S. China.
c^2. Pilenm streaked with gray ..... *P. guerini*, China.

(173). Picus awokera TEMM.

Japan Green Woodpecker. Awo-gera.

1836.—*Picus awokera* TEMMINCK, Pl. Color. IV, livr. 99, pl. 585 (the plate erroneously inscribed "Pic kizuki."—*Gecinus a.?* TEMM. & SCHLEG., Faun. Jap. Av. (p. 72, pl. xxxvi), (1849).—BLAKIST. & PRYER, Ibis, 1878, p. 229.—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 208.—*Id., ibid.*, X, 1882, p. 136.—BLAKIST., Chrysanth., Febr., 1883, p. ——. — *Id.*, Amend. List B. Jap., p. 46 (1884).—JOUY, Pr. U. S. Nat. Mus., VI, 1883, p. 308.
1866.—*Picus awokera* SUNDEVALL, Consp. Picin., p. 60.

This species, peculiar to Japan south of Yesso, is rather strongly marked and can be confounded with no other form. The male in its head-markings somewhat resembles *P. viridis* and its allies, but the sides of the head are gray and not suffused with green, as in *viridis*. The two Japanese Green Woodpeckers consequently differ in a reverse way from their European allies, the Japanese *P. jessoensis* being a green-headed *P. canus*, while *P. awokera* is a kind of gray-headed *P. viridis*.

The female, however, is very different from the female of *P. viridis*, as the upper part of the head is gray, marked with black in the middle, and the upper part of the cervix only is red; furthermore, the moustachial stripe is red, as in the male.

In the collection sent home by Mr. Jouy I find a young female (U. S. Nat. Mus. No. 91429, Jouy, No. 703, Tate Yama, Hondo, October 19, 1882.) The differences from the adult female are only slight. The upper part of the head is gray, with narrow blackish margins to the feathers, but no medial blackish patch; the red on the cervix and the moustache is less brilliant and somewhat smaller in extent; the breast is grayer and slightly suffused with reddish, and the yellow tinge of the abdominal region less intensive; the black cross markings on the posterior half of the lower surface commence higher up on the breast.

No. 91575 (*Yokohama, April* 6, 1883, *Jouy*) is a male which differs considerably from the two other males in the collection. The whole back is gray, with a very faint wash of greenish gradually increasing towards the rump; the cross markings on the under surface run farther forward, and the breast shows a faint wash of reddish, like the young female described above. On the whole, I am inclined to regard this specimen as a bird of the foregoing year.

Measurements.

U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exp. culmen.	Tarsus.	Ant. ext. toe without claw.
91430	Jouy, 752	♂ ad.	Tate Yama	Nov. 2, 1882	142	96	33	27	21
96008	Blakist., 2661	♂ ad.	Yokohama	Dec	139	101	30	26	21
91575	Jouy, 1051	♂	do	Apr. 6, 1883	142	98	32	27	22
91428	Jouy, 699	♀ ad.	Tate Yama	Oct. 17, 1882	142	96	30	25	21
91429	Jouy, 703	♀ jun.	do	Oct. 19, 1882	137	90	30	26	20

(172) **Picus canus jessoensis** subsp. nov.

Yesso Green Woodpecker. Yama-gera.

1862.—*Gecinus canus* BLAKIST., Ibis, 1862, p. 325.—*Id.*, Chrysanth., 1882, p. 473.—*Id.*, *ibid.*, 1883, p. 28.—*Id.*, Amend. List B. Jap., p. 28 (1884).—WHITELY, Ibis, 1867, p. 195.—SWINHOE, Ibis, 1875, p. 451.—BLAKIST. & PRYER, Ibis, 1878, p. 229.—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, p. 208.—*Iid.*, *ibid.*, X, 1882, p. 136.

DIAGN.—Similar to *Picus canus viridi-canus* (MEY. & WOLF), but the whole head strongly tinged with green, and the under surface lighter and clearer; black streaks (in the male) on pileum and occiput longer.

TYPE.—U. S. Nat. Mus. No. 91538.

HAB.—Apparently confined to the island of Yesso, Japan.

The so-called Gray-headed Green Woodpeckers have hitherto been considered a very homogeneous species, and no attempt has apparently been made to distinguish its subspecies.

The material at my command, however, shows considerable difference between the specimens from distant localities. European specimens exhibit two different styles, which agree in having the head gray; but in the specimens from Norway, the true and typical *P. canus*, the gray of the head is considerably darker, and so is the gray ground color of the whole body, causing the green to appear duller and darker. The birds from Germany are considerably lighter throughout, and in the males the streaks on top of the head behind the red patch seem to be more developed. There is an admixture of brown which makes the green somewhat olivaceous and the yellow of the rump inclining to saffron. I shall designate them as *Picus canus viridi-canus*. The ground-color of the Japanese specimens is still lighter, and, consequently, their whole coloration is clearer, but the green and yellow *per se* are also brighter and purer, without admixture of brownish. The chief character of this form, however, is the strong suffusion of green on the head. So strong is this green tinge that it is a decided misnomer to call the Japanese form a "Gray-headed Green Woodpecker." Indeed, it is more "green-headed" than many a *P. viridis*, only that the green is of a different tint, not being as yellow as in the latter species. In the European ex-

amples there is a just perceptible shade of greenish on the top of head and middle of hind neck, but the sides are decidedly gray. Not so in the Japanese representative, in which the green color not only pervades the sides of head and neck, besides being very much stronger, but also faintly tinges the whitish throat and chin. Swinhoe remarks (l. c.) that the Japanese specimens he examined had small bills. Such a distinction seems not to hold, as is apparent from the table of measurements appended.

That the differences pointed out above are not due to individual variation seems clear from the great uniformity in the specimens from each locality. Unfortunately but few of them are dated, but as all of them are in perfect plumage (especially the tails) they can safely be assumed to be practically in corresponding plumage, and the differences cannot be due to season.

The Gray-headed Woodpeckers inhabiting the intermediate region may be expected to show additional variation of this species, as there is no lack of indications in the literature that some Siberian specimens are unusually gray, and Dresser speaks of an aberrantly colored specimen from Southern Russia in Lord Lilford's collection (B. of Eur., v, p. 96).*

I may further remark that the dull-colored specimens from Norway, alluded to above, are from the rainy west coast. It would, therefore, not invalidate the conclusions here set forth, if it should be found that specimens from eastern and southern Scandinavia agree better with the Central European race.

It would be very interesting to know, if the Gray-headed Woodpeckers in Spain, in the Balkan Peninsula and in Caucasus show any differences from those of Northern and Central Europe. The homes of *Picus sharpii*, *P. saundersi*, and *Dryobates lilfordi* may justly be expected to foster recognizable races of *P. canus*.

*A specimen from the mainland opposite northern Japan (received after the above had been submitted for publication) is very different from *P. jessoensis* from the latter country. It is pale-gray-headed, with gray forehead, and altogether the whole plumage is strongly pervaded with gray, without any brown admixture, resembling most closely the Norwegian true *P. canus*, but very much paler and with a decided white superciliary spot. The yellow on the rump is very restricted, being chiefly confined to the upper tail-coverts and of a clear lemon yellow. The type of this form, which I designate as *Picus canus perpallidus*, is a ♂, U. S. Nat. Mus. No. 108897. It was collected at Sidinij, Ussuri, November 25, 1884, by Mr. I. Kalinowski. The dimensions are as follows: wing, 144mm; tail-feathers, 96mm; expos. culmen, 35mm.

Comparative measurements.

Sub-species.	U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exp. culmen.	Tarsus.	Ant. ext. toe without claw.	Total length.	Remarks.
					1882.							
jessoensis ..	91538	Blak. 3125	(♂) ad.	Sapporo, Japan	Oct. 14	144	93	33	25	21	.....	Type.
	96606	Blak. 3099	(♂) ad.	....do	Oct. 9	137	90	30	25	20	.....	
	96607	Blak. 3124	♀ ad.	....do	Oct. 12	141	100	31	26	19	305	
	91539	Blak. 3126.	♀ ad.	....do	Oct. 16	145	97	31	25	20	.....	
viridi-canus	18938	Drouet ..	♂ ad.	Germany	.....	142	96	32	.....	.....	.....	
	56723	Schlüter ..	♂ ad	....do	.....	143	92	33	.....	.....	.....	
	56724	....do	♀ ad.	....do	.....	145	92	30	.....	.....	.....	
	9595	v. Müller ..	♀ ad.	Europe	.....	145	98	31	.....	.....	.....	
canus	98024	.....	(♂) ad	Bergen, Norway	.....	141	100	30	.....	.....	.....	
	98025	.....	(♂) ad.	....do	.....	146	88	34	.....	.....	.....	
					1884.							
pernallidus	108897	Kalinowski	♂ ad	Ussuri	Nov. 25	144	96	35	.....	.....	.....	Type.

DRYOBATES Boie.

1816.—*Dendrocopos* Koch, Bayr. Zool., I, p. 72 (type *P. tridactylus* L.?). (nec *Dendrocopus* Vieill., Anal., p. 45 (1816).)

1826.—*Dryobates* Boie, Isis, 1826, p. 977 (type *P. pubescens* L.).

1828.—*Picus* Brehm, Isis, 1828, p. 1274 (type *P. major* L.).

1829.—*Dendrodromas* Kaup, Entw. Europ. Thierw., p. 136 (type *P. leuconotus* Bechst.).

1845.—*Leuconotopicus* Malherbe, Rev. Zool., 1845, p. 373.

1854.—*Dyctiopicus* Bonaparte, Consp. Vol. Zyg. Estr. Aten. Ital., No. 8, 1854, p. 8.

1854.—*Phrenopicus* Bonaparte, Consp. Vol. Zyg. Estr. Aten. Ital., No. 8, 1854, p. 8.

1854.—*Trichopicus* Bonaparte, Consp. Vol. Zyg. Estr. Aten. Ital., No. 8, 1854, p. 8.

1854.—*Hypopicus* Bonaparte, Consp. Vol. Zyg. Estr Aten. Ital., No. 8, 1854, p. 8.

1854.—*Pipripicus* Bonaparte, Consp. Vol. Zyg. Estr. Aten. Ital., No. 8, 1854, p. 8.

1854.—*Leiopicus* Bonaparte, Consp. Vol. Zyg. Estr. Aten. Ital., No. 8, 1854, p. 8.

1855.—*Piculus* Brehm, Naumannia, 1855, p. 274 (type *P. minor* L.), (nec J. Geoffr., 1832).

1863.—*Dendrocoptes* Cabanis & Heine, Mus. Hein., IV, p. 41 (type *P. medius* L.).

1863.—*Liopipo* Cabanis & Heine, Mus. Hein., IV, p. 44.

1863.—*Xylurgus* Cabanis & Heine, Mus. Hein., IV, p. 50 (type *P. hyperythrus* Vig.).

1863.—*Xylocopus* Cabanis & Heine, Mus. Hein., IV, p. 51 (type *P. minor* L.).

SYNOPSIS OF THE FORMS KNOWN TO OCCUR IN JAPAN.

a^1. Under tail-coverts and abdomen red.

b^1. Entire back black (*Dryobates*).

c^1. Under surface whitish; scapulars mostly white ..... *D. japonicus.*

c^2. Under surface brownish; scapulars mostly black ..... *? D. gouldii.*

b^2. With white on lower back (*Dendrodromas*).

c^1. Great wing-coverts with two rows of white spots; ear patch and lateral neck patch continuous above, being only partly separated by a black line.

d^1. Under surface and lower back white ..... *? D. leucotos.*

d^2. Under surface and lower back white, strongly washed with buff; rump black. *D. subcirris.*

c^2. Great wing-coverts with only one subapical white spot in the outer web; ear patch and lateral neck patch completely separated by a black streak ..... *D. namiyei.*

a^2. Under tail-coverts and abdomen without red (*Xylocopus*) ..... *D. minor.*

(167) Dryobates japonicus (Seeb.).

Great Spotted Woodpecker. Akagera.

1857.—*Picus major* Cassin, Perry's Exped. Jap., II, p. 222 (*nec.* Linn.).—Blakist., Ibis, 1862, p. 325.—Whitely, Ibis, 1867, p. 195.—Sharpe & Dresser, B. Eur., V, p. 19 (*part*) (1871).—Swinhoe, Ibis, 1875, p. 451.—Blakist. & Pryer, Tr. As. Soc. Jap., VIII, 1880, p. 207 (*part*).—*Id.*, *ibid.*, X, 1882, p. 132 (*part*).

1883.—*Picus japonicus* Seebohm, Ibis, 1883, p. 24.—*Id.*, Hist. Br. B. Eggs, II, p. 355, (1884).—*Dryobates japonicus* Stejneger, Orn. Expl. Kamtsch., pp. 231, 232 (*part*), (1885).

1882.—*Picus major japonicus* Blakist., Chrysanth., Oct., 1882, p. 473.—*Id.*, *ibid.*, Jan., 1883, p. 28.—*Id.*, *ibid.*, Feb., 1883, p.— (*part only*).—*Id.*, Amend. List B. Jap., p. 44, (1884).—Jouy, Pr. U. S. Nat. Mus., VII, Dec. 27, 1884, p. 307 (*part*).

I have before me fourteen specimens from Japan, which, compared with Mr. Seebohm's remarks in establishing *D. japonicus*, induce me to believe that there are two forms in the islands, more or less closely related to *D. major*.

Mr. Seebohm had eleven specimens, five from Hondo, or the middle island, the rest from the northern islands, including Sakhalin and the Kuriles. These he describes (Ibis, 1883, p. 24) as follows: "The color of the under parts agrees with *P. major cissa* from Scandinavia; but the white on the secondaries is more developed, and the white on the innermost secondaries is as much developed as in *P. luciani*." Of *cissa* he says that it is "much whiter on the under parts than those from Britain and South Europe," but "in Scandinavia * * * intermediate forms occur." The inference is that his *japonicus* is lighter underneath than British and South European specimens. Of *luciani* he says that "the white spots on the innermost secondaries meet, forming several broad white bars across the feathers," and in his History of British Birds and Eggs, II, p. 355 (1884), he states that in *japonicus* "the white on the innermost secondaries is developed into broad transverse bars." He furthermore says that "it is probably only sub-specifically distinct from *P. major*," and compared with his statement of "*P. major* and its allies always having white scapulars, and *P. cabanisi* and its allies always having black scapulars," one is justified in concluding that *japonicus* belongs to the former of these two groups; in the latter he also includes *P. gouldi*.

The specimens before me are from the Middle Island as well as from Yesso, five being from the latter island; but only two specimens of the whole series are birds taken during the breeding season, one from each of the islands mentioned.

I shall treat of these two first.

The breeding bird from Yesso (Blak. Coll. No. 2340, U. S. Nat. Mus. No. 95996) is a ♀ shot at Sapporo May 8, 1877. In Blakiston's manuscript notes I find a remark to the effect that this specimen is similar to one from South Yesso, which, in 1882, he sent to Seebohm, and one of the specimens upon which Seebohm founded his *japonicus*. This

specimen matches exactly four specimens from France and Saxony in regard to the color underneath (which is quite light), and in the amount of white on the scapulars, but has the white spots on the inner secondaries longer, nearly forming cross-bands, and, like all eastern specimens at my command, has white tips to the longest primaries. This bird I therefore feel justified in regarding as typical *japonicus*. The next conclusion is that the typical *japonicus* breeds in Yesso.*

The other breeding bird is from Fuji, on the Middle Island, a ♂, collected by Jouy (Coll. No. 425, U. S. Nat. Mus. No. 88703), July 4, 1882. This bird is entirely different from the foregoing. All the white under parts are strongly suffused with brown, and so are the ear-coverts; the scapulars are black, only a few with white tips; the white spots on the inner secondaries are not continuous, consequently they have no bars, although they are somewhat larger than in European specimens of *major*; between the black lateral patches on the breast a few feathers are tipped with red; the outer rectrices are strongly barred with broad black bands. Having no Chinese specimens at hand I have to content myself with Malherbe's figures (Mon. Pic. Atl. I, pl. xvii) and the assertion of Mr. Seebohm that the birds there figured, viz. *P. mandarinus*, *P. gouldii*, *P. cabanisi*, and *P. luciani*, all of which he refers to two extremes, *P. cabanisi* and *P. luciani*, are "apparently separated by a hard and fast line from" *P. major* and allies by having black scapulars. This being the case the Japanese specimen in question can only be referred to the Chinese group, and, indeed, I can at present discover no character by which it can be separated from *P. gouldii*, though actual comparison of specimens may reveal some diagnostic mark. The conclusions to be derived from the above is that there breeds in the Middle Island of Japan a Great Spotted Woodpecker which is different from Seebohm's *P. japonicus*, and which we call *Dryobates gouldii*, at least provisionally.

Several other facts can be adduced in support of the latter conclusion. In the U. S. National Museum is a specimen (No. 91327), a ♂, collected by Jouy at Chiusenji Lake, Middle Island, September 6, 1882. It is essentially like the one described above, even in possessing the red margins to some of the pectoral feathers, and the spots on the inner secondaries are still smaller. During the same summer Mr. Jouy collected six more specimens on the Middle Island, none of which (except a young male), however, came to the National Museum. In regard to these specimens I find the following remarks in Blakiston's manuscript notes: "Jouy's summer specimens all dark."† A third fact in this

* I may add here that a female, the first specimen collected in Japan, (cf. Cassin, Perry's Exped. Jap., II, 222) Hakodadi, May, 1854, U. S. Nat. Mus. No. 15873, is now in a condition which makes it unsafe to base any conclusions upon it, but so far as I can tell from it and from Cassin's remarks, *l. c.*, it is a typical *japonicus*, closely resembling the one above.

† Cf. also Blakiston's remark, Tr. As. Soc. Jap., X, 1882, p. 132: "While the light parts about the face, throat, and breast in Yezo examples are nearly white, southern specimens are deeply tinged with brown."

connection is that Gray, in his Hand-list, II, p. 181, gives *P. gouldii* as in the British Museum from "Japan."

It is evident from Seebohm's remarks that he has light specimens from the Middle Island; so have I, and I have also dark ones from Yesso, but all these are winter birds. There are also several specimens in the collection before me which seem to be intermediate, not only in regard to the coloring of the lower surface, but also as to the amount of white on the shoulders.

The conclusions which I draw from the above facts are, that Japan south of "Blakiston's line" has received its Great Spotted Woodpecker from China, while the inhabitant of Yesso originally immigrated from the adjacent parts of Siberia. The intermediate forms I regard as hybrids. The Great Spotted Woodpeckers are known to be great travelers in autumn and winter,* straggling around the country in all directions. To them the narrow streets of Tsugaru is no obstacle, hence we may find *japonicus* in winter in Hondo, and *gouldii* at the same season in Yesso. That under such circumstances hybridization takes place on a large scale between so closely allied species cannot cause surprise, notwithstanding the probability that most of the straggling specimens will retreat to their original homes towards the breeding season. It must also be remembered that our collections have been chiefly made in districts where the hybrids would most likely occur, viz, in the districts of the Middle Islands north of the line Owari-Tsuruga, and in the southern part of Yesso. The probability is, that in Southern Japan the dark species will be found more exclusively and more pure-bred. The hypothesis is strengthened by numerous similar, or even more distinct, cases of Manchurian and Siberian species entering Japan respectively from the south and the north.

It is plain that the "intergradation," in this case, does not prove the two forms to be geographical races of the same species in the sense in which it is commonly adopted; that is to say, the two forms have not differentiated in Japan. They came to Japan as two well defined species "separated by a hard and fast line," and by different roads of immigration: they met there and intermingled to a certain degree. The case is absolutely parallel to what, in some instances, has taken place in the Scandinavian peninsula, where Siberian forms coming from the northeast and Central European forms from the south meet each other and obscure their distinctiveness by an extensive hybridization, a condition of affairs which should always be borne in mind when speaking of "intermediate links" from Scandinavia.

The two Japanese forms (*D. japonicus* and *gouldii*) differ from the European *D. major* in having exposed white spots in the inner webs

* Cf. *D. major* passing Heligoland "regularly, never in large quantities, but most numerous in autumn" (Seebohm, Brit. B. Eggs, II, 354, note), and *D. pursus* crossing over to the treeless Bering Island, a distance of at least 100 miles (Stejneger, Orn. Explor. Kamtsch., p. 231.)

of the tertiaries, a character which is equally pronounced as well in the young in the first plumage as in the old birds. The Kamtschatkan species, *D. purus*, in that respect resembles the European bird, notwithstanding the fact that in all other parts the white is more extensive and purer than in any of the many allied forms. It is considerably larger, and can never be confounded with its southern neighbors.

Dryobates gouldii [MALH. ?] GRAY.

? Gould's Woodpecker. Akagera.

1857.—? *Picus cabanisi* GOULD, B. of Asia, (pt. ix, pl. 10) (nec MALH., 1854.)
1861.—? *Picus gouldii* MALHERBE, Mon. Picid. I, p. 62, pl. xvii, figs. 6, 7.
1861.—? *Picus luciani* MALHERBE, Mon. Picid. I, p. 63, pl. xvii, figs. 4, 5.
1868.—*Picus major* BLAKIST. & PRYER, Ibis, 1868, p. 228 (part).—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 207 (part).—*Id.*, *Ibid.*, X, 1882, p. 132 (part).—? Seebohm, Ibis, 1879, p. 29.
1870.—*Picus gouldii* GRAY, Handl. B. II, p. 181.
1883.—*Picus major japonicus* BLAKIST., Chrysanth., Febr., 1883, p. — (part).—*Id.*, Amend. List B Jap., p. 13 (part).—JOUY, Pr. U. S. Nat. Mus., VI, Dec. 27, 1883, p. 307 (part).
1885.—*Dryobates japonicus* STEJNEGER, Orn. Expl. Kamtsch., pp. 231, 232 (part).

I have already given my reasons for including this bird in the Japanese fauna, and expressed the opinion that it breeds on Hondo to the exclusion of *D. japonicus*. It should be mentioned, however, that the distribution may be quite different. An inspection of the map compared with what we know about the climatology of the island might lead one to think that the fauna of the western shore may be more like that of Yesso than that of the eastern portion as far north at least as the border of the Tokaido circuit. It is a fact that nearly the entire western slope, and the whole northern portion of Hondo north of the thirty eighth parallel is a *terra incognita* to ornithologists; a minute exploration of these parts, and careful comparison of the birds breeding there, may lead to very unexpected results.

A young female in the first plumage was collected by Jouy at Fuji Yama July 2, 1882. It clearly bears out all the essential characters of the species, and is especially interesting on account of it being considerably different from the young *D. major* in the corresponding plumage in other respects also. On the whole it is like the adult, though the colors are duller; the tertiaries have large exposed white spots in the inner webs; the malar black stripe is distinct and continuous all the way, and the postauricular black stripe separating the cheeks and the lateral neck patch is effecting a perfect connection between the malar stripe and the black on the nape, as in the adult, consequently differing from the young European *D. major*, and resembling in that respect the adult *Dryobates medius* of Europe; the posterior long scapulars are white in the apical half, which is crossed by a broad, nearly continuous black bar; the continuation of the malar stripe, broadening behind, dissolves

on the sides of the breast into numerous cordate blackish spots, the outlines of which become less definite on the sides and the flanks, producing numerous dusky but ill-defined bars in these parts; the whole lower surface is dull brownish-white, only the anal region, crissum, and under-tail coverts washed with a pale and dull carmine; top of head black, the feathers on the crown tipped with glossy but dark crimson. Wing, 127mm; tail-feathers, 78mm; exposed culmen, 21mm; tarsus, 23mm; ant. ext. toe without claw, 14mm.

(169) **Dryobates subcirris** sp. nov.

Ō-akagera.

1862.—*Picus leuconotus* BLAKIST., Ibis, 1862, p. 325.—*Id.*, Chrysanth., Jan. 1883, p. 28.—*Id.*, *ibid.*, Feb. 1883, p. —.—SWINHOE, Ibis, 1875, p. 451?—BLAKIST. & PRYER, Ibis, 1878, p. 229 (part).—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 208.—*Id.*, *ibid.*, X, 1882, p. 133.—JOUY, Pr. U. S. Nat. Mus., VI, 1883, p. 307.

1867.—? *Picus uralensis* WHITELY, Ibis, 1867, p. 195.

DIAGN.—Similar to *D. leucotos* (BECHST.), but considerably larger; the sides of the head and the whole under surface, except the chin, strongly tinged with brownish buff, axillars, middle wing coverts, and lower back lighter and the tinge more yellowish, while the rest of the markings on the wing and the chin are pure white; the white on the upper side is restricted to the lower back (tergum), the interscapulars and the rump proper being black, as are also the upper tail-coverts. ♂ Wing, 155mm; tail-feathers, 95mm; exp. culmen, 37mm.

TYPE.—U. S. Nat. Mus. No. 96000.

HAB.—Northern parts of Hondo Island and (in winter only?) Yesso, Japan.

As far as the color of the under side is concerned this form bears a similar relation to the typical *D. leucotos* from Central Europe, as does *Sitta cæsia* to *S. europæa*. The three specimens before me, an adult male, an adult female, and a young bird of the latter sex, are absolutely identical in this respect. That we have not to do with an artificial stain is evident from the fact that the wash of buff also pervades the axillaries and under wing-coverts, upper middle wing-coverts and lower back. The amount of white on the wings is about the same as in Central European specimens, but on the upper side of the body it is considerably restricted, as the whole rump is black. In size the present species is very superior, and it seems even to be larger than the true *D. cirris* of Siberia.

This form is known from the portion of Hondo north of Yokohama, and it probably breeds in that part of the island, since Jouy, on August 21, 1882, collected a young female, which seems referable to this form, at Chiusenji Lake, in the Nikko Mountains (U. S. Nat. Mus. No. 91326, Jouy No. 649), with trace of the first plumage on top of head, hind neck, and chin. It has also been collected in Southern Yesso, but I suspect that this form only occurs there in autumn and winter, and that the breeding bird of that island is white on the under side, and probably more nearly related to *D. leucotos*.

Measurements.

U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exp. culmen.	Tarsus.	Ext. ant. toe without claw.	Total length.	Remarks.
96000	Blak. 2768	♂ ad.	Sapporo, Yesso	Nov. 11, 1881	155	95	37	28	18	270	Type.
96001	Blak. 3127.	♀ ad	do	Oct. 12 1882	152	95	34	24	17	271	
91326	Jouy 649..	♀ jun.	Chuisenji, Hondo..	Aug. 31, 1882	142	83	30	25	17	.....	

? **Dryobates leucotos** (BECHST.).

1803.—*Picus leucotos* BECHSTEIN, Orn. Taschenb., p. 66.
1826.—*?? Picus cirris* PALLAS, Zoogr. R. As., I, p. 410.
1882.—*Picus leuconotus* BLAKIST., Chrysanth., 1882, p. 473.

During his voyage in the spring of 1882 Captain Blakiston collected two females of a White-backed Woodpecker at Sapporo on June 2 and 4, consequently breeding. They are Nos. 2904 and 2905 of his collection, and were afterwards given to the Hakodadi Museum, being Nos. 1250 and 429 of the latter, according to Blakiston's notes. Regarding No. 2904, I find in his manuscript a note saying that it is "like No. 3127 [the ♀ *D subcirris* now in the U. S. Nat. Mus.] except that the white is not at all tinged with buff." This buff tinge being one of the characters by which to distinguish *D. subcirris* from *D. leucotos* and *D. cirris*, we are inclined to think that the breeding bird of Yesso may belong to the Siberian form. This conclusion is somewhat doubtful, however, as Blakiston makes no mention of the specimen shot two days later, since if this be buff-colored like the rest, No. 2904 may be regarded as an exceptional light individual. As will be seen from the list of specimens collected by Blakiston during his residence in Japan, extracted from his manuscript, only two other specimens can be regarded strictly as breeding birds, viz: No. 1609 and 1610, the two which he sent to Swinhoe in 1875, and which* the latter determined as "*Picus leuconotus*, L. (*uralensis*)" (Ibis, 1875, p. 451).

The question has become still more involved in doubt by a statement of Messrs. Sharpe and Dresser (B. of Eur., V, p. 40) in regard to "a pair of Japanese birds collected by Mr. Whitely." They assert that these birds do not show the differences distinctive of the Siberian birds when compared with Swedish examples, and hence they conclude that *D. cirris* is not a distinguishable bird! A curious conclusion indeed, that because the Japanese and the Swedish examples—both coast forms—do not show the characters attributed to the continental Siberian form, the latter is not distinguishable at all!! That these gentlemen found no difference between Japanese and Swedish examples of *D. leucotos* does not prove that such are not to be found, for they also assert (*tom. cit.*, p.

*Swinhoe seems to have received the male only (*l. c.*)

21) in regard to *D. major*, that "we could not see any difference in specimens collected in the latter island (Japan) by Mr. Whitely, when compared with European birds," differences duly appreciated by Mr. Seebohm, who for himself refutes the idea of being a "splitter." As Dresser and Blakiston, however, say nothing about the color of the rump, it is still doubtful whether the white-breasted Japanese birds should be referred to true *D. cirris* with white rump, or be regarded as light-colored specimens of *D. subcirris* with black rump.

Since the above was written and submitted for publication, I have received a female White-backed Woodpecker from the mainland opposite Northern Japan. U. S. National Museum No. 108896; Sidinij, Ussuri, December 19, 1884.) Without going into detail I may state that I can find no character which would warrant its separation from typical *D. leucotos*. Whether the males will agree in the same manner, and whether Yesso birds will agree with the mainland bird are questions which are still open. But, certainly, even if the Ussuri bird be inseparable from the European species, there is no good reason to conclude that the Siberian form also is identical. At present, therefore, I regard it safest to retain for the white-breasted Japanese form Bechstein's name, *D. leucotos*, with a query.

WHITE-BACKED WOODPECKERS COLLECTED BY CAPTAIN BLAKISTON IN JAPAN.

I extract the following list of the specimens of White-backed Woodpeckers (*subcirris* and *?leucotos*) collected by Captain Blakiston, from his manuscript notes, together with the measurements as recorded by him. The specimens marked "Hak." were presented by him to the Hakodadi Museum; those marked "Sw." to Mr. R. Swinhoe; and those marked "U. S." to the National Museum of the United States. The last one was not preserved. No. 9 was collected by Mr. Fukushi.

The fresh colors of the specimen first mentioned are given as follows: "Eye, light brown; bill, leaden horn color; feet, bluish slate."

	Museum.	Mus. No.	Blakist. orig. No.	Sex and age.	Locality.	Date.	Total length.	Wing.
1	Hak.	748	754	♂ juv.	Hakodadi, Yesso	Oct. 21, 1861	282	148
2	Hak.	749	1608	♂	Sitosi, Yesso	Nov. 10, 1874	267	157
3	Sw.		1609		Mohitze, Yesso	May 17, 1874	273	153
4	Sw.		1610		do	May 17, 1874	264	157
5	Hak.	750	1611	♂	Porobets, Yesso	Aug. 25, 1874	254	153
6	Hak.	751	2338	♀	Sapporo, Yesso	Apr. 21, 1877	274	152
7	Hak.	752	2339	♂	do	Oct. 28, 1877	277	155
8	U. S.		2768	♂ ad.	do	Nov. 5, 1881	270	154
9	Hak.	1887	2887	♂	do	Nov. 27, 1881	287	155
10	Hak.	1250	2904	♀	do	June 2, 1882		
11	Hak.	4298	2905	♀	do	June 4, 1882		
12	U. S.		3127	♀ ad.	do	Oct. 12, 1882	271	155
13					do	Nov. 10, 1881	278	150

Dryobates namiyei sp. nov.

PLATE II.

1882.—*Picus leuconotus* BLAKIST. & PRYER, Tr. As. Soc. Jap., X, 1882, p. 133 (part).

DIAGN.—Similar to *D. leucotos* (BECHST.), but much darker; lower back with a few white cross-bars only; white spots on wings fewer and smaller, and no white band formed by the middle coverts, only a few of the inner ones having a white spot; great wing coverts with only one subapical white spot in the outer web; ear-patch and lateral neck-patch completely separated by a black streak; ♂ wing, 146mm; tail-feathers, 88mm; exposed culmen, 34mm.

TYPE.—Tokio Educational Museum, No. 178

HABITAT.—Southwestern portion of Hondo Island, Japan.

DESCRIPTION OF THE TYPE (*Tokio Educ. Mus. No.* 178; *Yamato, Hondo, Sept.* 1876; *coll. H. Pryer*) ♂ *ad.*—Hind neck, interscapilium, rump, upper tail-coverts, scapulars and lower back (tergum) black, the feathers of the latter with broad white subapical bars, forming about three cross-bands; a few of the hindmost scapulars have similar subapical white bars; chin and throat white, the ground color of the rest of the lower surface being similar, but tinged with buff, and from the lower breast backwards strongly washed with a dull carmine; a frontal band, and sides of head and neck whitish, forehead and ear-coverts strongly suffused with buff; from the mandibular apex a broad black band runs backwards between throat and ear-coverts, sending off an ascending branch behind the latter, which joins the black on the nape and completely separates the whitish lateral neck patch from the cheeks, and descending to the sides of the breast, where widening into a large solid black patch; across the breast the patch is nearly connected with that of the other side by a number of heavy black spots, and backwards they dissolve into large black flames covering the sides and flanks; middle of abdomen and crissum unspotted, but the lower tail-coverts have a faint brownish streak in the middle; a few feathers between the two pectoral patches are slightly tinged with dull carmine; wings above black, the remiges with rather small white spots in both webs, which do not meet across the shaft, except on the tertiaries; primary coverts uniform black, except a few of the external ones which are irregularly whitish at the extreme base and have a rounded white spot in the inner web; the great coverts have only a rounded white spot in the outer web near the tip; only a few of the innermost coverts of the middle row have a subapical white spot in the inner web or across both webs, thus forming a small and rather inconspicuous white spot; the larger under wing-coverts white with a subapical broad blackish band; the smaller under wing-coverts blackish, the outer ones uniformly so, the inner ones more or less marked with white obliquely over both webs; axillaries with large blackish marks; two central pairs of tail-feathers uniform black; the next pair also black, but with two brownish white spots in the outer web near the tip; in the following pair the tip is whitish, and so are a broad cross-bar over both webs, and, higher up, the outer web for a considerable distance, with an adjoining small spot in the inner web; the outer pair (except the rudimentary one) is similar, but with one whitish cross-bar more; rudimentary pair black with two white spots in the outer web, the lower one occupying the tip; crown of head slate grey, each feather broadly tipped with dark crimson, behind which is a distinct black cross-bar; a narrow black edge separates the crown from the whitish of the sides of the head.

Dimensions: Wing, 146mm; tail-feathers, 88mm; exposed culmen, 34mm; ext. ant. toe, without claw, 18mm.

Wing formula: 2<7; 3<6; 4<5, >6; 5 longest.

In their "Birds of Japan" (Tr. As. Soc. Jap., X, 1882, p. 133) Messrs. Blakiston and Pryer comment on the above specimen as follows:

"There is a specimen in the Educational Museum, at Tokio, collected

in Yamato, southwest of Osaka, of the same size as female *leuconotus*, measuring in the wing 152mm.* It has red head, and general resemblance to the male *leuconotus*, but has much more black on the breast, and the white in the middle of the back is almost wanting. It may possibly be a localized race if not distinct species."

In Mr. Blakiston's manuscript notes there is the following remark in regard to the same: "Not nearly so much white; no white on hind neck; certainly sufficiently distinct for another species."

An inspection of the specimen, which Mr. S. Tegima, the director of the Educational Museum, Tokio, had the kindness to loan me, shows that Captain Blakiston was right; and, so far as can be judged from descriptions, our present bird seems to be nearer related to *Dryobates insularis* Gould, from Formosa, than to typical *D. leucotos* or its representative in the northern part of Hondo, *D. subcirris*.

D. namiyei is an interesting analogue of *Dryobates lilfordi* from Southeastern Europe, but is much more different from the typical form than is the latter, which has been generally accepted as a good species, differing from *D. leucotos* chiefly in having the white of the back and rump transversely barred with black (in Dresser's figure, B. of Eur., v., pl. 280, we count about eight black cross-bars, against about two in our bird); otherwise the white does not seem to be materially restricted. Like the Japanese form of *leucotos*, our bird has the whole rump perfectly black, and only the longest feathers of the lower back are barred with white. But also in all other parts of the body the white is restricted and supplanted by black, as already pointed out in the diagnosis and the "key." We shall only add, that the number of white spots in the inner web of the primaries has likewise decreased by about one in each feather.

Having no specimen of *Dryobates insularis* from Formosa, we will have to content ourselves with the descriptions, which, however, are somewhat contradictory *inter se;*† but it seems as if *D. insularis*, in spite of

* Evidently by flattening the wing. The dimensions given by myself were taken by means of dividers.—L. S.

† The following is the synonymy and the most important original descriptions of this species:

Dryobates insularis (GOULD).

1862.—*Picus insularis* GOULD, P. Z. S., 1862, p. 283.—*Id.*, B. Asia, pt. xvi, pl. — (1864).—SWINHOE, Ibis, 1863, p. 390.—SUNDEVALL, Consp. Picin., p. 24 (1866).—*Dendrodromas* i. CAB. & HEINE, Mus. Hein., IV, pt. ii, p. 38 (1863).

HABITAT: Formosa.

The original description of *D. insularis* by Gould is as follows (P. Z. S., 1862, p. 283):

"Male: Forehead crossed by a narrow band of buff; crown of the head, scarlet; lores, cheeks, sides of the neck and throat white; a black line commencing at the base of the lower mandible passes down between the ear-coverts and the throat on to the sides of the chest, where it forms a broad patch; flanks buffy white, strongly striated with black; lower part of the abdomen and under tail-coverts rosy scarlet; mantle, shoulders, upper tail-coverts, and four middle tail-feathers black; center of the back

the restriction of the white color on other parts, has more white on the back than its Japanese relative, cf. Mr. Gould's expression: "Center of the back white, crossed with irregular rays of black, as in *Picus leuconotus*." The red on the lower parts seems also to be more restricted and paler in the Formosa bird.

As to the curious distribution of these bird on the Japanese islands, two distinct forms of the same superspecies inhabiting the same island, I may remark that not only is there a marked difference between the ornis of Yesso and that part of the empire lying south of the Tsugaru Strait, or Blakiston's line, as it is deservedly called in zoogeographical parlance, the former belonging to Siberia, the latter to the Manchurian region; but the ornis of Nagasaki shows a considerable difference from that of those parts of the central portion of Hondo, or the Middle Island, with the fauna of which we are acquainted.

The ornis of the southwestern parts of Hondo, especially the circuits of Gokinai, Sanindo, and Sanyodo, and of the Island of Shikoku, is very little known, and it is hardly possible yet to say with certainty whether it agrees most closely with that of Kiusiu, or with that of the central part of Hondo. The present species, the type of which was taken in Yamato, seems to indicate the southern character of the ornis of the country south and west of a line between the bays of Owari and Tsuruga, which has been ascertained to be the "line of demarkation" in respect to coleoptera (*cf.* Blak. & Pryer, Tr. As. Soc. Jap., x, 1882, p. 145), and it would not be surprising at all if this line also limits the distribution of certain local specializations of birds or immigrants from the south. It may be, however, that the region thus set off will have to

white, crossed with irregular rays of black, as in *Picus leuconotus*; wings black, spotted with white in both webs of the feathers, as in that species; outer tail-feathers alternately barred with black and white; bill bluish horn-color; tarsi and feet lead-color.

"Total length, 9¼ inches; bill, 1½; wing, 5⅜; tail, 3½; tarsi, ⅝.

"Female like the male in every respect except in having a black instead of a red crown."

Messrs. Cabanis and Heine describe a young male (Mus. Hein., IV, ii, p. 38) as having the whole crown varied of black and red; the postauricular black stripe separating the ear-patch and the lateral neck-patch; the feathers of the lower back broadly tipped with white; the feathers of the abdomen and crissum only faintly tinged with red ("plumis * * * ventris pallide et subobsolete subrosaceo tinctis, crisso auguste pallide rosaceo, miniato, carmineo"); the six middle rectrices uniform black, etc.

In view of these descriptions, which are based upon specimens, and which plainly indicate a whitish spot on the side of the neck, Sundevall's assertion (Consp. Picin., p. 24), that the jugular streak is indistinct and confluent with the black of the nape, the sides of the neck thus being totally black ("linea ordinaria nigra ad latera juguli non districta, sed cum nigredine cervicis confluens, unde latera colli tota nigra") seems inexplicable.

The measurements given by Cabanis and Heine (and from them Sundevall?) are considerably smaller than those of Gould, being, total length, 8 1/12 inches; culmen, 1; wing, 4⅜; tail, 3; tarsi ⅝ (Sundevall: wing, 125mm).

be restricted to the country lying south of the mountain range separating the circuits of Sanindo and Sanyodo.

I take great pleasure in dedicating this interesting form to Mr. Namiye, the zoologist of the Tokio Educational Museum.

It will be seen that we have been forced to conjecture that there exists in Japan three forms of the Great White-backed Woodpecker. That in this "Prodromus" we have distinguished them by binominals does not mean, however, that we regard them as separated by "hard and fast" lines. We have not, by far, enough material to decide this point, and the status of these forms as here represented is chiefly conjectural and provisional. So far as the material goes, it indicates a dark southern form (*D. namiyei*), a lighter, larger, underneath buff-colored form in the northern half of the Middle Island (*D. subcirris*), and a still whiter form (*? D. leucotos* or *cirris*) breeding in Yesso.

Subgenus XYLOCOPUS CAB. & HEINE.

(168) **Dryobates minor** (LINN.).

Lesser Spotted Woodpecker.

1758.—*Picus minor* LINN., S. N., 10 ed., I, p. 114.—SEEBOHM, Ibis, 1879, p. 29.—*Id., ibid.*, 1884, p. 36.—BLAKIST. & PRYER, Tr. As. Soc. Jap., VIII, 1880, p. 207.—BLAKIST., Amend. List B. Jap., pp. 28, 44 (1884).

1866.—*Picus minor* var. *borealis* SUNDEVALL, Consp. Picin., p. 26.

1882.—*Picus minor-pipra* BLAKIST., Chrysanth., 1882, p. 473.—*Id., ibid.*, 1883, p. 28.

1882.—*Picus pipra* BLAKIST. & PRYER, Tr. As. Soc. Jap., X, 1882, p. 133.

The Japanese form of the Lesser Spotted Woodpecker is apparently identical with the typical *D. minor* as the latter averages between Middle Scandinavia and Germany, and shows no particular approach to the Siberian *D. pipra* proper, as has sometimes been alleged. The sides are usually strongly streaked, the under tail-coverts always spotted, and the outer tail-feathers provided with two or three cross-bars.

Measurements.

U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-f.	Exp. Culmen.	Tarsus.	Ant. ext. toe, without claw.	Total length.
95999	Blak., 3013	♂ ad.	Sapporo, Yesso	Oct. 1, 1882	93	58	13	14	9	"152"
95997	Blak., 2343	♂ ad.	....do	Apr 28, 1877	90	57	14	15	.....	"150"
95998	Blak., 2345	♀ ad.	....do	May. 10, 1877	93	60	13	14	9	"150"

This species seems to occur only in Yesso, where it is a breeding resident. Blakiston only collected specimens near Sapporo, altogether five, three of which are enumerated above. His No. 2344 was a ♂ shot April 29, Hakodadi Museum No. 754, total length, "155mm," and his No. 2346 is the specimen referred to by Mr. Seebohm in the Ibis for 1879, p. 29. This was also a ♂ collected on May 11, 1877, its total length being "152mm."

The Kamtschatkan *D. immaculatus*,* characterized by its larger size and its excessive whiteness, the whole under surface being pure and unspotted white, and the outer tail-feathers likewise white and nearly unspotted, has not been observed in Japan, unless it be a specimen which, according to Mr. Blakiston's manuscript notes, was collected by Mr. Fukushi at Sapporo in December. It is said to be a ♂ measuring 160^{mm} in total length, with a wing measuring 97^{mm}, consequently in size agreeing pretty well with the type of *D. immaculatus*.

YUNGIPICUS Bonap.

1845.—*Tripsurus* Eyton, Ann. Mag. Nat. Hist., XVI (p. 229) (nec Sw., 1827).
1854.—*Yungipicus* Bonap., Consp. Vol. Zygod. Estr. Aten. Ital. No. 8, 1854, p. 8 (type *P. hardwickii*).
1863.—*Bæopipo* Cabanis & Heine, Mus. Hein., IV, ii, p. 54 (= *Yungipicus*).
1873.—*Yungiceps* Meyer, Journ. f. Orn., 1873, p. 405 (errore).
1874.—*Iyngipicus* Salvadori, Ucc. Borneo (p. 41), (emend.).

Yungipicus seems to me to deserve generic recognition. It differs materially from *Dryobates*, especially in the form of the bill and feet. The former is much less angular, narrower, and barely straight; the gonys is decidedly rounded, and not keeled; and the tarsi and toes are proportionally longer and slenderer.

(170) Yungipicus kizuki (Temm.).

1836.—*Picus kizuki* Temminck, Pl. Color., IV, livr. 99 (text only).—*Iyngipicus k.* Hargitt, Ibis, 1882, p. 36 (*part*).—*Id., ibid.*, 1884, p. 100.
1836.—*Picus kisuki* Temminck, Tabl. Méth., p. 64.—Temm. & Schleg., Fauna Jap. Aves, (p. 74, tab. xxxvii) (1849).—Malherbe, Mon. Pic., I, p. 154, pl. xxxvi, figs. 1, 2.—Blak. & Pryer, Ibis, 1878, p. 229 (*part*).—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 208 (*part*).—*Id., ibid.*, X, 1882, p. 134 (*part*).—Seebohm, Ibis, 1879, p. 29.—Blakiston, Chrysanth., Jan. 1883, p. 28 (*part*).—*Id., ibid.*, Feb. 1883, p. —.—*Id.*, Amend. List B. Jap., p. 45, (1884).—Jouy, Proc. U. S. Nat. Mus., VI, 1883, 308.—*Iyngipicus k.* Seebohm, Ibis, 1884, p. 169.
1845.—*Picus zizuki* Gray, Gen. B., I, p. 435.

Mr. Hargitt has recently divided the Pygmy Woodpecker of Japan into a southern form, the typical *Y. kizuki*, and a northern one, distinguished by being generally paler and having the white markings broader and larger; the latter is his *Y. seebohmi*.

The habitat of these two forms is presumed to be Kiusiu for *Y. kizuki*, and Hondo-Yesso for *Y. seebohmi* (cf. Blakiston, A. L. B. J., pp. 45, 46), and Mr. Blakiston expresses some surprise at finding the bird from the Main Island (Hondo) identical with the Yesso bird, and different from the Kiusiu form, a state of affairs which would be nearly unique among Japanese birds. A close examination of my material leads me to quite different conclusions. In order to find out the true habitat of a Woodpecker it is necessary to ascertain where it breeds, or, reversely,

Dendrocopus immaculatus Stejneger, Pr. Biol. Soc. Wash., II, Aug. 10, 1884, p. 98.—*Dryobates immaculatus* Stejneger, Orn. Explor. Kamtsch., p. 231 (1885).

if we want to determine which form is peculiar to a certain locality, we will have to find out which form breeds there. This is often difficult, because most specimens in museums are autumn or winter birds collected when these birds straggle over the country in all directions. Of all the birds of this genus, which Blakiston collected, only one (Blak. No. 2765, ♀, Sapporo, Yesso, June 23, 1879, Hakod. Mus. No. 755) is a breeding bird, while the others are obtained in September, October, and November. Of all the *Yungipici* collected by Messrs. Jouy and Smith, three only were breeding birds, one of which reached our museum (U. S. Nat. Mus. No. 88705, ♂, Fuji Yama, Hondo, June 28, 1882), all the rest being collected in October, November, and December. And as in these collections, so is the case probably in most others (Hargitt, Ibis, 1882, p. 37, does not give the date of the specimens examined by him).

Of Blakiston's collection I have before me three autumnal birds from Yesso; of Jouy's there are four autumnal and one breeding bird, all from the Middle Island (Hondo). Finally, my material comprises the specimen of Ringer's collection from Nagasaki (Kiusiu), which caused the separation of *Y. kizuki* and *seebohmi*, and which was taken to Leyden and compared with the type of Temminck's *Y. kizuki*.

This specimen is neither dated nor sexed; but I take it to be a female, as it has no trace of red at the end of the superciliary streak, and the condition of the plumage leads me to believe that it was collected rather late in winter. It is apparently safe to regard it as typical of the southern form.

The summer specimen from the Middle Island alluded to above may be pronounced nearly identical with the Nagasaki bird. Apart from the presence of the red spot in the former, the only difference consists in a barely appreciably stronger wash of yellow on the lower surface of the southern example; it may then be remarked that even this difference is probably more apparent than real, since the abrasion of the plumage of the northern bird easily accounts for it, a conclusion warranted by the fact that the autumnal birds from the north have the yellow wash quite pronounced. In the heavy streaking on the lower surface; in the darkness of the brown patches on the sides of the breast, and of the interscapular region; in the narrowness of the white markings on the lower back and wings; in all these important points the two birds agree so closely, that I have no hesitation in asserting, that the form breeding in the Middle Island, not far from Yokohama, is the true *Y. kizuki* of Temminck.

Now, placing the three Yesso birds alongside the typical Kiusiu bird a great difference is at once appreciable. Notwithstanding their having a fresher plumage, the brown on top of head, hind neck, and interscapulars is much paler, as if suffused with ashy; the white cross-bands on back and wings are purer and considerably broader; the outer tail-feathers, instead of being black with white cross-bars, are

white with black cross-bars, the streaks on the flanks and breast are fewer and more indistinct, and the brown patches on the sides of the breast are scarcely more than indicated. There can, I think, be no doubt but what these may be safely regarded as typical *Y. seebohmi*.

I will now call attention to the four autumnal specimens, from Tate Yama, on the Middle Island. Being collected at precisely the same season as the Yesso birds, they offer all desirable advantages for a fair comparison. It will be found at once that the two groups are readily distinguished by essentially the same characters which separate *Y. seebohmi* and *Y. kizuki*. The Tate Yama birds are browner on head and neck; the lateral breast-patches are large and well defined, the streaking is dense and dark, the white marks on back and wing are narrower. In other words, taking the seasonal difference into consideration, the Tate Yama specimens essentially conform with the Fuji Yama bird which we have referred to *Y. kizuki* proper. The only appreciable difference I can detect by a minute examination is that the white bands on the wings and tail in the four specimens is a trifle (perhaps 0.3mm) broader than in the specimens alluded to.

To sum up, I find the Yesso bird, *Y. seebohmi* as here restricted, quite different and easily separable from its southern representative, and that the form which inhabits the Middle Island is inseparable from the Nagasaki bird. I will not deny the possibility that a larger series from the latter locality may show it to be slightly different from the bird of the Middle Island, northeast of the line Owari-Tsuruga, but it is plain to me that the birds south of "Blakiston's Line" are more different from the Yesso bird than are Yokohama and Nagasaki specimens from each other.

From the above it is evident that the Pygmy Woodpeckers of Japan form no exception to the general rule of geographical distribution and local differentiation in those islands. "Blakiston's Line" is also in this instance the dividing line which separates the representative forms, whether they immigrated from the south and from the north into the Japanese Empire as already distinct species, or they differentiated in the islands after having spread over the archipelago by one of these routes alone.

Measurements.

U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exp. culmen.	Tarsus.	Exterior anterior toe, without claw.
96002	Ringer ..	♀ ad	Near Nagasaki, Kiusiu	.....	82	46	12	15	10
88705	Jouy, 314	♂ ad	Fuji Yama, Hondo ..	June 28, 1882	82	45	14	16	10
91333	Jouy, 698	♂ ad	Tate Yama, Hondo....	Oct. 17, 1882	80	47	13	15	10
91427	Jouy, 822A	♂ ad	.....do	Nov. 30, 1882	85	.....	13	15	10
91334	Jouy, 780	♀ ad	.....do	Nov. 25, 1882	87	53	14	15	10
91426	Jouy, 801	♀ ad	.....do	Nov. 20, 1882	90	52	14	15	10

(170½) **Yungipicus seebohmi** HARGITT.

Ko-gera.

1862.—*Picus kisuki* BLAKISTON, Ibis, 1862, p. 325 (*nec* TEMM.).—*Id.*, Chrysanth., Jan., 1883, p. 28 (*part*).—*Id.*, Tr. As. Soc. Jap., XI, 1883, p. 137.—SWINHOE, Ibis, 1875, p. 451.—BLAK. & PRYER, Ibis, 1878, p. 229 (*part*).—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, p. 208 (*part*).—*Iid.*, *ibid.*, X, 1882, p. 134 (*part*).

1884.—*Iyngipicus seebohmi* HARGITT, Ibis, Jan., 1884, p. 100.—SEEBOHM, Ibis, 1884, p. 179.—*Picus s.* BLAKISTON, Amend. List B. Jap., p. 45 (1884).

The distinguishing characters of this form have already been discussed under the foregoing species. It breeds in Yesso, whence in winter it probably straggles across the Tsugaru Strait into Northern Hondo.

Measurements.

U. S. Nat. Mus. No.	Collector and No.	Sex and age	Locality.	Date.	Wing.	Tail-feathers.	Exp. culmen.	Tarsus.	Ext. ant. toe without claw.	Total length.
96004	Blak, 3213...	(♂) ad..	Sapporo, Yesso..	Oct. 26, 1882	85	50	13	15	10	142
96005	Blak, 3214 ..	(♂) ad..	. do	Oct. 26, 1882	83	...	13	15	10	139
96003	Blak, 2766...	(♀) ad..	... do	Nov. 9, 1881	88	52	13	16	11	155

DRYOCOPUS BOIE.

1826.—*Dryocopus* BOIE, Isis, 1826, p. 978 (type *P. martius* LINN.).

1828.—*Dendrocopus* BREHM, Isis, 1828, p. 1274 (nec VIEILL., 1816) (same type).

1829.—*Carbonarius* KAUP, Entw. Eur. Thierw., p. 131 (same type).

1831.—*Dryotomus* SWAINSON, Faun. Bor. Amer., II. p. 301 (same type).

1837.—*Hemilophus* SWAINSON, Classif. B., II, p. 309 (type *pulverulentus*), (nec SERV. 1835).

1849.—*Dryopicus* MALHERBE, Mém. Ac. Metz, 1849–1850, p. 320.

1850.—*Dryopicus* MALHERBE, Class. Nouv. Pic., Sept. 1850, p. ——.

1854.—*Mulleripicus* BONAPARTE, Consp. Vol. Zygodact. Estr. Aten. Ital., No. 8, 1854, p. 7 (type *pulverulentus* TEMM.).

1854.—*Lichtensteinipicus* BONAPARTE, Consp. Vol. Zygodact. Estr. Aten. Ital., No. 8, 1854, p. 7 (type *modestus* VIG.).

1854.—*Alophonerpes* REICHENBACH, Handb. Sp. Ornith., II, Oct. 1, p. 385 (type *pulverulentus*).

1855.—*Picus* GRAY, Cat. Gen. Subgen. Br. Mus., p. 91 (type *martius* L.).

1861.—*Alophus* MALHERBE, Monogr. Pic., I, p. 47 (type *pulverulentus*), (nec SCHÖNH., 1826).

1861.—*Macropicus* MALHERBE, Monogr. Pic., I, p. liii (same type).

1863.—*Thriponax* CABANIS & HEINE, Mus. Hein., IV, p. 105 (type *P. javensis* HORSF.).

SYNOPSIS OF THE JAPANESE SPECIES OF THE GENUS *DRYOCOPUS*.

a^1. Abdomen and lower back black as the rest of the plumage (*Dryocopus*).. *D. martius.*

a^2. Abdomen and lower back white (♀) (*Thriponax*) ..... *D. richardsi.*

(171) **Dryocopus martius** (LINN.).

Great Black Woodpecker. Kuma-gera.

1758.—*Picus martius* LINN., S. N. 10 ed., I, p. 112.—*Id.*, S. N. 12. ed., I, p. 173 (1766).—*Dryocopus m.* BONAP., Geogr. Comp. List, p. 39 (1838).—BLAKISTON, Ibis, 1862, p. 325.—*Id.*, Chrysanth., Jan., 1883, p. 38.—*Id.*, Amend. List B. Jap., p. 28 (1884).—SWINHOE, Ibis, 1875, p. 451.—BLAKIST. & PRYER, Ibis, 1878, p. 229.—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, pp. 177, 208.—*Iid., ibid.*, X, 1882, p. 135.

1758.—*Picus cornicinus* LINN., S. N. 10 ed., I, p. 113 (sub *P. pileatum*).

1831.—*Dendrocopus pinetorum* BREHM, Handb. Vög. Deutschl., p. 185.

1855.—*Dryocopus alpinus* BREHM, Naumannia, 1855, p. 274.

1855.—*Dryocopus niger* BREHM, Naumannia, 1855, p. 274.

Not having access to Japanese specimens of the present species, our Museum possessing none from Japan, I abstain from further remarks.

Subgenus THRIPONAX CAB. & HEINE.

(171½) **Dryocopus richardsi*** TRIST.

Richards's Woodpecker.

1879.—*Dryocopus richardsi* TRISTRAM, P. Z. S., 1879, p. 336, pl. xxxi.—BLAKIST. Amend. List B. Jap., p. 46 (1884).—*Mulleripicus r.* WALLACE, Island Life, p. 363 (1881).—BLAKIST. & PRYER, Tr. As. Soc. Jap., X, 1882, p. 136.—*Thriponax r.* HARGITT, Ibis, 1885, p. 156.

Beyond the descriptions and remarks by Tristram and Hargitt (*ll. cc.*) on the type specimen, a female from Tshu Shima, which, to our knowledge, is still unique, nothing is known about the present species.

* To Vice-Admiral Sir George Henry Richards, H. Br. M. N.

CATALOGUE OF ANIMALS COLLECTED BY THE GEOGRAPHICAL AND EXPLORING COMMISSION OF THE REPUBLIC OF MEXICO.

By FERNANDO FERRARI-PEREZ,

Chief of the Natural History Section.

PREFATORY NOTE.

The Geographical and Exploring Commission of the Republic of Mexico was established by an act of Congress in the year 1877 at the recommendation of the President of the Republic, General Porfirio Diaz, and finally organized at the end of 1878. At that time the Commission consisted only of the Director, Mr. Agustin Diaz, C. E., who still holds the same position, and four more engineers detailed by the Department of Public Works (Secreteria de Fomento). The original object of the Commission was the preparation of a general map of the Republic, the previous non-existence of such a map being due to the accidental loss of the plans and the data pertaining to an earlier topographical survey of the country.

In view of the important results obtained during a short period of work, and at the suggestion of the Director, the Secretary of War, toward the end of 1879, resolved to approve the augmentation of the Commission by ten officers, engineers of the scientific corps of the general staff, and to appoint the present writer as Naturalist of the Commission. By this enlargement the Commission obtained such palpable results that the Government was subsequently induced to increase its facilities by appointing additional members whenever it was found desirable, until the Commission now consists of twenty engineers appointed by the Secretary of Public Works and thirty by the Secretary of War.

In the astronomical, geodetic, and topographical branches the following results have been obtained to date: 26 plans of cities, towns, and villages, some drawn to a scale of 1: 5,000 and others to a scale of 1: 10,000; 13 sheets of the topographical chart of the surroundings of Pueblo to a scale of 1: 20,000, already published; 30 sheets of the geographical chart of the Republic to a scale of 1: 100,000 (the publication of which by the Government has not yet been consummated), each one of these sheets comprising an area of 212,000 hectares, consequently the thirty sheets already completed have together a total area of 6,360,000 hectares, equal to 15,715,560 acres. Each one of these sheets is accompanied by a volume constituting an atlas which contains on a large scale all the details and data pertaining to its history. The following States are represented in their entire extent: The Federal District, Puebla, Tlaxcala, and Morelos; while only portions of Hidalgo, Mexico, Vera Cruz, Nuevo Leon, and Tamaulipas are included. Special maps of each State will be published as soon as all the sheets of the general

map containing portions of a particular State shall have been finished. Every plan, map, or portion of a map prepared by the Geographical Commission carries an inscription indicating the date of its preparation, the persons by whom it has been prepared, and, in general, all the explanations necessary to elucidate the history of its construction and the degree of reliance which can be placed in it; the numerical data included in the tables being referred to points plainly visible and perfectly fixed. This system, introduced by the Commission, has the advantage of establishing several points of comparison which in future work may be utilized for reference. The methods employed are the most exact ones known which can be adapted to the circumstances of the country, several new methods rendered necessary by special topographical conditions having been devised by the Director.

The work at the offices has been considerably facilitated by the establishment of small lithographic and photographic galleries at the headquarters of the Commission. At the former are printed the different kinds of blanks and diagrams for the scientific service, including the schemes for the geodetic and astronomical calculations, which when brought together form a collection illustrating the methods and instruments rendered necessary by peculiar circumstances of travel and transportation. By means of these schemes there has been obtained a much greater promptness in the work, more exact interpretation of the signs in the employment of the formulas, and a uniformity which permits an easy revision of the calculations should any be desired. In the photographic gallery the reduction of the maps for different purposes is made.

In the natural history division of the Commission the work has thus far consisted in the preparation of a part of the geological map, corresponding to two sheets of the general map, at a scale of 1:100,000, and in bringing together an extensive collection of specimens of the different branches of natural history, catalogues of which will appear in these "Proceedings."

The considerable expense necessary for the acquisition of the very costly instruments to be used by the astronomical and topographical division of the Commission has not yet permitted in the natural history division the formation of a library sufficiently complete to insure the success of its work. For that reason no formal publication has been attempted as yet; but when General Porfirio Diaz, who fully appreciates the importance of the work of the Commission, ordered it to take part in the Exposition at New Orleans, the collections of natural history objects were shipped in advance in order to have the identifications of the specimens revised and completed before the opening of the Exposition. Unfortunately, the steamer (the City of Merida) in which they were shipped to New York was burned at Havana on the 29th of August, 1884, causing the loss of the entire collection, consisting of 123 boxes, besides all the baggage of the present writer, wherein was included all the manuscripts pertaining to the collections. The Commission, desir-

ous of repairing this loss as soon as possible, and of sending at least some specimens to the Exposition, in order to profit by the opportunity of having them exactly identified by comparison with specimens in the rich collections of the United States, proceeded with all possible activity to collect new material during the months of October, November, December, and part of January. The collections thus obtained were packed during the latter part of January and shipped about the middle of February to New Orleans. At the Exposition the Grand Diploma of Honor was awarded to the Commission for the excellence of its exhibit as a whole.

In selecting the scientific establishment wherein to make the necessary comparisons and identifications, the Director of the Commission decided upon the United States National Museum, in charge of the Smithsonian Institution, on account of its world-wide reputation, to the great satisfaction of the present writer, who, had it rested with him alone, should have made no other selection, attracted as he was by the kind courtesies received from the celebrated Director of the above-named establishment, Prof. S. F. Baird, who has provided the naturalists of the Commission with all the facilities at his command in order to assist in the execution of our task. We profit by this opportunity to express our profound gratitude for the very kind interest manifested by him in our work.

I.—MAMMALS.

By F. Ferrari-Perez.

The difficulty of collecting and preserving mammals accounts for the insignificant number of specimens which we were able to bring together during the short time between the destruction of the original collection by the conflagration and the opening of the exposition. All those numbered in the following brief list have been verified by Prof. Frederick W. True, the curator of the department of mammals.

Fam. EMBALLONURIDÆ.

1. Molossus rufus Et. Geoffroy.

Molossus rufus Et. Geoffroy, Ann. du Mus., VI, 1805, p. 154. Alston, Biol. Centr. Am. Mam., 1879–82, p. 31.

Vulg.—Murciélago, Raton viejo.

Hab.—State of Chiapas: ? No. 6 ♂ ad., 8 ♀ juv., 9 ♂ juv.

2. Molossus glaucinus (Wagner).

Dysopes glaucinus Natt., Wagner, Wiegm. Archiv, 1843, p. 368.

Molossus glaucinus Dobson, P. Z. S., 1876, p. 714, fig. 2; Cat. Chirop. Brit. Mus., 1878, p. 417.

Vulg.—Murciélago, Raton viejo.

Fam. PHYLLOSTOMIDÆ.

3. **Artibeus perspicillatus** (Linnæus).

Vespertilio perspicillatus Linnæus, Syst. Nat., 10th ed., I, 1758, p. 31.
Artibeus perspicillatus Gray, Mag. Zool. & Bot., II, 1839, p. 487. Alston, Biol. Centr. Am. Mam., 1879–82, p. 47.

Vulg.—Murciélago, Raton viejo.
Hab.—State of Vera Cruz: Jalapa, No. 275 ♂, 276 ♂.
State of Chiapas: ? No. 1 ♀, 2 ♂ juv., 3 ♀, 4 ♂ juv.

4. **Vampyrops lineatus** (Et. Geoffroy).

Phyllostoma lineatum Et. Geoffroy, Ann. du Mus., XV, 1810, p. 180.
Vampyrops lineatus Peters, Monatsb. Ak. Berl., 1865, p. 356. Alston, Biol. Centr. Am. Mam., 1879–82, p. 48.

Vulg.—Murciélago, Raton viejo.
Hab.—State of Chiapas: ? No. 7 ♀.

Fam. FELIDÆ.

5. **Felis tigrina** (Erxleben).

Felis tigrina Erxleben, Syst. Reg. An., 1777, p. 517. Alston, Biol. Centr. Am. Mam., 1879–82, p. 61.

Vulg.—Figrillo.
Hab.—State of Vera Cruz: Jalapa, No. 326 ♂.

6. **Lynx rufus** (Guldenstädt).

Felis ruffa Guldenstädt, Nov. Comm. Petrop., XX, 1776, p. 499.
Lynx rufus Rafinesque, Am. Month. Mag., II, 1817, p. 46.
Felis rufa Alston, Biol. Centr. Am. Mam., 1879–82, p. 64.

Vulg.—Gato montes de cola corta.
Hab.—State of Puebla: Tstatcihualt (S. Martin Texmelucan), No. 295 ♂, August.

Fam. PROCYONIDÆ.

7. **Bassaris astuta** Wagler.

Bassaris astuta Lichtenstein, Abh. Ak. Berl., 1827, p. 119 (descr. nulla). Wagler, Isis, 1831, p. 513, (descr. orig.). Alston, Biol. Centr. Am. Mam. 1879–82, p. 72.

Vulg.—Cacomistle.
Hab.—State of Puebla: Puebla, No. 12 ♀, February.

8. **Cercoleptes caudivolvulus** (Pallas).

Viverra caudivolvula Pallas in Schreber's Säugth., III, 1777, p. 453, pl. CXXV. B.

Cercoleptes caudivolvulus, Tomes, P. Z. S., 1861, p. 280. Alston, Biol. Centr. Am. Mam., 1879–82, p. 76.

Vulg.—Marta, Martucha.
Hab.—State of Vera Cruz: Jalapa, No. 297 ♂.

FAM. MUSTELIDÆ.

9. Putorius brasiliensis frenatus (Lichtenstein).

Mustela frenata Lichenstein, Darst. new Säugt., 1834, pl. XLII.
Putorius (Gale) brasiliensis frenatus Coues, Fur-bearing An., 1877, p. 142.
Mustela brasiliensis Alston, Biol. Centr. Am. Mam., 1879–82, 78.

Vulg.—Onzita, Comadreja.

Hab.—State of Puebla: Huexotitla, No. 309 ♂, January.

FAM. SCIURIDÆ.

10. Sciurus aureogaster F. Cuvier.

Sciurus aureogaster F. Cuvier, Hist. Mam. III, livr. LIX, 1829 (with a fig.).
Sciurus variegatus, Alston, Biol. Centr. Am. Mam., 1879–'82, p. 127.

Vulg.—Ardilla canela, Ardillon canels.

Hab.—State of Vera Cruz: Jalapa, No. 313 ♂.

11. Spermophilus grammurus (Say).

Sciurus grammurus Say Long's Expd. Rock. Mount., II, 1823, p. 72.
Spermophilus grammurus Alston, Biol. Centr. Am. Mam., 1879–82, p. 136.

Vulg.—Ardillon, Ardilla pinta de tierra.

Hab.—State of Puebla: S. Salvador el Verde (Huejocingo)., No. 308 ♀, September.

12. Spermophilus mexicanus (Lichtenstein).

Citillus Mexicanus Lichtenstein, Darstel. Säugt., 1827–34 (not paged), tab. XXXI, fig. 2.
Spermophilus Mexicanus Wagner, Suppl. Schreb., III, 1843, p. 250. Alston, Biol. Centr. Am. Mam., 1879–'82, p. 137.

Vulg.—Huron, Moto, Ardilla.

Hab.—State of Puebla: Puebla, No. 312 ♂.

FAM. GEOMYIDÆ.

13. Geomys mexicanus (Lichtenstein).

Ascomys mexicanus Lichtenstein, Abh. Ak. Berl., 1827, p. 113 (1830, descr. orig).
Geomys mexicanus Richardson, Sixth Ann. Rep. Brit. Assoc. Adv. Sci., 1836, 1837, p. 150. Alston, Biol. Centr. Am. Mam., 1879–'82, p. 159.

Vulg.—Tuza.

Hab.—State of Puebla: S. Isidro (Puebla), No. 319 ♂, September.

14. Geomys sp?

Vulg.—Tuza.

Hab.—State of Chiapas: ? No. 11, 12.

The present species is only represented by two extremely young specimens. The careful examination of their crania by Mr. True and myself revealed features considerably different from those of the other species known, but as the U. S. National Museum possesses no specimens of exactly corresponding age it has been thought prudent to await the arrival of additional material before expressing any definite opinion.

FAM. HYSTRICIDÆ.

15. Synetheres mexicanus (Kerr).

Hystrix mexicana Kerr, Linn. An. Kingd., p. 214 (1792, ex Pennant).
Synetheres mexicanus Alston, Biol. Centr. Am. Mam., 1879–82, p. 170.

Vulg.—Huistlacuachi, Bistlacuachi, Hoitztlacuatzin.
Hab.—State of Vera Cruz: Jalapa, No. 328 ♂.

FAM. LEPORIDÆ.

16. Lepus sylvaticus Bachman.

Lepus sylvaticus Bachman, Jour. Ac. Philad. VII, 1837, p. 403. Alston, Biol. Centr. Am. Mam. 1879–82, p. 176.

Vulg.—Conejo real.
Hab.—State of Puebla: Atlixco, No. 316 ♂.

FAM. DASYPODIDÆ.

17. Tatusia novemcincta (Linnæus).

Dasypus novemcinctus, Linnæus, Syst. Nat. I. 1758, p. 51.
Tatusia novemcincta Alston, Biol. Centr. Am. Mam. 1879–82, p. 188.

Vulg.—Armadillo.
Hab.—State of Vera Cruz: Jalapa, No. 332 ♂, juv., 332a ♀, juv.

FAM. DIDELPHIDÆ.

18. Didelphis virginiana Kerr.

Didelphis virginiana Kerr, Linn. An. Kingd., p. 193 (1792, ex Pennant).
Didelphys virginiana Alston, Biol. Centr. Am. Mam. 1879–82, p. 196.

Vulg.—Tlacuachi, Tlacuache, Tlacoatzin.
Hab.—State of Vera Cruz: Jalapa, No. 327 ♂, 327a ♀.

II.—BIRDS.

By F. FERRARI PEREZ.

WITH DESCRIPTIONS OF FIVE NEW SPECIES, AND CRITICAL REMARKS ON OTHERS OF GREAT OR LESS RARITY OR INTEREST.

By ROBERT RIDGWAY.

During the preparation of the present list we have had the benefit of free access to the rich collection of birds in the U. S. National Museum, consisting of 39,000 specimens of the reserve or study skin series, 7,000 mounted specimens of the exhibition series, 7,500 duplicates for exchange, and 2,500 birds in alcohol, making a total of 56,000 specimens actually in existence. No less useful to me, or even more so, has been the active and intelligent assistance of Prof. Robert Ridgway, the curator of the department of birds, and I have also received some benefit from Dr. L. Stejneger's intimate knowledge of the ornithological literature; both these gentlemen have taken the greatest pleasure in facili-

tating my work, permitting me with great kindness and liberality to consult and use their valuable manuscripts. It is a pleasant duty for me to hereby acknowledge publicly my gratitude.

The present catalogue is only the initial step to a more extensive work on the birds of Mexico, which the Geographical and Exploring Commission intends to publish at some future time.

It will be perceived that the rules of nomenclature adopted by the "American Ornithologists' Union" have been followed, while Messrs. Sclater and Salvin's "Nomenclator Avium Neotropicalium" has been adhered to as regards the sequence of the families. The sex, locality, and date of each specimen have been noted with great care at the time of collecting, and in case where any doubt has arisen as to the accuracy of a particular statement caused by some unavoidable accident, it has been entirely suppressed or marked with a query; all other statements not thus marked are entirely reliable.

FAM. TURDIDÆ.

1. Turdus aonalaschkæ auduboni (Baird).

Turdus auduboni Baird, Rev. of Am. Birds, p. 16; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 14.

T[urdus] aonalaschkæ auduboni Ridgw., Proc. U. S. Nat. Mus., III, p. 1.

Vulg.—Mirlo.

Hab.—State of Puebla: Chachapa, No. 50*a* ♀, May.

2. Ridgwayia pinicola (Sclater).

Turdus pinicola, Sclater, P. Z. S., 1859, p. 334. Salv. & Godm., Biol. Centr. Am. Aves, I, p. 23.

Ridgwayia pinicola, Stejneger, Proc. U. S. Nat. Mus., 1882, p. 460.

Vulg.—Primavera.

Hab.—State of Puebla: Teziutlan, No. 188*a* ♀, November.

[An adult (?) female from Teziutlan, State of Puebla (November, 1884), is in general appearance much like an Orizaba specimen in the National Museum collection (No. 37472, F. Sumichrast), but differs as follows: The whitish portions of the plumage incline more decidedly to dull buff or light isabella color, except the edgings on basal half of the outer webs of the secondaries and the patch at base of the primaries, which are quite pure white; the lighter streaks of the head and neck are broader and more distinct. The differences are perhaps seasonal, the Orizaba specimen being apparently in spring or summer plumage. Wing, 5.30; tail, 3.40; culmen, .90; bill from basal fossa, .45; gonys, .40; tarsus, .95; middle toe, .85.—R. R.]

3. Merula tristis Swainson.

Merula tristis Swainson, Phil. Mag., New Ser., 1827, p. 369.

Turdus tristis Salvin & Godman, Biol. Centr. Am. Zool. Av., I, 1879, p. 15.

Hab.—State of Vera Cruz: Jalapa, No. 390 ♂, August.

4. **Merula grayi** (Bonaparte).

Turdus grayi Bonaparte, P. Z. S., 1837, p. 118; Salvin & Godman, Biol. Centr. Am. Zool. Av., I, 1879, p. 18.
Merula grayi Ridgway, Proc. U. S. Nat. Mus., V, 1882, p. 386.

Vulg.—Primavera.
Hab.—State of Vera Cruz: Jalapa, No. 356 ♀, juv., September.

5. **Merula migratoria propinqua**, Ridgway.

Turdus propinquus, Ridgw., Bull. of the Nutt. Club, II, p. 9.
Merula migratoria propinqua, Ridgw., Nom. of N. A. Birds, p. 11.
Turdus migratorius, Linn. in Salv. & Godm. Biol. Centr. Am. Aves, I, p. 20.

Vulg.—Primavera café.
Hab.—State of Puebla: Teziutlan, No. 189 ♂, November.

6. **Merula flavirostris**, Swainson.

Merula flavirostris, Swains., Phil. Mag., New. Ser., I, p. 369.
Turdus flavirostris, Salv. & Godm., Biol. Centr. Am. Aves, I, p. 21.

Vulg.—Primavera, Chivillo.
Hab.—State of Puebla: Chietla, No. 171 ♂, No. 171*a* ♀, December; Chiantla, No. 355 ♂.

7. **Melanotis cærulescens** (Swains.).

Orpheus cærulescens, Swains., Phil. Mag., New Ser., I, p. 369.
Melanotis cærulescens, Bonap. Comp., I, 1850, p. 276; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 28.

Vulg.—Mulato, Primavera.
Hab.—State of Puebla: Chietla, No. 167 ♂, 167*a* ♀, December. State of Vera Cruz: Jalapa, No. 374 ♂, 375 ♂, 471 ♂, August.

8. **Harporhynchus curvirostris** (Swains.).

Orpheus curvirostris, Swains., Phil. Mag., New Ser., I, p. 369.
Harporhynchus curvirostris, Caban., Mus. Hein., I, 1850, p. 81; Salvin & Godman, Biol. Centr. Am. Aves, I, p. 32.

Vulg.—Cuitlacoche de pecho pinto oscuro.
Hab.—State of Puebla: No. 233*a* ♀, Chietla, December.

[An adult female from Chietla, State of Pueblo (December, 1884), agrees with examples from the Rio Grande Valley, and is no smaller, its measurements, compared with those of No. 73681, Hidalgo, Texas (April 17; G. B. Sennett), being as follows:

♀ from Puebla ...	4.10	4.30	1.30	.95	1.30	1.00
♀ from Texas. ...	3.95	4.20	1.35	.95	1.25	.95

R. R.]

9. **Mimus polyglottos** (Linn.)

Turdus polyglottos, Linn., Syst. Nat., I, p. 169.
Mimus polyglottos, Bonap.; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 35.

Vulg.—Centrontle.
Hab.—State of Puebla. No. 173 ♂, No. 173*a* ♀, Chietla, December.

FAM. SYLVIIDÆ.

10. Myadestes obscurus, Lafr.

Myadestes obscurus, Lafr., Rev. Zool., 1839, p. 98.
Myiadectes obscurus, Salvin & Godman, Biol. Centr. Am., Aves, I, p. 40.

Vulg.—Clarin.

Hab.—State of Puebla. No. 161 ♂, Teziutlan, November.

[An adult male from Teziutlan, State of Puebla (November, 1884), is essentially identical in coloration and other characters with examples from Orizaba, Vera Cruz. (*Cf.* STEJNEGER, Proc. U. S. Nat. Mus., iv, 1881, p. 371.)—R. R.]

11. Sialia azurea, Baird.

Sialia azurea, Baird, Review of American Birds, I, p. 62.
Sialia azurea? Swains., Phil. Mag., New Ser. (1827), I, p. 369 (descr. nulla).
Sialia sialis, Salv. & Godm., Biol. Centr. Am., Aves, I, p. 45.

Vulg.—Tempestad.

Hab.—State of Puebla. S. Martin Texmelucan, No. 75 ♂, December; No. 320 ♂, January.

State of Vera Cruz. Jalapa, Nos. 362 ♂, 389 ♂, 401 ♂, 406 ♂, August.

[Two adult males from S. Martin Texmelucan, State of Puebla (December, 1884, and January, 1885), agree strictly with other Mexican examples in those characters which separate *S. azurea* from *S. sialis.*] These consist in (1) the decidedly more greenish shade of the blue, (2) decidedly lighter and less purplish tint of the breast, etc., and (3) the encroachment of the latter over the malar region and sides of the neck. In *S. sialis* the malar region is wholly blue, like the auriculars, the chin itself usually blue, and the sides of the neck are mostly blue. In *S. azurea*, on the other hand, the chin and anterior portion of the malar region are whitish, the posterior half or more of the malar region cinnamon-rufous, like the throat, and the sides of the neck chiefly cinnamon-rufous, this color even sometimes nearly meeting across the cervix. The two specimens measure as follows:

Number.	Date.	Wing.	Tail.	Bill from nostril.	Tarsus.	Middle toe.
No. 75. ..	Dec., 1884.	4.10	2.70	.35	.85	.60
No. 320 ..	Jan., 1885.	4.10	2.80	.35	.80	.58

R. R.]

12. Regulus calendula (Linn.).

Motacilla calendula, Linn., Syst. Nat., ed. 12, I. 1766. p. 337.
Regulus calendula, Licht., Verz. Doubl., 1823, No. 408; Salv. & God., Biol. Centr. Am., Aves, I, p. 49.

Vulg.—Verdin aplomado, Verdin de moño colorado.

Hab.—State of Puebla. No. 128 ♂, Teziutlan, November; No. 11 ♀, Garita de Tlaxcalor, in the city of Puebla.

13. Polioptila cærulea (Linn.).

Motacilla cærulea, Linn., Syst. Nat., 12, I, 1766, p. 337.
Polioptila cærulea, Scl., P. Z. S., 1855, p. 11; Salv. & God., Biol. Centr. Am., Aves, I, p. 50.

Vulg.—Pespirria, Papamoscas aplomadito.
Hab.—State of Puebla. Puebla, No. 10 ♂.

Fam. PARIDÆ.

14. Psaltriparus melanotis (Hartl.).

Parus melanotis, Hartl., Rev. Zool., 1844, p. 216.
Psaltriparus melanotis, Bonap., Compt. Rend., XXXVIII, 1854, p. ; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 58.

Vulg.—Sastre.
Hab.—State of Puebla. Teziutlan, No. 49 ♂, No. 49*a* ♀, November.

[An adult female, almost certainly of this species, differs from the male in the absence of any black on the head, except an indistinct, though rather broad streak along the sides of the occiput, above the auriculars. The auriculars and orbits are light grayish brown, fading into paler brown on the malar region and lores. It thus corresponds well with the *Psaltrites helviventris*, of Cabanis, as described in the "Journal für Ornithologie" for July, 1881, p. 333, and figured on plate 4, fig. 1 of the same journal for October, 1881. A translation of Cabanis's description is as follows:

"Upper parts olive-gray, hood pure gray, back brown. Throat and sides of neck white. Chin, bridle, orbital and auricular region, as well as the lower breast, light brown. The gray hood is separated on both sides from the light brown sides of the head by a black stripe beginning behind the eye.

"The species is distinguished from the related *Psaltrites melanotis* by the light brown (not black) cheeks, and from *P. minimus* by the gray (not brown) hood.

"It inhabits Western Mexico (Tehuantepec?) (Mus. Berol.)."

Since the specimen referred to was obtained at the same time with a male of *P. melanotis* (at Teziutlan, in the State of Puebla, in November, 1884), while it agrees in all respects with the latter except in the coloration of the sides of the head, there can be no reasonable doubt that it is the same species and therefore that *P. helviventris* must be considered as a synonym of *P. melanotis*.

The two specimens measure as follows:

♂	1.90	2.10	Iris "black."
♀	1.90	2.10	Iris yellow.

R. R.]

15. Parus meridionalis, Scl.

Parus meridionalis, Scl., P. Z. S., 1856, p. 293; 1857, p. 81; 1858, p. 299; 1859, p. 363; Salv. & God., Biol. Centr. Am., Aves, I, p. 57.

Vulg.—Valoncito.

Hab.—State of Puebla. Teziutlan, No. 142 ♂, November.

[A male from Teziutlan, November, 1884, is similar in plumage to specimens from Mirador and Orizaba, and measures as follows: Wing, 3.00; tail, 2.55; culmen, .42; tarsus, .70. The black of the throat extends backward 1.05 inches from the mental apex.—R R.]

16. Parus wollweberi (Bonap.).

Lophophanes wollweberi, Bonap., Compt. Rend., XXXI, p. 478; Sal. & Godm., Biol. Centr. Am., Aves, I, p. 56.

Parus wollweberi, Henry, Pr. Phila. Acad., VII, 1855, p. 309.

Vulg.—Copetoncito, Obispillo.

Hab.—State of Puebla. Chachapa, No. 24 ♂, January; No. 23 ♂, March; No 23*a* ♀, December.

[Three specimens from Chachapa, Puebla (March, 1884, December, 1884, and January, 1885). These appear to be undistinguishable from examples from New Mexico and Arizona. The longer feathers of the crest are very much recurved, and this character I have not observed in any of the United States specimens; but the latter are all dried skins, whereas the three Puebla specimens were mounted from the freshly killed birds, which may account for the difference. Their measurements are as follows:

	Wing.	Tail.	Culmen.	Tarsus.	
No. 24 ♂	2.70	2.65	.38	.60	Col. Comision Geografica Exploradora de Mexico, January, 1885.
No. 23 ♂	2.80	2.65	.40	.60	Col. Comision Geografica Exploradora de Mexico, March, 1884.
No. 23*a* ♀	2.60	2.40	.40	.60	Col. Comision Geografica Exploradora de Mexico, December, 1884.

R. R.]

Fam. TROGLODYTIDÆ.

17. Campylorhynchus jocosus, Scl.

Campylorhynchus jocosus, Scl., P. Z. S., 1859, p. 371; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 66.

Vulg.—Saltapared alacranero.

Hab.—State of Puebla. Chietla, No. 45 ♂, No. 45*a* ♀, No. 143 ♂, December.

18. Campylorhynchus zonatus (Less.).

Picolaptes zonatus, Less., Cent. Zool., p. 210, t. 70.

Campylorhynchus zonatus, Gray, Gen. Birds, I, 1847, p. 159; Salv. & God., Biol. Centr. Am., Aves, I, p. 68.

Vulg.—Ayacatcho.

Hab.—State of Puebla. Mazatiopam (Tehuacan), No. 137 ♂, 137*a* ♀, November.—State of Vera Cruz. Jalapa, No. 360 ♂, 371 ♂, September.

19. Salpinctes obsoletus (Say).

Troglodytes obsoleta, Say, Long's Exp., II, p. 4.

Salpinctes obsoletus, Cab., Arch. f. Naturg., XIII, p. 323; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 71.

Vulg.—Saltapared de barranca.

Hab.—State of Puebla. Puebla, No. 130 ♂, December.

20. Henicorhina leucosticta (Cab.).

Cyphorhinus leucostictus, Cab., Arch. f. Naturg., Jahrg. XIII, I, p. 206.
Henicorhina leucosticta, Salv., P. Z. S., 1870, p. 181; Salv. & God., Biol. Centr. Am., Aves, I, p. 79.

Vulg.—Saltapared de Tular.

Hab.—State of Puebla. Teziutlan, No. 125 ♂, November.

21. Thryothorus bewickii bairdi (Salv. & Godm.).

Thryothorus bairdi, Salv. & Godm., Biol. Centr. Am., Aves, I, p. 95.
Thryothorus bewickii bairdi, Ridgw., Proc. of U. S. Nat. Mus., 1885, p. 354.

Vulg.—Saltapared aplomado.

Hab.—State of Puebla. Puebla, No. 6 ♂, No. 6*a* ♀, No. 28 ♂, December.

22. Troglodytes brunneicollis Sel.

Troglodytes brunneicollis, Sel., P. Z. S., 1858, p. 297, 1859, p. 372, 1862, p. 18; Salv. & God., Biol. Centr. Am., Aves, I, p. 103.

Vulg.—Matraca.

Hab.—State of Puebla. Teziutlan, No. 141 ♂, December.

Fam. MOTACILLIDÆ.

23. Anthus pensilvanicus (Lath.).

Alauda pensilvanica, Lath., Synops. Supl., I, p. 287 (1787).
Anthus pensilvanicus, Thienem., Rhea, II, p. 171; Stejneger, Auk, I, p. 168.
Anthus ludovicianus, Sci., P. Z. S., 1856, p. 293; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 108.

Vulg.—Alondra de la majada.

Hab.—State of Puebla. Puebla, No. 43 ♂; December.

24. Anthus spragueii (Aud.).

Alauda spragueii, Aud. B. Am. VII. 1843, 335, pl. 486.
Anthus spragueii, Baird, Rev. Am. B. I, 1864, 155.

Hab.—State of Puebla. Puebla, No. 43*a* ♀, December.

[This specimen extends the known southward range of the species about 1,000 miles in a direct line, the most southern previous record being Southeastern Texas. (Nehrling, Bull. Nutt. Orn. Club, vii, 1882, p. 8.)—R. R.]

Fam. MNIOTILTIDÆ.

25. Seiurus motacilla (Vieillot).

Turdus motacilla, Vieillot, Ois. Am. Sept., II, 1807, p. 9, pl. 65.
Siurus motacilla, Coues, Bull. Nutt. Club, II, 1877, p. 33; Salvin & Godman, Biol. Centr. Am., Zool., Av., I, 1881, p. 147.

Hab.—State of Vera Cruz. Jalapa, No. 435 ♂, August.

26. Mniotilta varia (Linn.).

Motacilla varia, Linn., Syst. Nat., I, p. 333 (ed. duod.).
Mniotilta varia, Vieill., Nouv. Dict. d'Hist. Nat., XXI, 1818, p. 230; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 110.

Vulg.—Verdin rayado del sauce.

Hab.—State of Puebla. Puebla, No. 14 ♂.

27. Dendrcica virens (Gmel.).

Motacilla virens, Gmel., Syst. Nat., I, p. 985.
Dendroica virens, Baird, B. N. Am., 1858, p. 267; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 137.

Vulg.—Verdin de toca amarilla.
Hab.—State of Puebla. Teziutlan, No. 123 ♂, November.

28. Dendroica chrysoparia, Scl. & Salv.

Dendræca chrysoparia, Scl. & Salv., P. Z. S., 1860, p. 298; Salv. & Godm. Biol. Centr. Am., Aves, I, p. 139.

Vulg.—Verdin ocotero de toca amarilla.
Hab.—State of Puebla. Teziutlan, No. 106*a* ♀, December.

29. Dendroica auduboni (Towns.).

Sylvia auduboni, Towns., Journ. Ac. Phil., VII, p. 191.
Dendræca auduboni, Scl., P. Z. S., 1858, p. 298; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 128.

Vulg.—Verdin de cola amarilla.
Hab.—State of Puebla. Puebla, No. 4 ♂, No. 4*a* ♀, December.

30. Dendroica æstiva (Gmel.).

Motacilla æstiva, Gmel., Syst. Nat., I, p. 996.
Dendroica æstiva, Baird, B. N. Am., 1858, p. 282; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 124.

Vulg.—Verdin amarilla.
Hab.—State of Puebla. Chietla, No. 21 ♂, December.

31. Geothlypis trichas occidentalis Brewster.

Geothlypis trichas occidentalis, Brewster, Bull. Nutt. Ornith. Club, VIII, p. 159.
Geothlypis trichas, Salv. & Godm., Biol. Centr. Am., Aves, I, p. 150.

Vulg.—Verdin de antifaz.
Hab.—State of Puebla. Huexotitla, No. 26 ♂, January.—State of Tlaxcala. Laguna del Rosario, No. 26*a* ♀, No. 27*a* ♀, January.

32. Sylvania pusilla (Wils.).

Muscicapa pusilla, Wils., Am. Orn., III, p. 103, t. 26, p. 4.
Sylvania pusilla, Nutt., Man., I, 2d ed., 1840, p. 335.
Myiodioctes pusillus, Bonap., Consp., I, 1850, p. 315; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 168.

Vulg.—Verdin de cabeza negra.
Hab.—State of Puebla. Puebla, No. 12*a* ♀, October; Huexotitla, No. 5 ♂, 5*a* ♀, November.
State of Vera Cruz. Jalapa, No. 368 ♂. No. 483 ♂. September.

33. Setophaga miniata, Swains.

Setophaga miniata, Swains., Phil. Mag., new ser., I, p. 368; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 181.

Vulg.—Guajolotito.
Hab.—State of Puebla. Puebla, No. 9 ♂, October.

34. **Euthlypis lacrymosa** (Bonap.).

Basileuterus lacrymosus, Bonap., Comp., p. 314.
Euthlypis lacrymosa, Caban., Mus. Hein., I, p. 19 (note).
Setophaga lacrymosa, Salv. & Godm., Biol. Centr. Am., Aves, I, p. 184.

Vulg.—Saltapared amarillo.

Hab.—State of Puebla. Acatlan, No. 80 ♂.

35. **Ergaticus ruber** (Swains.).

Setophaga rubra, Swains., Phil. Mag., new ser., I, p. 368.
Ergaticus ruber, Ridgw., Proc. U. S. Nat. Mus., III, 1880, p. 174; Salv. & Godm., Biol. Centr. Am., Aves, I, p. 164.

Vulg.—Coloradito de patilla blanca.

Hab.—State of Puebla. Istatcihuatl (Texmelucan), No. 15 ♂, September; Chachapa, No. 16 ♂, November; Teziutlan, No. 120 ♂, December.

36. **Icteria virens** (Linn.).

Turdus virens, Linn., Syst. Nat., ed. 10, I, p. 171.
Icteria virens, Baird, Rev. Am. Birds, I, p. 228.
Icteria viridis, Bonap., P. Z. S., 1837, p. 111; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 157.

Vulg.—Calandria de agua.

Hab.—State of Puebla. Chietla, No. 62 ♂, No. 62*a* ♀, December.

FAM. VIREONIDÆ.

37. **Cyclorhis flaviventris**, Lafresnaye.

Cyc[laris] flaviventris, Lafresnaye, Rev. Zool., 1842, p. 133.

Hab.—State of Vera Cruz. Jalapa, No. 413 ♂, September; Plan del Rio, No. 486 ♀, August.

FAM. LANIIDÆ.

38. **Lanius ludovicianus excubitorides**, Swains.

Lanius excubitorides, Swains. Faun. Bor.-Am., II, p. 115, t. 34.
Lanius ludovicianus excubitorides, Coues, Key, 1872, p. 125.
Lanius ludovicianus, Salv. & Godm., Biol. Centr. Am., Aves, I, p. 213.

Vulg.—Pegareborda. Pájaro gato.

Hab.—State of Puebla. Huexotitla, No. 170 ♂, October; Puebla, No. 170*a* ♀, October.

[An adult male from Huexotitla, State of Puebla (October), agrees with examples from the Western United States, but is slightly smaller, the measurements being as follows: Wing, 3.75; tail, 3.90; culmen, .80; bill, from nostril, .48; depth, at base, .35; tarsus, 1.02; middle toe, .65.—R. R.]

FAM. AMPELIDÆ.

39. **Ampelis cedrorum** (Vieill).

Bombycilla cedrorum, Vieill, Ois. Am., Sept., I, p. 88, t. 57.
Ampelis cedrorum, Gray, Gen. Birds, I, 1849, p. 278. Salv. & Godm., Biol. Centr. Am. Aves, I, p. 215.

Vulg.—Filomena, Burrito.

Hab.—State of Puebla. Rancho de Posada, No. 48*a* ♀, No. 108*a* ♀, March.

40. Ptiliogonys cinereus, Swains.

Ptiliogonys cinereus, Swains., Phil. Mag., new ser., I, p. 368.
Ptilogonys cinereus, Salv. & Godm., Biol. Centr. Am. Aves, I, p. 217.

Vulg.—Jaripa, Filomena.

Hab.—State of Puebla. Teziutlan, No. 131 ♂, No. 131*a* ♀, November. State of Vera Cruz. Jalapa, No. 405 ♂, August; No. 386 ♂, September.

41. Phainopepla nitens (Swains.).

Ptilogonys nitens, Swains., An. in Menag., p. 285.
Phainopepla nitens, Scl., P. Z. S., 1858, p. 543; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 220.

Vulg.—Jilguero negro copeton.

Hab.—State of Puebla. Rancho del Aguacate, No. 46 ♂, April; Huehuetlan, No. 51 ♂, May.

Fam. HIRUNDINIDÆ.

42. Progne leucogaster, Baird.

Progne leucogaster, Baird, Rev. Am. Birds, I, p. 280.
Progne chalybea, Salv. & Godm., Biol. Centr. Am. Aves, I, p. 224.

Vulg.—Golondrina comun.

Hab.—State of Vera Cruz. Jalapa, No. 182 ♂, No. 182*a* ♀, No. 353 ♂, 489 ♂, August.

43. Petrochelidon lunifrons, (Say).*

Hirundo lunifrons, Say, in Long's Exp., II, p. 47.
Petrochelidon lunifrons, Scl. Cat. Am. B., p. 40.
Petrochelidon pyrrhonota, Scl. & Salv., Nomencl. Av. Neotr., p. 14; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 226.

Vulg.—Golondrina vencejo.

Hab.—State of Puebla. Acatlan, No. 153 ♂.

[An adult male from Acatlan, Puebla (date not given, but said to be some time between January and May), is true *P. lunifrons*, and not *P. melanogaster* (Swains.).]

44. Stelgidopteryx fulvipennis (Sclater).

Cotyle fulvipennis, Sclater, P. Z. S., 1859, p. 364.
Stelgidopteryx fulvipennis, Baird, Rev. Am. B., I, 1864, p. 316.
Stelgidopteryx serripennis, Salvin & Godman, Biol. Centr. Am. Zool. Av., I, 1883, p. 237.

Hab.—State of Vera Cruz. Jalapa, No. 490 ♀, August.

* After a very careful and impartial investigation of the matter, I find myself unable to coincide with the views of those authors who would identify positively the *Hirundo pyrrhonota* of Vieillot with the *H. lunifrons* of Say. It is impossible to reconcile certain discrepancies in Vieillot's description and those of the authorities upon which his name was based, with the characters of the present bird; and, even granting that *H. pyrrhonota* Vieill. *may* have been, or even probably was, this bird, there is no more occasion in this instance to "exchange a certainty for an uncertainty" than in other cases which have been objected to. The same applies with equal, but scarcely greater, force to *H. americana* Gmel. As to the identity of the South American with the North American bird, I have nothing to say, not having seen specimens of the former; but it would be by no means remarkable if they were the same species.—R. R.

Fam. CŒREBIDÆ.

45. Diglossa baritula, Wagl.

Diglossa baritula, Wagl., Isis, 1832, p. 281; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 242.

Hab.—State of Puebla. S. Salvador el verde (Huejotringo) No. 20 ♂, September.

Fam. TANAGRIDÆ.

46. Euphonia elegantissima (Bonap.).

Pipra elegantissima, Bonap., P. Z. S., 1837, p. 112.
Euphonia elegantissima, Du Bus, Esq. Orn., t. 8; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 256.

Vulg.—Mongita de S. Bartolo.

Hab.—State of Puebla. Chachapa, No. 345*a* ♀, February.—State of Vera Cruz. Jalapa, No. 369 ♂, August.

47. Tanagra abbas, Lichtenstein.

Tanagra abbas, Lichtenstein, Preiz-Verz. Mex. Vög., 1831, p. 2; Salvin & Godman, Biol. Centr. Am. Zool. Av., I, 1883, p. 278.

Hab.—State of Vera Cruz. Jalapa, No. 370 ♂, August.

48. Piranga rubra (Linn.).

Fringilla rubra, Linn., Syst. Nat., ed. 10, I, 1758, p. 181.
Piranga rubra, Vieill., Ois. Am., Sept., 1807, p. iv.
Pyranga æstiva, Salv. & Godm., Biol. Centr. Am. Aves, I, p. 289.

Vulg.—Aguacatero.

Hab.—State of Puebla. Chietla, No. 55 ♂, 55*a* ♀, December; Huexotitla, No. 72*a* ♀, November.

49. Piranga hepatica, Swains.

Pyranga hepatica, Swains., Phil. Mag., new ser., I, p. 438; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 291.

Vulg.—Cardinal.

Hab.—State of Puebla. Teziutlan, No. 134 ♂, No. 134*a* ♀, November.

50. Piranga ludoviciana, (Wils.).

Tanagra ludoriciana, Wils., Am. Orn., III, p. 27, t. 20, f. 1.
Pyranga ludoriciana, Bonap., P. Z. S., 1837, p. 116; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 297.

Vulg.—Triguero.

Hab.—State of Puebla. Chietla, No. 73*a* ♀, December.

51. Chlorospingus olivaceus (Bonaparte).

Poospiza oliracea, Bonaparte, Comp., I, 1850, p. 473.
Chlorospingus oliraceus, Sclater, Tanagr. Cat. Specif., 1854, p. 6; Salvin & Godman, Biol. Centr. Am. Zool. Av., I, 1884, p. 315.

Hab.—State of Vera Cruz. Jalapa, No. 485 ♂, August.

52. **Buarremon brunneinucha** (Lafresnaye).

Embernagra brunneinucha, Lafresnaye, Rev. Zool., 1839, p. 97.
Buarremon brunneinucha, Sclater, P. Z. S., 1856, p. 85; Salvin & Godman, Biol. Centr. Am. Zool. Av., I, 1884, p. 319.

Hab.—State of Vera Cruz. La Banderilla (Jalapa), No. 430 ♂, September.

53. **Buarremon albinucha** (Lafr. & d'Orb.).

Embernagra albinucha, Lafr. & d'Orb., Rev. Zool., 1838, p. 165.
Buarremon albinucha, Bonap., Consp., I, p. 484.
Buarremon albinucha, Salv. & Godm., Biol. Centr. Am. Aves, I, p. 321.

Vulg.—Calandria cerquera de cabeza blanca.

Hab.—State of Puebla. Tezintlan, No. 135*a* ♀, December.

54. **Saltator atriceps** (Less.).

Tanagra (*Saltator*) *atriceps*, Less., Cent. Zool., p. 208, t. 69.
Saltator atriceps, Gray, Gen. Birds, II, 1844, p. 366; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 325.

Vulg.—Pico gordo, Quejoso.

Hab.—State of Oaxaca. Janhuitlan (?), No. 208 ♂.—State of Vera Cruz, Plano del Rio, No. 481 ♀, August.

55. **Saltator grandis** (Lichtenstein).

Tanagra grandis, Lichtenstein, Preis-Verz. Mex. Vög., 1831, p. 2.
Saltator grandis, Sclater, P. Z. S., 1856, p. 72; Salvin & Godman, Biol. Centr. Am. Zool. Av., I, 1884, p, 328.

Hab.—State of Vera Cruz. Jalapa, Nos. 392 ♂, 402 ♂, September.

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56. **Pheucticus chrysopeplus** (Vigors).

Coccothraustes chrysopeplus, Vigors, P. Z. S., 1832, p. 4.
Pheucticus chrysopeplus, Finsch., Abh. nat. Ver. z. Bremen, 1870, p. 339; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 335.

Vulg.—Güillo pico gordo.

Hab.—State of Puebla. Chietla, No. 158*a* ♀, No. 218*a* ♀, December.

57. **Habia melanocephala**, (Swains.).

Guiraca melanocephala, Swains., Phil. Mag., 1827, I, p. 438.
Habia melanocephala, Stejneger, Auk, I, p. 367.
Hedymeles melanocephalus, Salv. & Godm., Biol. Centr. Am. Aves, I, p. 338.

Vulg.—Tiguerillo.

Hab.—State of Puebla. Atlixco, No. 110*a* ♀; Chietla, No. 71*a* ♀, December; S. Martin, Texmelucan, No. 71 ♂, September.

58. **Guiraca cærulea** (Linn.).

Loxia cærulea, Linn., Syst. Nat., I, p. 175.
Guiraca cærulea, Swains., Phil. Mag., new ser., I, p. 438; Salv. & Godm., Biol. Centr. Am. Aves, I, p. 344.

Vulg.—Azulejo maicero.

Hab.—State of Puebla. Huexotitla, No. 63♂, November, No. 63*a* ♀, December; Puebla, No. 79 ♂.

59. **Sporophila torqueola** (Bonap.).

Spermophila torqueola, Bonap., Consp., I., p. 495.

Vulg.—Dominiquito del sur.

Hab.—State of Puebla. Huehuetlan, No. 31 ♂, November.

60. **Volatinia jacarina** (Linn.).

Tanagra jacarina, Linn., Syst. Nat., éd. 12, I, p. 314
Volatinia jacarina, Cabanis, Mus. Hein., I, p. 147.

Vulg.—Dominquito negro de las cañas.

Hab.—State of Puebla. Huehuetlan, No. 13 ♂, January.—State of Vera Cruz, Jalapa, No. 87 ♂.

61. **Euetheia pusilla** (Swainson).

Tiaris pusillus Swainson, Phil. Mag., new ser., 1827, p. 438.
E[uetheia] pusilla Cabanis, Mus. Hein., I, 1851, p. 146.

Vulg.—Dominiquito.

Hab.—State of Vera Cruz. Jalapa, No. 372 ♂, September.

62. **Passerina cyanea**, Linn.

Tanagra cyanea, Linn., Syst. Nat., ed. 12, I, p. 315.
Passerina cyanea, Vieillot, Nouv. Dict., XXV, 1817, p. 7.

Vulg.—Azulito.

Hab.—State of Puebla. Chietla, No. 30 ♂, December.

63. **Passerina versicolor**, Bonap.

Spiza versicolor, Bonap., P. Z. S., 1837, p. 120.
Passerina versicolor, Gray, Hand-list B., II, p. 97, No. 7438 (1870.)

Vulg.—Gorrion moradito.

Hab.—State of Puebla. Chietla, No. 3, ♂, 3*a* ♀, December; Azatlan, No. 7 ♂.

64. **Passerina ciris**, Linn.

Emberiza ciris, Linn., Syst. Nat., I, p. 179.
Passerina ciris, Vieillot, Nouv. Dict., XXV, 1817, p. 17.

Vulg.—Siete colores.

Hab.—State of Puebla. Chietla, No. 17 ♂, 18 ♂, December.

65. **Passerina leclancheri**, Lafr.

Passerina leclancheri, Lafr., Rev. Zool., 1840, p. 260.

Vulg.—Amarillito.

Hab.—State of Puebla. Chietla, No. 1 ♂, 1*a* ♂, 2 ♂, 2*a* ♀, December.

66. **Poocætes gramineus confinis**, Baird.

[*Poocætes gramineus*] variety *confinis*, Baird in B., C. & L., Birds of N. A., p. 448 (in text).

Vulg.—Gorrion triguero.

Hab.—State of Puebla. S. Baltazar, No. 36 ♂, 36*a* ♀, December.

67. Amphispiza ferrariperezi, Ridgway, sp. nov.

Amphispiza ferrariperezi, Ridgway, Auk, iii, July, 1883, 332.

Vulg.—Cerquero de collar.

Hab.—State of Puebla. Chietla, No. 44 ♂, type, 44*a* ♀, December.

[SP. CHAR.—Similar to *A. quinquestriata* (Scl.*), but rump brown instead of slate-gray, the lesser wing-coverts cinnamon-rufous instead of slate-color, throat with a broad patch, instead of stripe, of white, black of the breast forming a broad collar, widest laterally, and the sides light drab instead of plumbeous.

Adult ♂ (type, No. 44, collection of Comision Geográfica Exploradora de Mexico, Chietla, Puebla, December, 1884): Head dark brownish slate, deepening into black on forehead, lores, and suborbital region, the occiput and cervix marked with broad but indistinct streaks of dark rusty. A supraloral spot, malar stripe, broad patch covering chin and throat, with entire abdomen and lower part of breast, pure white. White of throat bordered on each side by a submalar stripe of black, connecting with a broad black collar across the jugulum and upper breast, this collar about .50 of an inch wide in the middle portion, and .75 of an inch broad at its lateral extremities. Back, scapulars, and lesser wing-coverts, bright cinnamon-rufous, the first with a few indistinct black streaks in the middle portion, and all the dorsal feathers rather indistinctly bordered with light grayish brown; middle wing-coverts black, edged with fulvous and tipped with white, the latter forming a narrow but distinct band; greater coverts similar, but with broader fulvous edgings and much less distinct whitish tips; tertials similar to the greater coverts, but without any white at tips; primaries slate-dusky, edged for terminal half with pale gray. Rump and upper tail coverts light grayish brown, the more posterior feathers with paler borders. Tail dusky, the feathers with paler edges. Sides and flanks light grayish brown; anal region and lower tail-coverts similar but paler. Maxilla, black; mandible, whitish; iris, blackish; feet, horn brown. Wing, 2.70; tail, 3.30; the lateral feathers .55 shorter; culmen, .50, depth of bill at base, .30; tarsus, .85, middle toe, .60.

Adult ♀ (No. 44*a*, collection of the Comision Geográfica Exploradora de Mexico, Chietla, Puebla, December, 1884): Exactly like the male, as described above, except that the back is less rufescent and more distinctly streaked, and the rump more rufescent. Wing, 2.50; tail, 3.00.

It affords me much pleasure to dedicate this elegant species to Professor Fernando Ferrari Perez, naturalist of the Mexican Geographical Exploring Commission, and president of the State's University of Puebla de Zaragoza.—R. R.]

68. Amphispiza mystacalis (Hartl.).

Zonotrichia mystacalis, Hartl., Rev. Zool., 1852, p. 3.

Vulg.—Cerquero de patilla negra.

Hab.—State of Puebla. Chietla, No. 43 ♂, 43*a* ♀, December.

Zonotricha quinquestriata, SCL. & SALV., P. Z. S., May 28, 1868, p. 323. (*Cf.* RIDGW., Ibis, Oct., 1883, p, 400.)

69. Melospiza lincolnii (Aud.).

Fringilla lincolnii, Aud. Orn. Biogr., II, p. 539, pl. 193.
Melospiza lincolnii, Baird, B. N. Am., p. 482.

Vulg.—Zorzal rosado.

Hab.—State of Puebla. Puebla, 19 ♂, December.

70. Melospiza fasciata mexicana, Ridgw.

Melospiza melodia, var *mexicana*, Ridgw. in B. B. & R., Hist. N. Am., B. II, 1874, p. 18.

Vulg.—Cerquero aguador.

Hab.—State of Puebla. Huexotitla, No. 61*a* ♀, November, No. 61 ♂, December.

[Two specimens, male and female, from Huexotitla, November, 1884, are essentially identical with the type, which is also from Puebla. They measure as follows:

	Wing.	Tail.	Culmen.	Tarsus.	Middle toe.
♂	2.80	2.70	.55	.90	.65
♀	2.70	2.60	.55	.95	.62

A good character of this race, overlooked in previous descriptions, consists in the rich umber-brown coloring of the tibial feathers.—R. R.]

71. Spizella socialis ! (Wils.)

Fringilla socialis, Wils. Am. Orn. II, p. 127, pl. 16, fig. 5.
Spizella socialis, Bonap., Consp., I., p. 480.

Vulg.—Zorzal chiquito de cabeza café, Zorzal rayado.

Hab.—State of Puebla. Puebla, No. 38 ♂, 38*a* ♀, December; Huextitla, No. 42 ♂, 42*a* ♀, December; Teziutlan, No. 126 ♂, November.

72. Spizella atrigularis (Caban.)

Spinites atrigularis, Caban., Mus. Hein. I, 1851, p. 133.
Spizella atrigularis, Baird, B. N. Am. 1858, p. 476.

Vulg.—Carbonero.

Hab.—State of Puebla. Attixco, No. 8*a* ♀.

[A female, nearly adult, from Chietla, is in winter plumage. It has the black of the throat much mixed with gray, but this is perhaps a character of immaturity. This specimen, together with an adult male from Coahuila, Nuevo Leon (May, 1853, Lieut. Couch*), differs from all examples in a series of eleven specimens from California (San Diego), Lower California, Arizona, and New Mexico, in somewhat larger bill, the culmen measuring .45, gonys .23, and width at base .22, against .45, .20, and .20, respectively, in the largest billed example of the northwestern series. An adult male from Chapulco, Puebla (No. 54, 143, Aug. 3, 1868; F. Sumichrast), however, apparently has the bill no larger,

* Type of *Struthus atrimentalis* Couch.

though it is difficult to decide on account of the defective condition of that member, which has the point broken and is otherwise injured.—R. R.]

73. Junco cinereus (Swains.).

Fringilla cinerea, Swains., Phil. Mag., 1827, I, p. 435.
Junco cinereus, Caban., Mus. Hein., p. 134.

Vulg.—Zorzal de lomo café.

Hab.—State of Puebla. Teziutlan, No. 121 ♂, November.

[A single specimen (♂ ad.) from Teziutlan, November, 1884, differs from examples from Orizaba and Mirador, in the State of Vera Cruz, in darker coloration, especially of the head, the entire auricular and suborbital regions being nearly as dark as the lores, in appreciable contrast with the gray of the neck. Wing, 2.90; tail, 2.65.—R. R.]

74. Ammodramus sandwichensis alaudinus (Bonap.).

Passerculus alaudinus, Bonap., Compt. Rend., XXXVII, p. 918; Not. Orn., p. 18.
Ammodramus sandwichensis alaudinus, Ridgw., Proc. U. S. Nat. Mus., 1885, p. 354.

Vulg.—Zorzal chiquito de cya amarilla.

Hab.—State of Puebla. Puebla, No. 34 ♂, 34*a* ♀, December.

75. Aimophila rufescens Swainson.

Aimophila rufescens Swainson, Two Cent., 1837, p. 315.

Vulg.—Triquero grande.

Hab.—State of Vera Cruz. Jalapa, No. 366 ♂, August; No. 357 ♂, September.

76. Aimophila melanotis Lawr.

Zonotrichia melanotis, Lawr., Ann. Lyc. N. Y., VIII, May, 1867, p. 473.
H[aimophila] melanotis, Lawr., Proc. Ac. Phil., Dec., 1868, p. 430.

Vulg.—Cerquero de tierra caliente.

Hab.—State of Puebla. Chietla, No. 60 ♂, 60*a* ♀, December

[Two specimens, male and female, from Chietla, Puebla (December, 1884), agree well with the type in all the characters which distinguish the species from *H. ruficauda*. The middle of the jugulum is even whiter than in the type, especially in the male, which has only the sides of the breast faintly ashy. The black stripes of the head are deep black throughout, except that there is a small grayish white spot at the end of the auriculars. The sexes are exactly alike in coloration. The measurements are as follows:

	Wing.	Tail.	Culmen.	Tarsus.	Mid. toe.
Type* (♂)	2.75	3.30	.60	.95	.65
♂	2.80	3.40	.60	.90	.60
♀	2.70	3.40	.60	.95	.65

*31827, Plains of Colima, June, 1863; J. Xantus.

Among the characters ascribed by Mr. Lawrence (Proc. Acad. Nat. Sci., Phil., Dec., 1868, p. 362), as distinguishing this species from *A. ruficauda*, Bonap., several do not hold good, among which may be mentioned the color of the tail, flanks, and lesser wing-coverts, which is essentially the same in the two species. The real diagnostic characters consist in the much more deeply black stripes of the head in the present species, its smaller bill, and absence of the very distinct gray clouding which forms an uninterrupted broad belt across the jugulum in *H. ruficauda*.—R. R.]

77. **Pipilo submaculatus** Ridgway, sp. nov.

Pipilo submaculatus, Ridgway, Auk, III, July, 1886, 332.

Vulg.—Chohuis.

Hab.—State of Puebla. Teziutlan, No. 285*a* ♀, type, November.

[SP. CHAR.—Resembling *P. maculatus*, Swains., but smaller, the back without white streaks, the white terminal spots of middle and greater wing-coverts and lateral rectrices much reduced in size, and the rufous of the sides of the breast marked with sagittate spots of black.

Adult ♂ (No. 285*a*, collection of the Comision Geográfico Exploradora de Mexico, Teziutlan, State of Puebla, November, 1884): Head, neck, and jugulum brownish black, decidedly lighter on the crown, occiput, and cervix, which incline to dark grayish brown, very indistinctly streaked with darker; sides of the jugulum indistinctly spotted or tinted with brown. Back and scapulars umber brown, tinged with rusty, the feathers with indistinct though broad medial streaks of dusky, some of the exterior scapulars with an indistinct whitish lateral streak. Rest of upper parts dull grayish brown, somewhat tinged with olive, especially on wings, the wing-coverts, remiges, and rectrices darker centrally; middle and greater wing coverts with small terminal roundish spots of white, those on the greater coverts confined to the terminal portion of the outer web; two innermost tertials with a very indistinct edging of dull whitish. Tail dusky grayish brown, the edges of the feathers hardly perceptibly different; outer feather with an elliptical spot of dull white, about .85 of an inch long, and for about the terminal half occupying the full breadth of the web, but the terminal border of the web, next the shaft, dusky, very sharply and abruptly defined against the whitish; terminal portion of outer web of same feather edged with white; second rectrix with a large, somewhat ovate subterminal spot of dull white, the terminal margin being quite broadly, and very abruptly, dusky; outer web with a much smaller subterminal white spot; third rectrix without white on either web. Middle of breast and abdomen white; sides of breast, sides, flanks, crissum, and lower tail-coverts, rusty rufous, paler posteriorly and anteriorly (especially on sides of breast), marked with sagittate spots of black. Maxilla, brownish black; mandible, paler; feet, light horn-brown. Wing, 3.30; tail, 3.70; culmen, .60; tarsus, 1.15; middle toe, .75.

This very curious *Pipilo* is almost exactly intermediate in coloration between *P. maculatus* Swains. and *P. carmani*, Baird, but in dimensions agrees best with the former, *P. carmani* being much smaller than either. From *P. maculatus*, *P. submaculatus* differs strikingly in the following characters: (1) Absence of distinct streaks, either of black or white, on the interscapular region; (2) greatly reduced size of white markings on scapulars, wing-coverts, and tertials, which are smaller even than in *P. carmani;* (3) limitation of white spots on the tail to the two lateral feathers, and their greatly reduced size; (4) black spots in ferruginous of the sides of the breast. The last character is perhaps not to be relied on, since a tendency to the same feature in some specimens of the several race of *P. maculatus*, especially *P. oregonus*.—R. R.]

78. **Pipilo complexus**, Ridgway, sp. nov.

Pipilo complexus, Ridgway, Auk, III, July, 1886, 332.

Vulg.—Chohuis.

Hab.—State of Puebla: Teziutlan, No. 138 ♂ type, November.

Sp. char.—Similar to *P. macronyx*, Swains., but decidedly smaller, the sides much paler rufous (almost buff), the throat with a white patch, and the occiput with a patch of rufous.

Adult ♂ (No. 138, collection of the Comision Geográfico Exploradora de Mexico, Teziutlan, State of Puebla, November, 1884): Head, neck, and breast deep black, relieved by a broken patch of rufous on the occiput (the feathers of which have tips and mesial streaks of black), an indistinct bar or broken oblong spot of white on each side of the forehead, and a white patch covering the medial portion of the chin and throat, broadest below. Rest of upper parts olive-green, the feathers dusky centrally; back and scapulars streaked with black, the latter with broader streaks (covering the greater portion of the outer web of each feather) of pale olive-yellow; middle and greater coverts broadly tipped with pale yellow, forming two distinct bands across the wing; outer webs of two innermost tertials broadly edged with dull yellowish white. Rump and upper tail-coverts plain dull olive-green. Tail dusky, the feathers edged with olive-green, the lateral feather with the terminal portion of the inner web dull yellowish white, about .90 of an inch in extent next the shaft; second rectrix with a similar but much smaller spot, and third rectrix with a very small spot, only about .25 of an inch long (measured along the shaft), and .15 of an inch wide. Abdomen and lower part of breast pure white; sides, flanks, and crissum pale ochraceous-rufous. Bill, blackish; iris, "reddish yellow"; tarsi, pale horn-brown; toes, darker. Wing, 3.60; tail, 3.90; culmen, .62; tarsus, 1.15; middle toe, .70.*

While *P. macronyx*, Swains., in its coloration forms a connecting link between the two sections of the genus represented by *P. maculatus*,

*An adult male of *P. macronyx* measures as follows: Wing, 3.80; tail, 4.60; culmen, .70; tarsus, 1.25; middle toe, .82.

Swains., and *P. chlorurus*, Towns., respectively, the present bird is in the same respect intermediate between the last and the first named, although nearest to *P. macronyx*, with which it agrees closely in general appearance, *P. chlorurus* being recalled simply by the white throat-patch and the rufous occipital spot, the latter representing an incipient condition of the rufous pileum of *P. chlorurus*.—R. R.]

79. Pipilo fuscus, Swains.

Pipilo fusca, Swains., Phil Mag. 1827, I, p. 434.

Vulg.—Llama comun.

Hab.—State of Puebla. Puebla, No. 74 ♂, 74*a* ♀, December.

[An adult male and an adult female from Puebla (December, 1884), agree with other specimens of true *P. fuscus* (including those from all portions of Mexico, whence I have seen examples of this species), in lacking any decided tinge of rufous on the pileum, in which respect, as well as in smaller size and darker general coloration, they differ from *P. fuscus mesoleucus* (Baird), of Arizona and New Mexico. National Museum specimens of true *P. fuscus* are from the following localities: Plains of Colima, June (1); Temiscaltepec, Oaxaca (1); Guanajuato (1); "Mexico" (1); Guadalajara, Jalisco (2); Tepic, Jalisco (1); Guaymas, Sonora, April (1), and Sta. Catarina, Nuevo Leon, April (1). It may be remarked that the two latter, which represent extreme northern localities, are quite typical *P. fuscus*. A December specimen from Guaymas, however, agrees best in coloration with *mesoleucus*.

The two Puebla specimens measure as follows:

	Wing.	Tail.	Culmen.	Bill from nostril.	Tarsus.	Middle toe.
♂	3.55	3.90	.63	.40	.95	.70
♀	3.60	3.80	.62	.40	1.00	.72

R. R.]

80. Chamæospiza torquata (Du Bus).

Pipilo torquatus, Du Bus, Bull. Acad., Brux., XIV, 2, p. 105.

Chamæospiza torquata, Sclat., P. Z. S., 1858, p. 304; 1859, p. 365.

Hab.—State of Puebla. Zoquitlan (Tehuacan), No. 192*a* ♀, May.

81. Pyrgisoma rubricatum (Caban.).

Atlapetes rubricatus, Caban., Mus. Hein., I, p. 140.

Pyrgisoma rubricatum, Sclat. & Salv., P. Z. S., 1868, p. 326.

Vulg.—Zorzal cerquero.

Hab.—State of Puebla. Chietla, No. 47 ♂, 47*a* ♀, December; Acatlan, No. 78 ♂, 111 ♂.

82. Atlapetes pileatus, Wagl.

Atlapetes pileatus, Wagl., Isis, 1831, p. 526.

Hab.—State of Puebla. Teziutlan, No. 132*a* ♀, November.

83. Chondestes grammacus strigatus (Swains.).

Chondestes strigatus, Swains., Phil. Mag., 1827, I, p. 435.
Chondetes grammica strigata, Ridgw., Proc. U. S. Nat. Mus., 1880, p. 179, No. 204*a*.

Vulg.—Gorrion pintado.

Hab.—State of Puebla. Chietla, No. 40 ♂, 40*a* ♀, December.

84. Carpodacus mexicanus (Müll.).

Fringilla mexicana, Müll., Syst. Nat. Suppl., 1776, p. 165.
Carpodacus mexicanus, Ridgw., Proc. Biol. Soc., Wash., II, 1884, p. 111.
Carpodacus hæmorrhous, Sclat., P. Z. S., 1856, p. 304; 1858, p. 303; 1859, p. 380 (ex Fringilla hæmorrhoa, Wagl.).

Vulg.—Gorrion de cabeza colorada.

Hab.—State of Puebla. Barrio de Santiago (Puebla), No. 35 ♂, 35*a* ♀, December.

85. Spinus notatus (Du Bus).

Carduelis notata, Du Bus, Bull. Acad. Brux., XIV, 2, p. 106.
Spinus notatus, Stejneger, Auk, 1884, p. 362.

Vulg.—Verdin calandria.

Hab.—State of Puebla. Teziutlan, No. 127 ♂, November.

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86. Ostinops montezuma (Less.).

Cassicus montezuma, Less., Cent. Zool., pl. F.
Ostinops montezuma, Sclat., P. Z. S., 1859, p. 380.

Vulg.—Pepe de cola amarilla, Marinero.

Hab.—State of Vera Cruz. Actopam, No. 234 ♂, 234*a* ♀, 235 ♂; Barra de Santa Ana, Nos. 455 ♂, 463 ♂, February; Paso de la Milpa, No. 378 ♂, February.

87. Cassiculus melanicterus Bonap.

Icterus melanicterus, Bonap., Journ. Ac. Philad., IV, p. 389.
Cassicalus melanicterous, Bonap., Consp., I., p. 428.

Vulg.—Galantina.

Hab.—State of Oaxaca. Yanhuitlan?, No. 178 ♂, 205 ♀, 483.

88. Cassicus holosericeus (Lichtenstein).

Sturnus holosericeus, Lichtenstein, Preis-Verz. Mex. Vög., 1831, p. 1.
Cacicus holosericeus, Salvin, Cat. Strickl. Coll., 1882, p. 263.
Cacicus prevosti, Scl. and Sal., N. A. N., 1873, p. 36.

Hab.—State of Vera Cruz. Jalapa, No. 383 ♂, August.

89. Icterus galbula (Linn.).

Coracias galbula, Linn., Syst. Nat., I, p. 108.
Icterus galbula, Coues, Bull. Nutt. Club, 1880, p. 98.

Vulg.—Calandria.

Hab.—State of Puebla. Teziutlan, No. 118 ♂, November. State of Vera Cruz. Jalapa, No. 434 ♀, September.

90. Icterus bullockii (Swains.).

Xanthornus bullockii, Swains., Phil. Mag., 1827. I, p. 436.
Icterus bullockii, Bonap., List, 1838, p. 29.

Vulg.—Calandria ordinaria.

Hab.—State of Puebla. Huehuetlan, No. 117 ♂, January.

91. Icterus spurius, (Linn.).

Oriolus spurius, Linn., Syst. Nat. (ed. 12), I, p. 162.
Icterus spurius, Bonap., Synops., 1828, p. 51.

Vulg.—Calandria cajé.

Hab.—State of Puebla. Huexotitla, No. 66 ♂; Chielta, No. 66*a* ♀, December.

92. Icterus wagleri, Sel.

Icterus wagleri, Sel., P. Z. S., 1857, p. 7, 1859, p. 381.

Vulg.—Calandria negro del quiote.

Hab.—State of Puebla. Tecali (Huehuetlan) No. 68 ♂, January; Huehuetlan, No. 262 ♂, February.

93. Icterus cucullatus, Swains.

Icterus cucullatus, Swains., Phil. Mag., 1827, I, p. 436.

Vulg.—Calandria zapotera.

Hab.—State of Puebla. Chietla, No. 54 ♂, 54*a* ♀, 67 ♂, December; Atlixco, No. 106 ♂, 106*a* ♀.

94. Icterus parisorum, Bonap.

Icterus parisorum, Bonap., P. Z. S., 1837, p. 110.

Vulg.—Calandria tunera.

Hab.—State of Puebla. S. Bartolo, No. 64 ♂, 64*a* ♀, November.

95. Icterus audubonii Giraud.

Icterus audubonii Giraud, Sixteen Texas B., 1841, p. 3.

Vulg.—Calandria.

Hab.—State of Vera Cruz. Jalapa, Nos. 361 ♂, juv., August; 404 ♂ juv., September.

96. Icterus gularis (Wagl.).

Psarocolius gularis, Wagl., Isis, 1829, p. 754.
Icterus gularis, Bonap., Consp., I, p. 435.

Vulg.—Calandria real.

Hab.—State of Vera Cruz. Actopam, No. 199 ♂.

97. Icterus pustulatus (Wagl.).

Psarocolius pustulatus, Wagl., Isis, 1829, p. 757.
Icterus pustulatus, Bonap., Consp., I, p. 435.

Vulg.—Calandria fuego.

Hab.—State of Puebla. Chietla, No. 65 ♂, 65*a* ♀, December.—State of Oaxaca. Ianhuiatlan, No. 109 ♂, 115 ♂.

[Two specimens (adult male and female) from Chietla, Puebla (December, 1884) are identical in coloration with examples from Tepic and

Mazatlan, while two others (both males, but one of them immature) from Anhuitlan, in the State of Oaxaca, are very different in being clear Indian-yellow where the others are deep cadmium orange. The black throat-stripe also appears to be narrower. The white on the wings, however, is exactly as in the Chietla, Tepic, and Mazatlan specimens, so it is therefore probable, or at least possible, that the differences noted may be due to difference of age.—R. R.]

98. Molothrus æneus (Wagl.).

Psarocolius æneus, Wagl., Isis, 1829, p. 758.
Molothrus æneus, Cab., Mus. Hein., I, p. 192.

Vulg.—Tordo gallito.

Hab.—State of Puebla. Izucar de Matamoros, No. 81 ♂; Chietla, No. 180 ♂, 191 ♂, December; Acatlan, No. 181 ♂.—State of Vera Cruz. Jalapa, No. 400 ♂, juv., August.

[The adult male of this species possesses a character which appears to have been overlooked by writers, in the possession of a very well-developed ruff, the feathers of the neck, especially on the lateral portions, being very much longer than those of the anterior portion of the body. This ruff, in the specimens belonging to the collection of the Commission, mounted immediately after shooting, strongly suggests that of *Pavoncella pugnax*, but is not, of course, so conspicuous.—R. R.]

99. Molothrus ater (Boddaert).

Oriolus ater Boddaert, Tabl. Pl. Enl., 1783, p. 37.
Molothrus ater Gray, Hand list, II, 1870, p. 36.

Vulg.—Tordo negro.

Hab.—State of Puebla. Huexotitla, No. 327 ♂, November.

[An adult male from Huexotitla, Puebla (November, 1884), is decidedly referable to the northern or typical form, the measurements being as follows: Wing, 4.35; tail, 3.15; culmen, .75; tarsus, 1.10; middle toe, .75. The female accompanying it, however, is the *M. ater obscurus* (Gmel.), its measurements (in the above sequence) being only 3.90, 2.70, .65, 1, and .70.—R. R.]

100. Molothrus ater obscurus (Gmel.).

Sturnus obscurus, Gmel., Syst. Nat., I, 1788, p. 804.
Molothrus ater obscurus, Ridgw., Proc. U. S. Nat. Mus., III, 1880, p. 182.

Vulg.—Tordo negro chico.

Hab.—State of Puebla. Puebla, No. 53*a* ♀, November.

101. Agelaius phœniceus (Linn.).

Oriolus phœniceus, Linnæus, Syst. Nat., I, 1766, p. 161.
Agelaius phœniceus, Swainson, F. B. A., II, 1831, p. 280.

Vulg.—Cañero, Tordo capitan, Coronel.

Hab.—State of Puebla. Chetla, Nos. 398 ♂, 427 ♂.

102. Agelaius gubernator (Wagl.).

Psarocolius gubernator, Wagl., Isis, 1832, IV, p. 281.
Agelaius gubernator, Bonap., Comp. and Geogr. List, 1838, p. 30.

Vulg.—Tordo capitan.

Hab.—State of Tlaxcala. Laguna del Rosario, No. 232 ♂, 245 ♂, January; Nativitas, No. 232*a* ♀, January.

103. Xanthocephalus xanthocephalus (Bonap.).

Icterus xanthocephalus, Bonap., Journ. Acad. Philad., II, p. 222.
Xanthocephalus xanthocephalus, Jordan, Man. Vertebr., 4 ed., 1884, p. 92.

Vulg.—Tordo de pecho amarillo.

Hab.—State of Puebla. Chietla, No. 162 ♂, 175 ♂, December; Huehuetlan, No. 162*a* ♀, December, No. 236 ♂, January; San Martin Texmelucan, No. 146*a* ♀, May.—State of Tlaxcala. Laguna del Rosario, No. 146 ♂, 159*a* ♀, January, No. 159 ♂, October.

104. Sturnella magna mexicana (Sclater).

Sturnella mexicana, Sclater, Ibis, III, 1861, p. 179.
Sturnella magna var. *mexicana*, B. B. & R., N. Am. B., II, 1874, p. 172.

Vulg.—Chirlota.

Hab.—State of Puebla. Llano de Chapulco, No. 147 ♂, July; Chietla, No. 147*a* ♀, December.

105. Scolecophagus cyanocephalus (Wagl.).

Psarocolius cyanocephalus, Wagl., Isis, 1829, p. 758.
Scolecophagus cyanocephalus, Caban., Mus. Hein., I, p. 195.

Vulg.—Tordo de ojo amarillo.

Hab.—State of Puebla. S. Baltazar, No. 148 ♂, November; State of Tlaxcala; Nativitas, No. 148*a* ♀, December.

106. Dives dives (Bonaparte).

Lampropsar dives, Bonaparte, Consp., I, 1850, p. 425.
Dives sumichrasti, Sclater, Ibis, 1884, p. 154.

Vulg.—Tordo.

Hab.—State of Vera Cruz. Plan del Rio, No. 482 ♂, juv., August.

107. Quiscalus macrourus Swains.

Quiscalus macrourus, Swains., An. in Menag., p. 299.

Vulg.—Urraca, Zanate.

Hab.—State of Puebla. Izucar de Matamoros, No. 212 ♂, 212*a* ♀, 213 ♂, 213*a* ♀, December; State of Vera Cruz; Plan del Rio, No. 363 ♀ juv.

Fam. CORVIDÆ.

108. Cyanocitta stelleri diademata (Bonap.).

Cyanogarrulus diadematus, Bonap., Consp., I., p. 377.

Vulg.—Fraile, Verdugo, Quauhgallito.

Hab.—State of Puebla. Hacienda de S. Pedro (Texmelucan), No. 197*a* ♀, September, No. 196 ♂, 196*a* ♀, 197 ♂, October.

109. Xanthoura luxuosa (Lesson).

Garrulus luxuosus, Lesson, Rev. Zool., 1839, p. 100.
Xanthoura luxuosa, Bonaparte, Consp., I, 1850, p. 380.

Vulg.—Quexque azul.

Hab.—State of Vera Cruz: Jalapa, Nos. 469 ♀, August; 470 ♂, 473 ♀, September.

110 Aphelocoma sieberii (Wagl.).

Pica sieberii, Wagl., Syst. Av., 1827, p. 365.
Aphelocoma sieberi, Caban., Mus. Hein., I, p. 221.

Vulg.—Caxcax, Crajo azul.

Hab.—State of Puebla. Cerro de S. Pedro en el Istatcihuatl (Texmelucan), No. 195 ♂, September; Hacienda de S. Pedro (Texmelucan), No. 237 ♂, October; S. Salvador el Verde (Huejotzingo), No. 195*a* ♀, September.

111. Cyanocorax ornatus (Less.).

Pica ornata, Less., Rev. Zool., 1839, p. 41.
Cyanocorax ornata, Gray, Gen. Birds, II, 1845, p. 307.

Vulg.—Quexquex.

Hab.—State of Vera Cruz. Jalapa, No. 243 ♂, No. 243*a* ♀.

[A male and female from Jalapa agree with other Mexican and also Guatemalan examples in having the blue cap bordered laterally with a distinct white line, broadest and most sharply defined posteriorly, of which there is no trace in Costa Rican specimens, recently separated by me as *C. cucullatus* (cf. Proc. U. S. Nat. Mus., viii. April 20, 1885, p. 23).—R. R.]

112. Calocitta formosa (Swains.).

Pica formosa, Swains., Phil. Mag., 1827, I, p. 437.
Calocitta formosa, Scl. & Salv., Ibis, 1859, p. 22.

Vulg.—Chismoso, Alguacil.

Hab.—State of Puebla. Chietla, No. 241 ♂, 241*a* ♀, 242 ♂, 242*a* ♀, 468, December.

113. Psilorhinus morio (Wagl.).

Corvus morio, Wagl., Isis, 1829, p. 751.
Psilorhinus morio, Gray, Gen. B., II, p. 308.

Vulg.—Pepe.

Hab.—State of Vera Cruz. Jalapa, No. 334 ♂, 334 *a* ♀; Plan del Rio, No. 422 ♂, juv., August.

114. Corvus corax sinuatus (Wagl.).

Corvus sinuatus, Wagl., Isis, 1829, p. 748.
Corvus corax sinuatus, Ridgw., Proc. U. S. Nat. Mus., 1885, p. 355.

Vulg.—Cuervo, Cacalotl, Cacalote.

Hab.—State of Puebla. Puebla, No. 306 ♂. State of Vera Cruz. Jalapa, No. 462 ♂, August.

FAM. TYRANNIDÆ.

115. Sayornis nigricans (Swains.).

Tyrannula nigricans, Swains., Phil. Mag., 1827, I, p., 367.
Sayornis nigricans, Bonap., Comp. Rend., XXXVIII, p. 657.

Vulg.—Papamoxca negro de rio.

Hab.—State of Puebla. Rio de Huexotitla, No. 52 ♂, November.

116. Sayornis phœbe (Lath.).

Muscicapa phœbe, Lath., Ind. Orn., II, p. 489.
Sayornis phœbe, Stejneger, Auk, 1885, p. 51.

Vulg.—Papamosca.

Hab.—State of Puebla. Teziutlan, No. 129 ♂, November.

117. Sayornis sayus (Bonap.).

Muscicapa saya, Bonap., Am. Orn., I, p. 20, pl. 2, fig. 3.
Sayornis sayus, Baird, B. N. Am., p. 185.

Vulg.—Papamosca boyero.

Hab.—State of Puebla. Puebla, No. 57 ♂, December; Chapulco, No. 57*a* ♀, December.

118. Myiozetetes texensis (Giraud).

Muscicapa texensis, Giraud, B. of Texas, text at pl. 1.
Myiozetetes texensis, Sclat., P. Z. S., 1859, p. 56.

Vulg.—Justo juez.

Hab.—State of Puebla. Chietla, No. 59 ♂, 59*a* ♀, December. State of Vera Cruz. Jalapa, Nos. 387 ♂, 403 ♀, 418, August.

119. Pitangus derbianus (Kaup).

Saurophagus derbianus, Kaup. P. Z. S. 1851, p. 44.
Pitangus derbianus, Scl. P. Z. S., 1856, p. 297, 1859, pp. 45, 56, 366.

Vulg.—Portugués.

Hab.—State of Puebla. Chietla, No. 185 ♂, 185*a* ♀, December, Acatlan, No. 179 ♂.

120. Pyrocephalus rubineus mexicanus (Sclat.).

Pyrocephalus mexicanus, Sclat., P. Z. S., 1859, pp. 45, 56, 366.
Pyrocephalus rubineus var. *mexicanus*, Coues, Key, 1st ed., p. 177.

Vulg.—Cardenal, S. Gabrielito.

Hab.—State of Puebla. S. Martin Texmelucan, No. 29 ♂, 29*a* ♀, November. State of Tlaxcala. Tlaxcala, No. 25 ♂, January. State of Vera Cruz. Jalapa, Nos. 351 ♂, 399 ♂, August, 489 ♂, September.

121. Empidonax fulvifrons rubicundus (Caban. & Heine).

Empidonax rubicundus, Caban. & Heine, Mus. Hein., II, p. 70.
Empidonax fulvifrons rubicundus, Ridgw., Proc. Biol. S. Wash., II, p. 109.

Vulg.—Papamosquita canelo.

Hab.—State of Puebla. Huehuetlan, No. 22 ♂, January.

[An example from Huehuetlan State of Puebla (January, 1885), agrees very closely with specimen No. 32,914, U. S. National Museum

collection, which has already been referred to by the writer in a paper* published in the "Proceedings" of the Biological Society of Washington, as representing a small, richly colored southern race of the species. The assumed southern locality of the specimen, which was labeled simply "Mexique," is therefore probably correct. The measurements are as follows: Wing, 2.40; tail, 2.10; culmen, .35; tarsus, .57.—R. R.]

122. Contopus borealis (Swainson).

Tyrannus borealis Swainson, F. B. A., II, 1831, p. 141, pl. 35.
Contopus borealis Baird, B. N. Am., 1858, p. 188.

Vulg.—Mosquero.

Hab.—State of Vera Cruz. Jalapa, No. 488 ♀, September.

123. Contopxs pertinax, Cabau. et Heine.

Contopus pertinax, Cabau. & Heine, Mus. Hein., II, p. 72.

Vulg.—Papamosca gris, Papamosca verdoso.

Hab.—State of Puebla. Chietla, No. 58 ♂, 58*a* ♀, December.—State of Vera Cruz. Actopam, No. 116 ♂; Jalapa, No. 350 ♂, August.

124. Myiarchus cinerascens (Lawr.)

Tyrannula cinerascens, Lawr., Ann. Lyc. N. Y., 1851, p. 109.
Myiarchus cinerascens, Sclater, Ibis, 1859, pp. 121, 440.

Vulg.—Abispero.

Hab.—State of Puebla. Huehuetlan (Tecali), No. 174*a* ♀, January.

125. Tyrannus melancholicus couchii (Baird).

Tyrannus couchii, Baird, B. N. A., 1858, p. 175.
Tyrannus melancholicus var. *couchii*, Coues, Check-list, 1st ed., Dec., 1873, p. 51.

Hab.—State of Vera Cruz. Jalapa, Nos. 407 ♂, 414 ♂, 492 ♂ juv., August.

126. Tyrannus vociferans, Swains.

Tyrannus vociferans, Swains., Quart. Journ. Sc., XX, p. 273, et Phil. Mag., I, 1827, p. 368.

Vulg.—Abejero.

Hab.—State of Puebla. Huexotitla, No. 163 ♂; Llano de S. Baltasar (Puebla), No. 163*a* ♀, November.

127. Tyrannus crassirostris, Swains.

Tyrannus crassirostris, Swains., Quart. Journ. Sc., XX, p. 278, et Phil. Mag., I., 1827, p. 368.

Vulg.—Abispero.

Hab.—State of Puebla. Chietla, No. 186 ♂, December.

128. Milvulus forficatus (Gmel.).

Muscicapa forficata, Gmel., S. N., I, p. 931.
Milvulus forficatus, Swains., Classif. B, II, 1837, p. 225.

Vulg.—Tijereta.

Hab.—State of Puebla. Huehuetlan, No. 77*a* ♀, November.

* Remarks on the Type-specimens of Muscicapa fulvifrons, Giraud, and Mitrephorus fulvifrons, Coues. < Proc. Biol. Soc. Washington, Vol. II, April 28, 1884, pp. 108–110.

Fam. COTINGIDÆ.

129. Tityra personata, Jard. & Selb.

Tityra personata, Jard. & Selb., Ill. Orn., I, pl. 24.

Vulg.—Viuda.

Hab.—State of Vera Cruz. Jalapa?, No. 164*a* ♀.

130. Hadrostomus aglaiæ (Lafr.)

Pachyrhynchus aglaiæ, Lafr., Rev. Zool., 1839, p. 98.
Hadrostomus aglaiæ, Cab. et Heine, Mus. Hein., II, p. 85.

Vulg.—Degollado, Mosquero.

Hab.—State of Puebla. Rancho del Ahuehuete (Tecali), No. 49 ♂, March; No. 49 *a* ♀, December.—State of Oaxaca. Yanhuitlan?, No. 107 ♂.—State of Vera Cruz. Jalapa, Nos. 373 ♀, 388 ♀, 409 ♂, September.

Fam. DENDROCOLAPTIDÆ.

131. Sittasomus olivaceus, Maximilian.

Sittasomus olivaceus, Maximilian, Beitr. Nat. Bras., III, 1830, p. 1146.

Hab.—State of Vera Cruz. Jalapa, No. 367 ♂, September.

132. Dendrornis flavigaster (Swains.).

Xiphorhynchus flavigaster, Swains., Philos. Mag., I., 1827, p. 440.
Dendronis flavigaster, Bonap., Consp. Volue. Anis., 1854, p. 11.

Vulg.—Saltapared de monte.

Hab.—State of Puebla. Chietla, No. 169 ♂, 169 *a* ♀, December.

133. Picolaptes affinis (Lafr.).

Dendrocolaptes affinis, Lafr., Rev. Zool., 1839, p. 100.
Picolaptes affinis, Gray, Gen. B., I, 1847, p. 140.

Vulg.—Saltapared.

Hab.—State of Puebla. Hueytamalco (Teziutlan) No. 133 ♂, November.—State of Vera Cruz. Jalapa, Nos. 376 ♂, 410 ♂, September.

Fam. FORMICARIIDÆ.

134. Thamnophilus doliatus (Linn.).

Lanius doliatus, Linn., Syst. Nat., ed. 12, I, 1766, p. 136.
Thamnophilus doliatus, Max., Beitr., III, p. 995.

Vulg.—Saltapared lutado.

Hab.—State of Puebla. Hueytamalco (Teziutlan), No. 136 ♂, December.

State of Vera Cruz. Jalapa, No. 487 ♂ juv., August.

Fam. TROCHILIDÆ.

135. Sphenoproctus curvipennis (Licht.).

Trochilus curvipennis, Licht., Preis-Verz., Mex. Thier., 1830, No. 32.
Sphenoproctus curvipennis, Gould, Intr. Troch., 8 ed., 1861, p. 51; Elliot, Syn. Troch., p. 23.

Vulg.—Chupamirto real blanco.

Hab.—State of Vera Cruz. Jalapa, No. 83 ♂, 85 ♂, 86 ♂, 103 ♂.

136. Campylopterus hemileucurus (Licht.).

Trochilus hemileucurus, Licht., Preis-Verz., Mex. Thier., 1830, No. 33.
Campylopterus hemileucurus, Cab. & Heine, Mus. Hein., Th. III, p. 13; Elliot, Clas. & Syn., Troch., p. 26.

Vulg.—Chupamirto pavito azul; Chupamirto real.

Hab.—State of Vera Cruz. Jalapa, No. 84 ♂, 89 ♂, 93 ♂, 94 ♂, 359 ♂. 365 ♂, September.

137. Cæligena henrica (Less. & Delattre).

Ornismya henrica, Less. & Delattre, Rev. Zool., 1839, p. 17.
Cæligena henrica, Caban & Heine, Mus. Hein., Th. III, 1860, p. 15, note; Elliot, Classif. and Synops. Troch., 1878, p. 30.

Vulg.—Chupamirto de pecho color de rosa.

Hab.—State of Vera Cruz. Jalapa, No. 104*a* ♀.

138. Petasophora thalassina (Swains.).

Trochilus thalassina, Swains., Phil. Mag., 1827, p. 441.
Petasophora thalassina, Gould, P. Z. S., 1847, p. 8; Elliot, Clas. & Synops. Troch., p. 51.

Vulg.—Chupamirto de cola verde-mar.

Hab.—State of Puebla. Puebla, No. 319 ♂, 332 ♂, September.

139. Eugenes fulgens (Swains.).

Trochilus fulgens, Swains., Phil. Mag., I, 1827, p. 441.
Eugenes fulgens, Gould, Mon. Troch., II, pl. 79. Elliot, Clas. & Synops. Troch., 1878, p. 60.

Vulg.—Chupamirto verde montero.

Hab.—State of Puebla. Puebla, No. 33 ♂, No. 278 ♂, 284 ♂, 285 ♂. 286 ♂, 287 ♂, 288 ♂, 289 ♂, 290 ♂, 293 ♂, 294*a* ♀, September; No. 32 ♂, June. State of Vera Cruz. Jalapa, No. 96 ♂, 96*a* ♀, 97 ♂, 95 ♂, 105 ♂, 114 ♂. 122 ♂, 122*a* ♀, 349 ♂, August; 352 ♂, September.

140. Trochilus colubris, Linn.

Trochilus colubris, Linn., Syst. Nat., I, p. 120. Elliot, Clas. & Syn. Troch., p. 105.

Vulg.—Chupamirto rubi.

Hab.—State of Vera Cruz. Jalapa, No. 92 ♂, 92*a* ♀.

141. Doricha eliza (Less. & Delattre).

Trochilus eliza, Less. & Delattre, Rev. Zool., 1839, p. 20.
Doricha elizæ, Gould, Intr. Troch., 8° ed., 1861, p. 94. Elliot, Clas. & Synops. Troch., p. 125.

Vulg.—Chupamirto rubi de cola horquillada.

Hab.—State of Vera Cruz. Jalapa, No. 82 ♂, 82*a* ♀.

142. Tilmatura duponti (Less.).

Ornismya duponti, Less., Ois. Mouch. Supppl., p. 100, t. 1.
Tilmatura duponti, Caban. & Heine, Mus. Hein., III, 1860, p. 59. Elliot, Clas. & Synops. Troch., 1878, p. 128.

Vulg.—Chupamirto de cola de tijera y garganta azul.

Hab.—State of Vera Cruz. Jalapa, No. 98*a* ♀.

143. Uranomitra cyanocephala (Less.).

Ornismya cyanocephala, Less., Ois. Mouch. Suppl., 1831, p. 134, pl. 18.
Uranomitra cyanocephala, Reich., Aufz. der Colib., 1853, p. 10. Elliot, Clas. & Syn. Troch., p. 197.

Vulg.—Chupamirto blanco, chico, de cabeza azul.
Hab.—State of Vera Cruz. Jalapa, No. 88 ♂, 99 ♂, 100 ♂, 101 ♂.

144. Amazilia mariæ (Bourc.).

Trochilus mariæ, Bourc., Ann. Soc. Agr. Tr., Lyon, 1846, p. 319, t. ix.
Amazilia mariæ, Elliot, Clas. & Synops. Troch., p. 222.

Vulg.—Chupamirto esmeralda.
Hab.—State of Vera Cruz. Jalapa, Nos. 90 ♂, 91 ♂, 102 ♂.

FAM. MICROPODIDÆ.

145. Chætura vauxii (Towns.).

Cypselus vauxii, Towns., Journ. Ac. Phil., VIII, p. 148.
Chætura vauxii, De Kay, N. Y. Zool., II, 1844, p. 36.

Vulg.—Aguador, Media luna.
Hab.—State of Tlaxcala. Laguna del Rosario, No. 41 ♂, October.

[A specimen from Laguna del Rosario, State of Tlaxcala (October, 1884), agrees exactly with examples from California and Washington Territory, and is at once distinguishable from the common Mexican species (*C. affinis*, Lawr.).—R. R.]

FAM. CAPRIMULGIDÆ.

146. Antrostomus vociferus (Wils.).

Caprimulgus vociferus, Wils., Am. Orn., V, p. 71, pl. 41, f. 1, 2, 3.
Antrostomus vociferus, Bonap., Comp. List, p. 8.

Vulg.—Puxacua, Papavientos.
Hab.—State of Puebla. Tlacotepec (Tehuacan), No. 342 ♂, December; Jagüey de la Magdelena, No. 110 ♂.

147. Nyctidromus albicollis (Gmel.).

Caprimulgus albicollis, Gmel., Syst. Nat., I, p. 1030.
Nyctidromus albicollis, Burm., Th. Bras., II, 1856, p. 389.

Vulg.—Puxacua.
Hab.—State of Puebla. Mazatiopam (Tehuacan), No. 341 ♂, December.

FAM. PICIDÆ.

148. Campephilus guatemalensis (Hartlaub).

Picus guatemalensis, Hartlaub, Rev. Zool., 1844, p. 214.
Campephilus guatemalensis, Sclater, Cat. Am. B., 1862, p. 331.

Vulg.—Carpintero.
Hab.—State of Vera Cruz. Santa Ana, No. 382 ♀, February; Paso de la Milpa, No. 384 ♂, February.

149. Ceophlœus scapularis (Vig.).

Picus scapularis, Vig., Zool. Journ., IV, 1829, p. 354.
Ceophlœus scapularis, Cabanis, Journ. f. Orn., 1862. p. 176.

Vulg.—Pito real, Carpintero real.

Hab.—State of Vera Cruz. Jalapa, No. 277 ♂.

150. Dryobates scalaris (Wagl.).

Picus scalaris, Wagl., Isis, 1829, p. 511.
Dryobates scalaris, Ridgw., Proc. U. S. Nat. Mus., 1885, p. 355.

Vulg.—Carpintero chililito.

Hab.—State of Puebla. Chietla, No. 144 ♂, December.

[An adult male from Chietla, State of Puebla, measures as follows: Wing, 2.80; tail, 2.30; culmen, .70. It has the nearly uniform red of the crown, like other specimens from Southeastern Mexico, including Yucatan, and the lower parts a deeper grayish brown than in Texas examples. The outer web of the lateral (second) rectrix, on each side, has but three bars of black.—R. R.]

151. Dryobates villosus jardinii (Malh.).

Picus jardinii, Malh., R. Z., 1845, p. 374.
Dryobates jardinii, Cab. & Heine, Mus. Hein., IV, 1863, p. 69.

Vulg.—Carpintero de pino.

Hab.—State of Puebla. Tezintlan, No. 139 ♂, November.

[An adult male from Tezintlan, State of Puebla (November, 1884), measures as follows: Wing, 4.90; tail, 3.20; culmen, 1.18. The lower parts are light smoky brown, as are also the light stripes on the head and the broad stripe down the back; the three lateral tail feathers deeply stained with cinnamon-brown terminally.—R. R.]

152. Sphyrapicus varius (Linn.).

Picus varius, Linn., Syst. Nat. (ed. 12), I, p. 176.
Sphyrapicus varius, Baird, B. N. Am., p. 103.

Vulg.—Carpintero amarillo.

Hab.—State of Puebla. Huexotitla, No. 76*a* ♀, November.

153. Chloronerpes oleagineus, Reichenbach.

Chloronerpes oleagineus, Reichenbach, Handb. Spec. Orn., II, 1854, p. 356.

Vulg.—Carpintero.

Hab.—State of Vera Cruz. Jalapa, No. 498 ♀ juv., August.

154. Melanerpes formicivorus, Swains.

Picus formicivorus, Swains., Phil. Mag., I, 1827, p. 439.
Melanerpes formicivorus, Bonap., P. Z. S., 1837, p. 109.

Vulg.—Carpintero negro.

Hab.—State of Puebla. Chachapa, No. 154 ♂, 154*a* ♀, December. State of Vera Cruz. Jalapa, No. 479 ♀, 480 ♀ juv., September, 396 ♀ juv., 475 ♀ juv., 478 ♀ juv., 493 ♀ juv., 494 ♀, August.

155. Centurus hypopolius (Wagl).

Picus hypopolius, Wagl., Isis, 1829, p. 514.
Centurus hypopolius, Licht., Nomenel., 1854, p. 76. Ridgw., Proc. U. S. Nat. Mus., 1881, p. 113.

Vulg.—Carpintero de cabeja colorada.

Hab.—State of Puebla. Huehuetlan, No. 153 ♂, 153*a* ♀, November; No. 193*a* ♀, January; Izucar de Matamoros, No. 193 ♂, December.

156. Centurus elegans (Swains.).

Picus elegans, Swains., Phil. Mag., I, 1827, p. 439.
Centurus elegans, Gray, Gen. B., II, 1849, p. 442. Ridgw., Proc. U. S. Nat. Mus., 1881, p. 114.

Vulg.—Carpintero de cabeza amarilla.

Hab.—State of Puebla. Izucar de Matamoros, No. 155 ♂, 155*a* ♀, 156 ♂, December.

157. Colaptes mexicanus, Swains.

Colaptes mexicanus, Swains., Phil. Mag., I, 1827, p. 440.

Vulg.—Carpintero de alas rojas.

Hab.—State of Puebla. S. Martin, Texmelucan, No. 198*a* ♀, 227 ♂, July; Totimehuacan, No. 198 ♂, November.

Fam. MOMOTIDÆ.

158. Momotus cæruliceps (Gould).

Prionites cæruliceps, Gould, P. Z. S., 1836, p. 18
Momotus cæruliceps, Gray, Gen. B., I, 1847, p. 68.

Vulg.—Turco, Pájaro bobo.

Hab.—State of Vera Cruz. Jalapa, No. 231 ♂, 380 ♀, 417 ♀, September.

159. Momotus mexicanus, Swains.

Momotus mexicanus, Swains., Phil. Mag., I, 1827, p. 442.

Vulg.—Bobo, Turco.

Hab.—State of Puebla. Chietla, No. 160*a* ♀, 176 ♂, 176*a* ♀, 177 ♂, 177*a* ♀, 415, December.

Fam. ALCEDINIDÆ.

160. Ceryle torquata (Linn.).

Alcedo torquata, Linnæus, Syst. Nat., ed. 12, I, p. 180.
Ceryle torquata, Bonaparte, P. Z. S., 1837, p. 108.

Vulg.—Martin pescador, Matraca.

Hab.—State of Vera Cruz. Paso de la Milpa, No. 465 ♂, February; Vega de Alatorre, No. 348 ♂, juv., August.

161. Ceryle alcyon (Linn.).

Alcedo alcyon, Linn., Syst. Nat., ed. 12, I, p. 180.
Ceryle alcyon, Boie, Isis, 1828, p. 316.

Vulg.—Martin pescador.

Hab.—State of Puebla. Epatlan, No. 206 ♂, December; Puebla, No. 206*a* ♀, September.

162. Ceryle amazona (Lath.).

Alcedo amazona, Lath., Index Orn., I, 1790, p. 257.
Ceryle amazona, Gray, Gen. B., I, 1847, p. 82.

Vulg.—Martin pescador.

Hab.—State of Vera Cruz. Jalapa, No. 187*a* ♀, 395 ♂, September.

163. Ceryle cabanisi (Tschudi).

Alcedo cabanisi, Tschudi, Faun. Per., p. 253.
Ceryle cabanisi, Gray, G. B., I, p. 82.

Vulg.—Martin pescador de rio.

Hab.—State of Puebla. Chietla, No. 56 ♂, December; Izucar de Matamoros, No. 56*a* ♀, December.—State of Vera Cruz. Jalapa, No. 112 ♂, 112*a* ♀, 377 ♂, August.

Fam. TROGONIDÆ.

164. Trogon mexicanus Swains.

Trogon mexicanus, Swains., Phil. Mag., I, 1827, p. 440.

Vulg.—Cuauhtotola.

Hab.—State of Puebla. Cerro de S. Mateo (Istatcihuatl, Texmelucan), No. 201 ♂, March; No. 202 ♂, September.—State of Vera Cruz. Jalapa, No. 393 ♂, juv., September.

165. Trogon ambiguus Gould.

Trogon ambiguus, Gould, P. Z. S., 1835, p. 30.

Vulg.—Cuauhtotola.

Hab.—State of Puebla. Chietla, 172 ♂, 200 ♂, 200*a* ♀, December.

[An adult male from Chietla, State of Puebla (*tierra caliente*), December, 1884, differs from an adult male from Mazatlan, another from the Tres Marias, and a third from Boquillo, Nuevo Leon, in the following characters: The entire fore part of the head, including the crown back to behind the eyes, the postocular and auricular regions, malar region, chin, throat, and jugulum, are dull slaty black, with a decided glaucous or chalky cast; the metallic bronze collar across lower part of jugulum is less than half as broad as the distance from its upper edge to the mental apex; the white breast-collar is very narrow, being in its widest part only about .35 of an inch wide, whereas in northern and western examples it is .50 or more in breadth; the mottling of the wings is appreciably more delicate, and the color of the upper surface of the four middle rectrices is a very rich purplish copper, instead of bronzy copper-color. The measurements are: Wing, 5.30; tail, 6.80; culmen, .80; width of bill at rictus, .72.

It is altogether probable that the birds of this species from Northern and Western Mexico, and those from Puebla and other more southern States of the Republic, represent two well-defined geographical races; but in the great uncertainty which at present necessarily exists as to which form represents the *T. ambiguus* of Gould, and likewise as to

the relation which the latter bears to the *T. elegans* of the same author, we cannot at present do more than call attention to the facts noted above.

A young male from Chietla (Mexican Exploring Commission, No. 200, December, 1884), in nearly the same stage of plumage as No. 4339, from Boquillo, Nuevo Leon (April, 1853), yet shows indications of the characters distinguishing the adult, as noted above.

A young female from the same locality (No. 200*a*, same date) is essentially similar to No. 37355, U. S. Nat. Mus., from the Tres Marias, but has the middle tail-feathers less decidedly rufous. There are also other differences, which, in the absence of a larger series of specimens, it is unnecessary to note.—R. R.]

166. Trogon citreolus Gould.

Trogon citreolus, Gould, P. Z. S., 1835, p. 30.

Vulg.—Cuauhtotola amarilla.

Hab.—State of Oaxaca. Iauhuitlan (?), No. 239 ♂, 239*a* ♀.

Fam. CUCULIDÆ.

167. Crotophaga sulcirostris Swains.

Crotophaga sulcirostris, Swains., Phil. Mag., I, 1827, p. 440.

Vulg.—Pijon, Garrapatero.

Hab.—State of Puebla. Izucar de Matamoros, No. 240 ♂, 240*a* ♀, 317 ♂, 317*a* ♀, December.—State of Vera Cruz. Plan del Rio, No. 347 ♀, 408 ♂, August.

168. Geococcyx affinis Hartl.

Geococcyx affinis, Hartl., Rev. Zool., 1844, p. 215.

Vulg.—Corre camino.

Hab.—State of Puebla. Huehuetlan, No. 210*a* ♀, July.

169. Piaya cayana (Linn.).

Cuculus cayanus, Linn., Syst. Nat., ed. 12, I, p. 170.
Piaya cayana, Bonap., Cons., I, p. 110.

Vulg.—Chile ancho, Vaguero de huerta.

Hab.—State of Vera Cruz. Jalapa, No. 340 ♂, 397 ♀, September; 467 ♀, August.

170. Piaya mexicana (Swains.).

Cuculus mexicanus, Swains., Phil. Mag., I, 1827, p. 440.
Piaya mexicana, Sclat., P. Z. S., 1859, p. 388; 1860, p. 285.

Vulg.—Vaguero de huerta, Cuapaxtle.

Hab.—State of Puebla. Chietla, No. 244 ♂, 244*a* ♀, December; No. 419, February, Acatlan, No. 247 ♂.

171. Coccyzus americanus (Linn.).

Cuculus americanus, Linn., Syst. Nat., I, 1758, p. 111.
Coccyzus americanus, Bonap., Obs. Wils., 1825, No. 47.

Vulg.—Abejarruco.

Hab.—State of Pueblo. Paseo Nuevo (Puebla), No. 214*a* ♀, July.—State of Vera Cruz. Jalapa, No. 354 ♀, juv.; 391 ♀, September.

Fam. RAMPHASTIDÆ.

172. Ramphastos carinatus Swains.

Ramphastos carinatus, Swains., Zool. Ill., I, pl. 45.

Vulg.—Tucán de cuello amarillo, Pico de canoa.

Hab.—State of Vera Cruz. Santa Ana, No. 224 ♂, 346 ♂, 450 ♂, 426 ♂, January.

173. Pteroglossus torquatus (Gmel.).

Ramphastos torquatus, Gmel., Syst. Nat., I, p. 354.
Pteroglossus torquatus, Wagl., Isis, 1829, p. 508.

Vulg.—Tucán de pecho rojo.

Hab.—State of Vera Cruz. Jalapa (?), No. 281 ♂.

174. Aulacoramphus prasinus (Gould).

Pteroglossus prasinus, Gould, Mon. Ramph., ed. 1, pl. 29.
Aulacoramphus prasinus, Bonap., Consp., I., p. 96.

Vulg.—Tucán verde, Pico de canoa verde.

Hab.—State of Vera Cruz. Jalapa, No. 203*a* ♀, 412 ♂, January.

Fam. PSITTACIDÆ.

175. Conurus aztec Souancé.

Conurus aztec, Souancé, Rev. Zool., 1856, p. 154.

Vulg.—Perico.

Hab.—State of Vera Cruz. Plan del Rio, No. 474 ♀, August.

176. Chrysotis autumnalis (Linn.).

Psittacus autumnalis, Linn., Syst. Nat., I, 1758, p. 102.
Chrysotis autumnalis, Swainson, Clas. Birds, II, 1837, p. 301.

Vulg.—Loro, Cotorra.

Hab.—State of Vera Cruz. Plan del Rio, No. 336 ♂, 364 ♂, August.—State of Puebla. San José Acateno, No. 466 ♂, June.

177. Chrysotis levaillantii Gray.

Chrysotis levaillantii, Gray, List Sp. Psitt., 1859, p. 79.

Vulg.—Loro.

Hab.—State of Vera Cruz. Santa Ana, No. 446 ♂, January.

Fam. STRIGIDÆ.

178. Strix pratincola Bonap.

Strix pratincola, Bonap., Comp. & Geog. List, 1838, p. 7.

Vulg.—Lechuza de campanario.

Hab.—State of Puebla. Llano de Chapulco, No. 228 ♂, June; Forres de la Catedral (Puebla), No. 228*a* ♀, July.

[Two fine adults, a male from Chietla (June, 1884) and a female from Puebla (July, 1884), are decidedly referable to *practincola* proper, and not to *S. guatemalæ* (*Strix flammea* var. *guatemalæ*, Hist. N. Am. B., iii, 1874, p. 11). The male is pure white beneath, with a few blackish specks—mostly of rhomboid shape—along the sides; the female also white beneath, but much tinged with buff on breast and abdomen, which are rather thickly marked with rhomboid, deltoid, cuneate, and sagittate specks of dusky, the sides more ochraceous. The upper parts are colored quite as in average specimens of the northern bird. They measure as follows:

	Wing.	Tail.	Culmen.	Tarsus.
♂	12.60	5.50	.90	2.75
♀	13.25	6.00	1.00	2.85

R. R.]

179. Asio accipitrinus (Pall.).

Strix accipitrina, Pall., Reise Russ. Reichs., I, 1771, p. 455.
Asio accipitrinus, Newt., ed. Yarr., Brit. B., I, 1872, p. 163.

Vulg.—Lechuza de llano.

Hab.—State of Puebla. Chapulco, No. 222 ♂, November; Llano de S. Baltazar, No. 222*a* ♀, July.

180. Syrnium virgatum Cassin.

Syrnium virgatum, Cassin, Proc. Ac. Phil., IV, 1848, p. 124.

Vulg.—Mochuelo.

Hab.—State of Vera Cruz. Jalapa, No. 331 ♂.

181. Ciccaba nigrolineata Sclater.

Ciccaba nigrolineata, Sclater, Trans. Zool. Soc., IV, p. 268, pl. 63, (1859).

Vulg.—Lechuza hitada de cara negra.

Hab.—State of Vera Cruz. Jalapa, No. 301 ♂.

182. Glaucidium phalænoides (Daud.).

Strix phalænoides, Daud., Traité, II, 1800, p. 206.
Glaucidium phalænoides, Sclater & Salvin, Nomenc. Av. Neotr., 1873, p. 117.

Vulg.—Tecolotillo or Tecolotito amarillo, rufous phase.

Hab.—State of Pueblo. S. Miguel Espejo, No. 261 ♂, February; Chietla, No. 260 ♂, 260*a* ♀, December; San José Acateno, No. 491 ♂, July; (?) No. 432, 433. State of Vera Cruz. Plan del Rio, No. 394 ♀, August.

[Three fine adults, all different in plumage, as follows:

No. 261, ♂ ad., San Miguel Espejo, Puebla, February, 1885: Rufous brown, inclining to russet, the sides more decidedly rufescent; legs like sides, but paler, especially on inner side. Tail dull brown, crossed by eight* bars of brownish white, tinged with rusty. Pileum without

* A ninth, terminal, bar is worn off, except partially on a single feather; the two anterior bars are mostly concealed by the upper coverts.

streaks or other markings, and scapulars and wing-coverts showing indistinct pale rufous spots instead of the usual large and very conspicuous white ones. Wing, 3.65; tail, 2.70.

No. 260 *a*, ♀ ad., Chietla, Puebla, Dec., 1884: Grayish brown above, the entire pileum streaked with pale brown, the nape with a large V-shaped mark of white (entirely absent in No. 261), with a black mark of similar form immediately beneath it; scapulars and lower wing-coverts with large roundish and oval spots of white. Tail rusty brown, crossed by about 10* broad bars of pale rufous, about the same width as the brown ones. The sides of the breast and stripes on flanks, &c., are grayish brown, much like the back. Outer side of legs mainly grayish brown, inner side mostly white. Wing, 3.75; tail, 2.70.

No. 260, ♂ ad., Chietla, December, 1884: In color of the upper parts (except tail), exactly intermediate between Nos. 261 and 260*a*; but with distinct white nuchal V-shaped band and white spots on scapulars and wing-coverts, as in the latter. Tail clear rufous, with about 10 narrow bars of brown, averaging less than half as wide as the rufous bands; markings of lower parts same color as the back (intermediate between cinnamon and umber). Legs white, spotted with brown on upper portion of outer side. Pileum indistinctly streaked with pale rusty brown, the streaks most distinct anteriorly and laterally. Wing, 3.90; tail, 2.75.—R. R.]

183. Micrathene whitneyi (Cooper).

Athene whitneyi, Coop., Pr. Cal. Acad., 1861, p. 118.
Micrathene whitneyi, Coues, Pr. Philad. Acad., 1866, p. 51.

Vulg.—Tecolotito.

Hab.—State of Puebla. S. Salvador el Verde (Huejotringo), No. 259 ♂, March.

[The single specimen, a beautiful adult male, is essentially identical with Arizona examples, as is also an adult (sex not determined from Guanajuato (No. 72,888, U. S. Nat. Mus.; Prof. A. Dugès). In *History of North American Birds*, vol. iii, p. 88, attention is called to differences between the type-specimen of this species and two specimens from Socorro Island, referred to the same species, these three examples being the only ones which had been obtained up to that time. Since then the National Museum collection of *M. whitneyi* has increased to 17 specimens, 2 from Southern California (2 from Lower California, 12 from Arizona, and 1 from Guanajuato, Mexico), so that now we have ample material for comparison; and a comparison of these† shows that the two Socorro birds are very distinct, in the characters pointed out in the work

*These bars are less distinct towards the end of the tail, the terminal one being particularly indistinct; in the closed tail, they are sharply defined, and continuous; but when the tail is spread it is seen that each is interrupted at the shaft, where the brown of the alternating bars runs the full length of the feather.

†Probably as many more, in other collections, have been examined.

referred to, and undoubtedly represent a distinct species, or at least subspecies, which may be characterized as follows:

Micrathene graysoni Ridgw.—Socorro Elf Owl.*

Micrathene whitneyi Grayson & Lawr., Proc. Boston Soc., N. H., 1871, 300; Mem. Bost. Soc., ii, pt. iii, No. ii, 1874, 297.—B. B. & R., Hist. N. Am. B. iii, 1874, 87 (part).

Sp. Char.—Similar to *M. whitneyi*, but much browner, the plumage without any superficial gray, and the light rusty tail-bands nearly as broad as the brown interspaces.

Adult ♂ (No, 49,678, Socorro I., W. Mexico; Col. A. J. Grayson): Above umber brown, the forehead and crown marked with rather large guttate spots of tawny; back, rump, and scapulars indistinctly spotted and barred with the same, but none of the markings well defined; a distinct but much broken collar of white across the nape; outer webs of exterior row of scapulars mostly white; and outer webs of the middle and greater wing-coverts with large oval terminal spots of the same. Wings much spotted and barred with light tawny (inclining to rusty on the lesser covert region), these markings on the remiges in the form of large semi-oval spots, arranged in transverse rows, or bands. Tail crossed by 6 broad bars† of pale tawny (inclining to white on inner web), these bars nearly as broad as the brown interspaces, but all interrupted along the middle line of each feather. Eyebrows white, also chin and sides of throat. Prevailing color of lower parts rusty brown or tawny, irregularly barred or vermiculated with dusky, but the prevalent rusty coloring much broken medially and posteriorly with white, in the form of ragged blotches; under tail-coverts with white prevailing. Wing, 4.25; tail, 2.20; culmen, .35; tarsus, .75.

Adult "♀" (No. 50,765, Socorro I.; Col. A. J. Grayson): Almost exactly like the male, as described above, but rusty coloring rather more pronounced, especially on throat and sides of the head. Wing, 4,05; tail, 1.90; culmen, .35; tarsus, .70.—R. R.]

Fam. FALCONIDÆ.

184. Circus hudsonius (Linn.).

Falco hudsonius, Linn., Syst. Nat., ed. 12, I, p. 128.
Circus hudsonius, Vieill., Ois. Am., Sept., I, 1807, p. 36, pl. ix.

Vulg.—Gavilan tonto aplomado, Gav. tonto café.

Hab.—State of Puebla. Puebla, No. 335 ♂; Llano de Chapulco, No. 226 ♂, November, 226*a* ♀, December.

185. Asturina plagiata Schlegel.

Asturina plagiata, Schlegel, Mus. Pays-Bas, Astnrinæ, 1862, p. 1.

Vulg.—Halcon pinto de cola larga, Gavilan.

* *Micrathene graysoni* Ridgw. Auk, iii, July, 1886, 333.

† The first and last bars are narrowest, one being terminal, the other concealed by the upper coverts.

Hab.—State of Vera Cruz. Jalapa, No. 282*a* ♀; Plan del Rio, No. 448 ♀, ad., August.

186. Rupornis magnirostris griseocauda Ridgway.

Buteo (*Rupornis*) *magnirutris* c var. *griseocauda*, Ridgway, Proc. Boston Soc. Nat. Hist., May 21, 1873, p. 89.

Vulg.—Halcon pollero.

Hab.—State of Vera Cruz. Jalapa, No. 307 ♂.

187. Buteo borealis calurus (Cassin).

Buteo calurus, Cassin, Proc. Ac. Philad., 1855, p. 281.
Buteo borealis var. *calurus*, Ridgway in Coues' Check list, 1873, No. 351*a*.

Vulg.—Aguilucho pardo, Gavilan de parvada.

Hab.—State of Vera Cruz. Jalapa, No. 330 ♂, No. 315 ♂.

188. Buteo abbreviatus (Cabanis).

Buteo abbreviatus, Cabanis in Shomb. Reis. Guian., III, 1848, p. 739.

Vulg.—Aguilucho negro.

Hab.—State of Puebla. Chietla, No. 291*b* ♂, December.

189. Buteo albicaudatus (Vieill.).

Buteo albicaudatus, Vieill., Nouv. Dict., IV, 1816, p. 477.

Vulg.—Gavilan negro.

Hab.—State of Vera Cruz. Jalapa, No. 329 ♂.

190. Buteo pensylvanicus (Wilson.)

Falco pensylvanicus, Wilson. Am. Orn., VI, 1812, p. 92, pl. 54, fig. 1.
Buteo pennsylvanicus, Bonap., Osserv. Cuv. R. A., p. 55.

Vulg.—Halcon pinto.

Hab.—State of Vera Cruz. Jalapa, No. 282*b* ♂.

191. Urubitinga anthracina (Nitzsch).

Falco anthracinus, Nitrsch., Pteryl., 1840, p. 83.
Urubitinga anthracina, Lafr., Rev. Zool., 1848, p. 241.

Vulg.—Aguilucho negro.

Hab.—State of Puebla. Atzala (Chietla), No. 291*a*, December. State of Vera Cruz. Jalapa, No. 343 ♂.

192. Spizaetus ornatus (Daud.).

Falco ornatus, Daud., Traité, II, p. 77.
Spizaetus ornatus, Vieill., Nouv. Dict., XXXII, 1819, p. 60.

Vulg—Serpentario, Juan de á pié.

Hab.—State of Vera Cruz. Actopam, No. 321 ♂; Barra de Santa Ana, No. 440 ♀, January.

193. Spizastur melanoleucus (Vieillot).

Buteo melanoleucus, Vieillot, Nouv. Dict., IV, 1816, p. 482.
Spiziastur melanoleucus, Sharpe, Cat. Brit. Mus., I, 1874, p. 258.

Vulg.—Halcon pescador.

Hab.—State of Vera Cruz. Jalapa, Nos. 314 ♂, 460, ♀ ad., August.

194. Accipiter velox (Wils.).

Falco velox, Wils., Am. Orn., pl. xlv, fig. 1, 1808.
Accipiter velox, Vigors in Beech. Voy., Zoöl., p. 15.

Vulg.—Halcon de cola larga.

Hab.—State of Puebla. Tecali, No. 238*a* ♀.

195. Falco columbarius Linn.

Falco columbarius, Linn., Syst. Nat., I, 1758, p. 90.

Vulg.—Halcon de cola corta.

Hab.—State of Puebla. Puebla, No. 339 ♂; Chietla, No. 238*a* ♀, December.

196. Falco sparverius (Linn.).

Falco sparverius, Linn., Syst. Nat., I, 1758, p. 90.

Vulg.—Cernícalo, Lilé.

Hab.—State of Puebla. Chietla, No. 204 ♂, 207 ♂, December; Huexotitla, No. 207*a* ♀; Puebla, No. 204*a* ♀, November.—State of Vera Cruz. Jalapa, No. 358, ♀ ad., October.

197. Ictinia plumbea (Gmelin).

Falco plumbeus, Gmelin, Syst. Nat., I, 1788, p. 283.
Ictinia plumbea, Vieillot, Nouv. Dict., XVI, 1817, p. 76.

Vulg.—Gavilan.

Hab.—State of Vera Cruz. Paso de la Milpa, No. 459, ♀ ad., February.

198. Herpetotheres cachinnans (Linn.).

Falco cachinnans, Linn., Syst. Nat., I, 1758, p. 90.
Herpetotheres cachinnans, Vieill., Nouv. Dict., XVIII, 1817, p. 317.

Vulg.—Vaquero de monte.

Hab.—State of Puebla. Chietla, No. 225 ♂, December, No, 456.—State of Vera Cruz. Santa Ana, No. 423 ♀, February, 424 ♀, March.

199. Polyborus cheriway (Jacq.).

Falco cheriway, Jacq., Beyt., 1784, p. 17, pl. 4.
Polyborus cheriway, Cabanis in Schomb., Guiana, III, p. 741.

Vulg.—Quebranta huesos.

Hab.—State of Puebla. Llano de S. Baltazar, No. 280 ♂, December, No. 280*a* ♀, November.

Fam. CATHARTIDÆ.

200. Catharista atrata (Bartr.).

Vultur atratus, Bartr., Trav., 1792, p. 289.
Catharista atrata, Gray, Hand-list, I, 1869, p. 3, No. 16.

Vulg.—Zopilote.

Hab.—State of Vera Cruz. Jalapa, No. 311 ♂, September.

201. Gypagus papa (Linn.).

Vultur papa, Linn., Syst. Nat., I, 1758, p. 86.
Gypagus papa, Vieillot, Nouv. Dict., XXXVI, 1819, p. 456.

Vulg.—Zopilote real.

Hab.—State of Vera Cruz. Ticaro, No. 346 ♂.

FAM. FREGATIDÆ.

202. Fregata aquila (Linn.).

Pelecanus aquilus, Linnæus, Syst. Nat., I, 1758, p. 133.
Fregata aquila, Reichenbach, Syst. Av., 1852, p. vi.

Vulg.—Babihorcado.

Hab.—State of Vera Cruz. La Mancha, Nos. 438 ♀, ad., 439 ♀, ad., January.

FAM. PELECANIDÆ.

203. Pelecanus fuscus Linn.

Pelecanus fuscus, Linnæus, Syst. Nat., I, 1766, p. 215.

Vulg.—Pelicano alcartáz.

Hab.—State of Vera Cruz. Santa Ana, No. 436 ♀, juv., January.

FAM. PHALACROCORACIDÆ.

204. Phalacrocorax mexicanus (Brandt).

Carbo mexicanus, Brandt, Bull. Sc. Ac. S. Petersb., III, 1838, p. 55
Phalacrocorax mexicanus, Selater & Salvin, Nom. Av. Neotr., 1873, p. 124.

Vulg.—Sargento.

Hab.—State of Vera Cruz. Santa Ana, No. 428 ♀, juv., February.

FAM. ARDEIDÆ.

205. Ardea egretta Gmelin.

Ardea egretta, Gmelin, Syst. Nat., I, 1788, p. 629.

Vulg.—Garza blanca grande.

Hab.—State of Vera Cruz. Jalapa, Nos. 299*a* ♀, 442 ♂, September, 443 ♀, 444 ♂, August.

206. Ardea candidissima Gmelin.

Ardea candidissima, Gmelin, Syst. Nat., I, 1788, p. 633.

Vulg.—Garza blanca chica.

Hab.—State of Tlaxcala. Laguna del Rosario, No. 251 ♂, 251*a* ♀, January.

207. Ardea tricolor ruficollis (Gosse).

Egretta ruficollis, Gosse, B. Jam., 1847, p. 338.
Ardea tricolor ruficollis, Ridgw., Proc. U. S. Nat. Mus., 1885, p. 355.

Vulg.—Garza azul.

Hab.—State of Puebla. S. Baltazar, No. 300 ♂.

208. Ardea cærulea Linn.

Ardea cærulea, Linn., Syst. Nat., I, 1758, p. 143.

Vulg.—Garza azul.

Hab.—State of Puebla. Laguna de Epatlan, No. 250 ♂, 250*a* ♀, December.—State of Tlaxcala. Laguna del Rosario, No. 304 ♂, January.—State of Vera Cruz. Plan del Rio, No. 445 ♀, juv., August; Jalapa, No. 452 ♀, juv., September.

209. Ardea virescens Linn.

Ardea virescens, Linn., Syst. Nat., I, 1758, p. 144.

Vulg.—Martinete cangrejero.

Hab.—State of Puebla. Acatlan, No. 253 ♀.—State of Tlaxcala. Laguna del Rosario, No. 253*a* ♀, September.—State of Vera Cruz. Plan del Rio, Nos. 385 ♀, 411 ♂, August; Jalapa, No. 425 ♀, August.

210. Botaurus lentiginosus (Montagne).

Ardea lentiginosa, Montague, Orn. Dict., Suppl., 1813.
Botaurus lentiginosus, Stephens, Shaw's Gen. Zool., XI, 1819, p. 596.

Vulg.—Pedréte, Perro, Pedréte amarillo.

Hab.—State of Tlaxcala. Laguna del Rosario, No. 279 ♂, 279*a* ♀, 302 ♂, January.

211. Botaurus exilis (Gmelin).

Ardea exilis, Gmelin, Syst. Nat., I, 1788, p. 645.
Botaurus exilis, Reichenow, I. f. O., 1877, p. 244.

Vulg.—Ardeola, Pescadora.

Hab.—State of Puebla. Laguna de S. Baltazar (Puebla), No. 229 ♂, September; Laguna de San Felipe (Izucar de Matamoros), No. 416 ♂ ad., March.

212. Tigrisoma cabanisi Heine.

Tigrisoma cabanisi, Heine, Jour. für Ornith., 1859, p. 407.

Vulg.—Garza pinta.

Hab.—State of Vera Cruz. Vega de Alatorre, No. 441 ♂ ad., July.

213. Nycticorax nycticorax nævius (Bodd.).

Ardea nævia, Boddaert, Tabl. Pl. Enl., 1783, p. 56.
Nycticorax nycticorax nævius, Zeledon, Proc. U. S. Nat. Mus., VIII, 1885, p. 113.

Vulg.—Iuanite pinto elote.

Hab.—State of Puebla. Chautla (Texmelucan), No. 303 ♂, August.—State of Vera Cruz. Jalapa, No. 323 ♂, December.

214. Nycticorax violaceus (Linn.).

Ardea violacea, Linn., Syst. Nat., I, 1758, p. 143.
Nycticorax violaceus, Vigors, Zool. Journ., III, 1827, p. 446.

Vulg.—Pedrete de márcara.

Hab.—State of Tlaxcala. Laguna del Rosario, No. 305 ♂, 324 ♂, October.—State of Vera Cruz. Santa Ana, No. 451 ♀ juv., January.

FAM. COCHLEARIDÆ.

215. Cochlearius zeledoni (Ridgway).

Cancroma zeledoni, Ridgway, Proc. U. S. Nat. Mus., VIII, 1885, p. 93.
Cochlearius zeledoni, Stejneger, Stand. Nat. Hist., IV, 1885, p. 179.

Vulg.—Yankee.

Hab.—State of Vera Cruz. Paso de la Milpa, Nos. 420 ♂, 421 ♂, February.

FAM. CICONIIDÆ.

216. Tantalus loculator Linn.

Tantalus loculator, Linn., Syst. Nat., I, 1758, p. 140.

Vulg.—Tagarote, Galambas, Garzon.

Hab.—State of Vera Cruz. Jalapa, No. 296 ♂; Vega de Alatorre, No. 458 ♂ juv., August.

FAM. PLATALEIDÆ.

217. Guara alba (Linn.).

Scolopax alba, Linn., Syst. Nat., I, 1758, p. 145.
Guara alba, Stejneger, Stand. Nat. Hist., IV, 1885, p. 9.

Vulg.—Ibis blanco.

Hab.—State of Vera Cruz. Actopam, No. 325 ♂; Jalapa, No. 461 ♂ ad., August.

218. Plegadis guarauna (Linn.).

Scolopax guarauna, Linn., Syst. Nat., ed. 12, I, p. 242.
Plegadis guarauna, Ridgw., Nom. N. Am. B., 1881, No. 504.

Vulg.—Chupa tierra, Atotola.

Hab.—State of Puebla. Laguna de Epatlan, No. 271*a* ♀, December.—State of Tlaxcala. Laguna del Rosario, No. 271 ♂, 272 ♂, 272*a* ♀, January.

FAM. ANATIDÆ.

219. Anser albifrons gambeli (Hartlaub).

Anser Gambeli, Hartlaub, R. M. Z., 1852, p. 7.
Anser albifrons Gambeli, Ridgw., Proc. U. S. Nat. Mus., 1880, p. 203.

Vulg.—Ansar salvage.

Hab.—State of Puebla. S. Marcos, No. 292 ♂, March.

220. Anas diazi Ridgway, sp. nov.

Anas diazi, Ridgway, Auk., III, July, 1886, p. 332.

Vulg.—Pato triguero.

Hab.—State of Puebla. S. Ysidro, No. 215*a* ♀ type, March.—State of Tlaxcala. Laguna del Rosario, No. 215 ♂ type, October.

[SP. CHAR.—Most resembling *Anas fulvigula*, nobis, but last row of wing-coverts with a distinct subterminal band of white, and the sec-

ondaries with a broad terminal bar of the same; general plumage much less fulvous; cheeks streaked with dusky, and lower basal angle of the maxilla destitute of any black spot.

Adult ♂ (type, No. 215, collection of the Comision Geografico Exploradora de Mexico, Laguna del Rosario, Tlaxcala, Mexico, October, 1884): Pileum nearly uniform dusky brown, the feathers narrowly edged, however, with dull buff, especially on forehead and sides of crown, and with glossy black shaft-streaks; this dusky color of the pileum continued as a narrow, well defined, lighter brown stripe down the middle of the cervix. Rest of head and neck light dull buff, the anterior portion of the lores (extending back nearly half an inch from the base of the bill), the chin, malar region, and entire throat, entirely immaculate; other portions narrowly streaked with dusky, these streaks sparser and smaller in a well-defined supereiliary stripe and in a stripe immediately beneath a very distinct dusky post-ocular stripe, the latter being continued in front of the eye as a broader stripe along the upper border of the lores. Prevailing color of the rest of the plumage dark sooty brown, but this broken by distinct buff borders or edgings to all the feathers, including the lesser and middle wing-coverts, and tertials. Greater wing-coverts brownish gray, broadly tipped with deep black, and crossed by a narrower subterminal band of white; secondaries metallic bluish green, with a distinct terminal band of pure white, and a broader subterminal one of deep black. Primaries and their coverts slaty brown. Rectrices dusky brown, edged with buff, each marked with a longitudinal stripe of deeper buff on the outer web and an obliquely transverse bar of the same on the inner web. Bill olive-yellow, darker on culmen, the nail and basal portion of culmen blackish brown; iris dark brown; legs and feet deep orange.* Wing, 10.00; tail, 4.00; culmen, 2.05; width of bill near end, .90, at base, .80; tarsus, 1.60; middle toe, 1.95.

Immature ♀ (collection of the Comision Geografico Exploradora de Mexico, San Ysidro, Puebla, March, 1884): Very similar to the adult male, but pileum more distinctly streaked, cervix also streaked, and dusky streaks or stripes on lower parts narrower, the ochraceous prevailing on the under surface; white band across greater wing-coverts much obscured by grayish mottling, the black terminal band much less intensely black. Wing, 8.90; tail, 3.80 (much worn at tip); culmen, 1.85; width of bill near end, .75; at base, .68.

This fine new species is respectfully dedicated to Professor Augustin Diaz, C. E., director of the Geographical Exploring Commission of Mexico, under whose intelligent direction the exceedingly beautiful collection, of which the type specimens form part, was formed.

Anas diazi is probably the same species as that which Col. A. J. Grayson identified as *Anas obscura*, Gm., and which is mentioned by

* Colors as represented by the taxidermist, and believed to correctly represent those of the living or freshly killed specimen.

him in Mr. Lawrence's Birds of Western and Northwestern Mexico* (page 314), as follows: "I shot many of this species near Tepic, but have not seen one in the vicinity of Mazatlan. They doubtless breed in the locality of Tepic, as I found them there in the month of June in pairs."

The discovery of this new duck increases the number of North American species of the restricted genus *Anas* to five, and of those peculiar to Mexico (so far as known) to two. The five species may be very readily distinguished by the following characters:

a^1. Smaller wing-coverts uniform grayish-brown or brownish slate; tertials without light edgings; sexes very different in plumage.

1. *A. boschas*, Linn. Wing with two distinct white bands.

a^2. Smaller wing-coverts distinctly bordered with buff or ochraceous, and tertials edged with the same. Sexes alike in plumage.

b^1. Wing without any white bands.

2. *A. obscura*, Gmel. Malar region, chin, and entire throat distinctly streaked with dusky; general plumage with dusky largely prevailing. Lower basal angle of the bill without black spot. *Hab.*—Eastern North America, breeding from northern border of the United States to Hudson's Bay region.

3. *A. fulvigula*, Ridgw.† Malar region, chin, and entire throat immaculate buff; general plumage with ochraceous prevailing. Lower basal angle of the bill with a black spot. *Hab.*—Florida, Kansas.

b^2. Wing with one or more distinct white bands.

4. *A. diazi*, Ridgw. Wing with two white bands; wing more than 9 inches. Malar region, chin, and throat immaculate buff; general plumage with dusky prevailing on upper parts, the lower surface with dusky and ochraceous in nearly equal amount. Lower basal angle of bill without black spot. *Hab.*—Southern Mexico. (Tlaxcala and Puebla; Tepic?).

5. *A. aberti*, Ridgw.‡ Wing with one white band, this a very broad one across tips of secondaries. Wing less than 9 inches. Chin and upper part of throat immaculate buff. General plumage a mixture of dusky and ochraceous in nearly equal amount. *Hab.*—Western Mexico. (Mazatlan.)—R. R.]

221. Anas strepera Linn.

Anas strepera, Linn., Syst. Nat., I, 1858, p. 125.

Vulg.—Pato pardo de grupo.

Hab.—State of Puebla. Tehuacan, No. 333 ♂. State of Tlaxcala. Laguna del Rosario, No. 220 ♂, January.—State of Vera Cruz. Barra de Santa Ana, No. 464 ♂, January.

222. Anas carolinensis Gmelin.

Anas carolinensis, Gmelin, Syst. Nat., I, 1788, p. 533.

Vulg.—Cerceta de listo verde.

Hab.—State of Tlaxcala. Laguna del Rosario, No. 217 ♂, 217*a* ♀, 266 ♂, January.

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*The Birds of Western and Northwestern Mexico, based upon collections made by Col. A. J. Grayson, Capt. J. Xantus and Ferd. Bischoff, now in the Museum of the Smithsonian Institution, at Washington, D. C. By Geo. N. Lawrence.<Memoirs Boston Soc. Nat. Hist., Vol. II, part iii, number ii, 1874, pp. 265–319. (316 species, with copious field notes.)

†*Cf.* Water Birds of North America, Vol. I., 1884, p. 503.

‡*Cf.* Proc. U. S. Nat. Mus., Vol. I, 1878, p. 350.

223. Anas discors Linn.

Anas discors, Linn., Syst. Nat., ed. 12, I, p. 205.

Vulg.—Cerceta comun.

Hab.—State of Puebla. Laguna de Chapulco, No. 221 ♂, 221*a* ♀, 257*a* ♀, October.

224. Anas cyanoptera (Vieillot).

Anas cyanoptera, Vieillot, Nouv. Dict., V, 1816, p. 104.

Vulg.—Cerceta café.

Hab.—State of Puebla. Laguna de Chapulco, No. 263 ♂, November.

225. Dafila acuta (Linn.).

Anas acuta, Linn., Syst. Nat., I, 1858, p. 126.
Dafila acuta, Bonap., Comp. & Geog. List, 1838, p. 56.

Vulg.—Pato golondrino.

Hab.—State of Puebla. Laguna del Mayorazgo, No. 216 ♂, December; S. Baltasar, No. 216*a* ♀, January.

226. Aythya affinis (Eyton).

Fuligula affinis, Eyt., Mon. Anat., 1838, p. 157.
Aythya affinis, Stejneger, Orn. Expl. Kamtsch., 1885, p. 161.

Vulg.—Pato boludo de cabeza café.

Hab.—State of Puebla. Epatlan (Izucar), No. 268*a*, ♀.

227. Aythya collaris (Donov.).

Anas collaris, Donov., Br. Birds, VI, 1809, pl. 147.
Aythya collaris, Ridgway, Proc. U. S. Nat. Mus., 1885, p. 356.

Vulg.—Pato boludo prieto.

Hab.—State of Puebla. Chapulco, No. 265*a* ♀, October.

228. Erismatura rubida Wilson.

Anas rubida, Wilson, Am. Orn., VIII, pp. 128, 130, pl. 71, figs. 5, 6.
Erismatura rubida, Bonap., Comp. & Geog. List., 1838, p. 59.

Vulg.—Pato zambullidor de pico azul.

Hab.—State of Puebla. Laguna de Chapulco, No. 264*a* ♀, November.—State of Vera Cruz. Jalapa, No. 379 ♀ ad., September.

Fam. COLUMBIDÆ.

229. Columba fasciata Say.

Columba fasciata, Say, Long's Exped., II, 1823, p. 10.

Vulg.—Cuauhpaloma.

Hab.—State of Puebla. Puebla, No. 337 ♂.

230. Zenaidura macroura (Linn.).

Columba macroura, Linn., Syst. Nat. I, 1758, p. 164.
Zenaidura macroura, Ridgw., Proc. U. S. Nat. Mus., 1885, p. 355.

Vulg.—Tórtola comun.

Hab.—State of Puebla. Huehuetlan, No. 168 ♂, 168*a* ♀, January.

231. Melopelia leucoptera (Linn.).

Columba leucoptera, Linn., Syst. Nat., I, 1758, p. 164.
Melopelia leucoptera, Bonap., Consp. Av., II, 1854, p. 81.

Vulg.—Paloma torcaz de alas blancas.
Hab.—State of Puebla. Atlixco, No. 283 ♂.

232. Scardafella inca (Less.).

Chamæpelia inca, Less., Descr. Quadr., etc., Buffon, 1850, p. 211.
Scardafella inca, Bonap., Consp. Av., II, 1854, p. 85.

Vulg.—Coquito comun.
Hab.—State of Puebla. Huexotitla, No. 69 ♂, 69*a* ♀, November.

233. Columbigallina passerina pallescens (Baird).

Chamæpelia passerina? var. *pallescens*, Baird, Proc. Ac. Philad., 1859, p. 305.

Vulg.—Coquito de monte.
Hab.—State of Puebla. Acatlan, No. 113 ♂; Chietla, No. 70 ♂, 70*a* ♀, 37 ♂, 37*a* ♀, December.

234. Peristera pretiosa F. Per.

Columba cinerea, Temminck (*nec* Scopoli), Pl. Col., 260.
Peristera cinerea, "Swainson," Gray, List Gen. of Birds, 1841, p. 75.
Peristera pretiosa, Ferrari Perez, MS.

Vulg.—Coquito aplomado.
Hab.—State of Vera Cruz. Jalapa, No. 223 ♂.

235. Engyptila albifrons (Bonap.).

Leptoptila albifrons, Bonap., Consp. Av., II, 1854, p. 74.
Engyptila albifrons, Coues, Bull. Nutt. Club, V, 1880, p. 100.

Vulg.—Paloma barranquera.
Hab.—State of Puebla. Rancho del Ahuehuete (Tecali), No. 219*a* ♀, June.

Fam. CRACIDÆ.

236. Crax globicera Linn.

Crax globicera, Linnæus, Syst. Nat., I, 1766, p. 270.

Hab.—State of Vera Cruz, No. 437 ♀.

237. Penelope purpurascens Wagler.

Penelope purpurascens, Wagler, Isis, 1830, p. 1110.

Vulg.—Cojolite.
Hab.—State of Vera Cruz. Jalapa, No. 318 ♂, 318*a* ♀.

238. Ortalis poliocephala Wagler.

Penelope poliocephala, Wagler, Isis, 1830, p. 1112.
Ortalida poliocephala, Wagler, Isis, 1832, p. 1227.

Vulg.—Chachalaca.
Hab.—State of Puebla. Chachapa, No. 344*a* ♀, February.

239. Ortalis vetula maccalli Baird.

Ortalida maccalli, Baird, B. N. Am., 1858, p. 611.
Ortalida vetula var *maccalli*, Baird, Hist. N. Am. B., III, 1874, p. 398.

Vulg.—Chachalaca.
Hab.—State of Puebla. San José Acateno, No. 449 ♂, July.

Fam. TETRAONIDÆ.

240. Colinus pectoralis (Gould).

Ortyx pectoralis, Gould, P. Z. S., 1842, p. 182.

Vulg.—Codorniz solitaria.
Hab.—State of Puebla. Chietla, No. 166 ♂, 166*a* ♀, December.

241. Philortyx personatus Ridgway, sp. nov.

Philortyx personatus, Ridgway, Auk, III, July, 1886, p. 333.

Vulg.—Codorniz de copete.
Hab.—State of Puebla. Chietla, No. 157 ♂, type, December.

[Sp. Char.—Somewhat like *P. fasciatus*, Gould, but differing in having the bill light brown instead of black, and the forehead, cheeks, and throat black, instead of brown and white.

Young ♂, *transition plumage* (type, No. 157, collection of the Comision Geografico Exploradora de Mexico, Chietla, Puebla, December, 1884): Forehead, cheeks, chin, and throat, uniform black; lores and post-ocular region dull ochraceous; feathers of crown, including those of the crest (the longest of which extend 1.25 inches from the base of the culmen), brownish black, with transverse spots or irregular bars of fulvous; occiput and nape light brown, barred with dusky, the lower part of the cervix uniform light grayish brown; scapulars, interscapulars, tertials, and some of the wing-coverts, light grayish brown, marked with a broad mesial streak of whitish, and large terminal or subterminal spots of black. (A few *new* feathers on the anterior portion of the scapular area have a terminal bar of dull buff preceded by a broad subterminal band or spot of black.) Primaries brownish gray, the outer webs irregularly spotted with pale brownish buff. Rump grayish brown, finely mottled with darker, some of the feathers with indistinct lighter tips and dusky subterminal spots; upper tail-coverts similar, but with more distinct markings. Tail finely mottled with light brown, pale dull grayish buff, and dusky, the coarser mottlings disposed in the form of indistinct but very regular bars. *Old feathers* (immature plumage) of jugulum and breast dusky, each with a sharply defined and very conspicuous white mesial streak; *new feathers* (adult plumage) alternately barred with blackish brown and white; new feathers of lower breast more broadly barred, the darker bars deep black; sides and flanks (old feathers) irregularly barred and spotted with dusky, on a white ground; abdomen white, immaculate in middle portion; lower tail-coverts pale dull buffy or brownish white. Bill light reddish brown;

feet horn-brown. Wing, 3.80; tail, 2.00; culmen, .42; depth of bill at base, .30; tarsus, 1.00; middle toe, .92.

This very distinct new species has its nearest ally in the *Philortyx fasciatus*, Gould, from Western Mexico (Colima), which, however, is larger, has the bill more robust and deep black, and has the chin, throat, and malar region wholly immaculate white.—R. R.]

Fam. RALLIDÆ.

242. Rallus elegans tenuirostris, Lawrence.

Rallus elegans var. *tenuirostris* Lawrence, Am. Nat., February, 1874, p. 111.

Vulg.—Rascon de agua.

Hab.—State of Tlaxcala. Laguna del Rosario, No. 211 ♂, October.

243. Aramides albiventris, Lawrence.

Aramides albiventris Lawrence, Proc. Ac. Phil., 1867, p. 234.

Vulg.—Gallina de Mostezuma, Totocalca.

Hab.—State of Vera Cruz. Actopam, No. 273 ♂; Vega de Alatorre, No. 453 ♂, August.

244. Porzana carolina (Linn).

Rallus carolinus Linn., Syst. Nat., 1858, I, p. 153.

Porzana carolina Baird, Lit. Rec. & Jour., Linn. Assoc., Penn. Col., October, 1845, p. 255.

Vulg.—Gallinita de ciénega.

Hab.—State of Puebla. Chapulco, No. 145*a* ♀, September; 145 ♂, October.

245. Fulica americana Gmelin.

Fulica americana Gmelin, Syst. Nat., 1788, p. 704.

Vulg.—Gallareta de pico blanco.

Hab.—State of Puebla. Laguna de Chapulco, No. 246 ♂, November. State of Tlaxcala. Laguna del Rosario, No. 246*a* ♀, October.

Fam. ARAMIDÆ.

246. Aramus giganteus (Bonaparte).

Rallus giganteus Bonaparte, Jour. Ac. Philad., 1825, p. 31.

Aramus giganteus Baird, B. N. A., 1858, p. 657.

Hab.—State of Vera Cruz. Santa Ana, No. 447 ♀, February.

Fam. JACANIDÆ.

247. Jacana gymnostoma (Wagler.)

Parra gymnostoma Wagler, Isis, 1831, p. 517.

Jacana gymnostoma Zeledon, Proc. U. S. Nat. Mus., 1885, p. 114.

Vulg.—Jacaná, Cirujano, Gallito de laguna.

Hab.—State of Puebla. Laguna de Epatlan, No. 249 ♂, 249*a* ♀, 274 ♂, 274*a* ♀, December.—State of Vera Cruz. Jalapa, Nos. 472 ♂, 495 ♂, 496, August.

Fam. CHARADRIIDÆ.

248. Charadrius dominicus Müller.

Charadrius dominicus Müller, Syst. Nat. Suppl., 1776, p. 116.

Vulg.—Pluvial dorado.

Hab.—State of Puebla. Huertas de S. Javier (Puebla), No. 209*a* ♀, March.—State of Tlaxcala. Nativitas, No. 194 ♂, October.

249. Ægialitis vociferus (Linn.).

Charadrius vociferus Linn., Syst. Nat., 1758, I, p. 150.
Ægialitis vociferus Bonap., Comp. & Geog. List., 1838, p. 45.

Vulg.—Chichicuilote de collar, Tildio.

Hab.—State of Puebla. Chapulco, Nos. 150 ♂, 150*a* ♀, October.—State of Vera Cruz. Jalapa, Nos. 429 ♀, 431 ♂, December.

Fam. SCOLOPACIDÆ.

250. Himantopus mexicanus, Müller.

Charadrius mexicanus Müller, S. N. Suppl., 1776, p. 117.
Himantopus mexicanus Ord ed. Wilson, VII, 1824, p. 52.

Vulg.—Candelero.

Hab.—State of Pbuela. Laguna de Chapulco, Nos. 252 ♂, 252*a* ♀, November.

251. Phalaropus tricolor (Vieillot).

Steganopus tricolor Vieillot, Nouv. Dict., XXXII, 1819, p. 136.
Phalaropus tricolor Stejneger, Auk., II, 1885, p. 182.

Vulg.—Chichicuilote nadador.

Hab.—State of Puebla. Laguna de Chapulco, Nos. 183 ♂, 183*a* ♀, September; Nos. 152 ♂, 152*a* ♀, October.

252. Gallinago delicata (Ord).

Scolopax delicata Ord ed. Wils. Orn., 25, IX, 1825, p. cexviii.
Gallinago delicata Ridgway, A. O. U. Check List, 1886, p. 148.

Vulg.—Agachona, Becacina.

Hab.—State of Tlaxcala. Laguna del Rosario, Nos. 149 ♂, 184*a* ♀, September; Nos. 149*a* ♀, 184 ♂, October.

253. Micropalama himantopus (Bonap.).

Tringa himantopus Bonap., Am. Lyc. N. Y., II, 1826, p. 157.
Micropalama himantopus Baird, B. N. Am., 1858, p. 726.

Vulg.—Chorlete desconocido.

Hab.—State of Tlaxcala. Laguna del Rosario, No. 151 ♂, January.

254. Totanus melanoleucus (Gmelin).

Scolopax melanoleuca Gmelin, Syst. Nat., I, 1788, p. 659.
Totanus melanoleucus Vieillot, Nouv. Dict., VI, 1816, p. 398.

Vulg.—Zarapico grande.

Hab.—State of Tlaxcala. Nativitas, No. 254 ♂, October; Laguna del Rosario, No. 254*a* ♀, October.

255. Numenius longirostris Wilson.

Numenius longirostris Wilson, Am. Orn., VIII, 1814, p. 24, pl. 64, fig. 4.

Vulg.—Chorlo real.

Hab.—State of Puebla. Laguna de S. Baltazar, No. 255 ♂, September.

Fam. LARIDÆ.

256. Sterna maxima Bodd.

Sterna maxima Bodd., Tabl. P. E., p. 58.

Vulg.—Gaviota.

Hab.—State of Vera Cruz. Jalapa, No. 270 ♂.

257. Hydrochelidon nigra surinamensis (Gmelin).

Sterna surinamensis Gmelin, Syst. Nat., I, 1788, p. 604.

Hydrochelidon nigra surinamensis Stejneger, Proc. U. S. Nat. Mus., V, 1882, p. 40.

Vulg.—Golondrina de mar.

Hab.—State of Puebla. Laguna de S. Baltazar, No. 165 ♀, October; Laguna de Chapulco, No. 165*a* ♀, October.

258. Larus atricilla Linn.

Larus atricilla Linn., Syst., Nat., I, 1758, p. 136.

Vulg.—Apipisca grande de alas largas, Gaviota.

Hab.—State of Vera Cruz. Jalapa, No. 267 ♂; Vega de Alatorre, No. 454 ♀, ad., July; Vera Cruz, No. 457 ♀ juv., January.

259. Larus franklinii Sw. & Rich.

Larus franklinii Sw. & Rich., F. B. A., II, 1831, p. 424, pl. 71.

Vulg.—Apipisca.

Hab.—State of Puebla. Laguna de S. Baltazar (Puebla), No. 230 ♂, 230*a* ♀, September.

260. Larus californicus Lawrence.

Larus californicus Lawr., Ann., Lyc., Nat. Hist. N. Y., VI, 1854, p. 79.

Vulg.—Paviota.

Hab.—State of Vera Cruz. Alvarado, No. 322 ♂.

Fam. PODICIPITIDÆ.

261. Æchmophorus occidentalis (Lawrence).

Podiceps occidentalis Lawr., in Baird's B. N. Am., 1858, p. 894.

Æchmophorus occidentalis Coues, Pr. Ac. Philad., 1862, p. 229.

Vulg.—Gallina soldado.

Hab.—State of Puebla. Laguna de Epatlan, No. 256 ♂, December.

262. Colymbus nigricollis californicus (Heerm.).

Podiceps californicus, Heerm., Proc. Ac. Philad., 1854, p. 179.

Colymbus nigricollis californicus Ridgway, Proc. U. S. Nat. Mus., 1885, p. 356.

Vulg.—Zambullidor de pico delgado.

Hab.—State of Puebla. Laguna de Epatlan (Isucar), No. 258*a* ♀, December.—State of Vera Cruz. Jalapa, No. 497 ♂, young, August.

263. Colymbus dominicus Linn.

Colymbus dominicus Linnæus, Syst. Nat., I, 1766, p. 223.

Hab.—State of Vera Cruz. Jalapa, Nos. 476 ♂, 477 ♂, 381 ♀, August.

264. Podilymbus podiceps (Linn.).

Colymbus podiceps Linn., Syst. Nat., I, 1758, p. 136.
Podilymbus podiceps Lawr., in Baird's B. N. Am., 1858, p. 898.

Vulg.—Zambullidor de pico grueso.
Hab.—State of Puebla. Laguna de Chapulco, No. 269 ♂.

Fam. TINAMIDÆ.

265. Crypturus sallæi (Bonap.).

Nothoccrcus sallæi Bonap., Compt. Rend., XLII, 1856, p. 954.
Crypturus sallæi Sclat. & Salv., Exot. Orn., t. 45.

Vulg.—Abutarda.
Hab.—State of Vera Cruz. Jalapa, No. 248 ♂.

Index to the genera of birds, with the corresponding numbers of their first species.

Index to the genera of birds, with the corresponding numbers of their first species—Cont'd.

Index to the genera of birds, with the corresponding numbers of their first species—Cont'd.

III.—REPTILES.

By F. Ferrari Perez.

With descriptions of new species, by Prof. E. D. Cope.

Whilst the collections of the Commission were at the Exposition at New Orleans they were examined by various specialists, and that of reptiles and batracians was carefully studied by the distinguished herpetologist, Prof. E. D. Cope, who published a preliminary list with the description of a new genus and species in the Proceedings of the American Philosophical Society of the year 1885, pp. 379–382. Owing to the short time he could spend in New Orleans, and to other circumstances, some of the species and the corresponding localities were not included in the list. Moreover, the collection has increased considerably in species and examples since that time, as well for the reason that the Commission has continued collecting and has sent to this capital a good number of the examples recently met with, as also because the secretary of Fomento of Mexico decided, by suggestion of the sub-secretary of the same ministry, Engineer Manuel Fernandez Leal, that the collection made in the State of Chiapas by Mr. Rafael Montes de Oca during the years that he discharged the office of naturalist of the commission of limits between Mexico and Guatemala should

remain in the hands of the Commission. Unfortunately this last came to the present writer without any precise indications of localities, a fact which obliged us to include them merely as coming from the State of Chiapas. All the identifications and descriptions of new species have been made by Professor Cope in Philadelphia, whither the present writer has been twice for that purpose.

OPHIDIA.

Fam. STENOSTOMIDÆ.

1. **Stenostoma phænops** Cope.

Stenostoma phænops Cope, Jour. Acad. Philad., 1875, p. 128.

Vulg.—Culebra pinta.

Hab.—State of Vera Cruz. Jalapa, No. 48, December.

2. **Stenostoma macrolepis** Peters.

Vulg.—Culebra.

Hab.—State of Puebla. Teziutlan, No. 50, December.

Fam. BOIDÆ.

3. **Boa imperator** Daudin.

Boa imperator Daudin, Hist. Rept., V, 1802, p. 150; Duméril et Bocourt, Miss. scient. Mex., III, 1882, p. 519, pl. XXX, fig. 8, 8*a*, 8*b*, 8*c*.

Vulg.—Boa, Vivora de cabeza de perro, Mazacoatl.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 6, December; Jalapa, Nos. 273, 362 ♀, December.—State of Chiapas. ? Nos. 235, 258.

Fam. COLUBRIDÆ.

4. **Leptognathus nebulata** (Linnæus).

Coluber nebulatus Linnæus, Syst. Nat., I, 1758, p. 222.

Leptognathus nebulatus Günther, Cat. Colubr. Snak., 1858, p. 177.

Vulg.—Vivora de barriga amarilla.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 69, December.

5. **Leptognathus fasciata** (Günther).

Tropidodipsas fasciata Günther, Cat. Colubr. Snak., 1858, p. 181.

Vulg.—Coralillo.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 21, 22, 23, 24, 25, 26, 27, 28, 29, December.

6. **Sibon annulatum** (Linnæus).

Coluber annulatus Linnæus, Syst. Nat., I, 1758, p. 224.

Sibon annulatus Fitzinger, Neue Class. Rep., 1826, p. 60.

Vulg.—Culebra de agua, Culebra pinta.

Hab.—State of Puebla. Hueytamalco (Teziutlan), No. 44, December. State of Vera Cruz. Jicaltepec (Jalapa), Nos. 45, 89, 90, 91, 92, 93, 94,

95, 96, December. Jalapa, Nos. 47, 85, December.—State of Chiapas. Nos. 236, 248, 249, 250, 251, 254, 256, 257.

7. **Sibon frenatum**, Cope, sp. nov.

Vulg.—Coralillo.

Hab.—State of Vera Cruz. Jalapa, No. 298, type.

[Scales in twenty-three longitudinal series. Body rather slender, tail rather short, head very distinct and depressed. Superior labials nine, eye resting on the fourth and fifth, and only separated from the third by the small inferior preocular. All are higher than long, excepting the eighth and ninth, which are longer than high; the sixth and seventh are the largest. Inferior labials, eleven. Postgeneials much longer than pregeneials. Loreal plate subquadrate; oculars, 2–2; the superior anterior not reaching frontal plate. Temporals, 1–2–3. Frontal twice as long as wide, with parallel sides. Occipitals moderate, reaching to above middle of eighth superior labials. Gastrosteges, 188; anals, 1–1; urosteges, 69.

Colors: above black, below white. At distances of from six to nine scales, narrow cross-bands of one scale in width rise from the abdominal border color, and meet or terminate in alternating positions, on or near the middle line of the back. These bands are more or less gray, sometimes darker in the middle. The top of the head is gray, densely mottled with blackish, leaving a crescentic space of light gray between a black spot behind the head-shields and the beginning of the black of the superior surfaces. A broad black band passes downwards and posteriorly from the eye, and crossing the angle of the mouth, covers the side of the neck, and unites with the black of the following regions. The superior labials are light-gray with black borders; the dark borders of the inferior labials are less distinct.

Total length, 305^{mm}; of tail, 66^{mm}; of head to canthus oris, 11^{mm}.

No. 298. Jalapa, Mexico.

This species is nearest the *S. personatum* Cope from Mazatlan, although the coloration is very different. That species has but one preocular, eight superior labials, &c.—E. D. Cope.]

8. **Trimorphodon collaris** Cope.

Trimorphodon collaris Cope, Journ. Ac. Philad., 1875, p. 131.

Vulg.—Culebra.

Hab.—State of Puebla. Izucar de Matamoros, No. 56, November.

9. **Dipsas cenchoa** (Linnæus).

Coluber cenchoa, Linnæus, Syst. Nat., I, 1758, p. 226; I, 1766, p. 389.
Dipsas cenchoa, Wied, Beitr., I, 1825, p. 396.

Vulg.—Miahuacuitlapitl.

Hab.—State of Vera Cruz. Sán José Acatino, No. 302.

10. Dipsas gemmistrata Cope.

Himantodes gemmistratus Cope, Proc. Acad. Philad., 1861, p. 296.
Dipsas gemmistratus Cope, Journ. Acad. Philad., 1875, p. 131.

Hab.—State of Chiapas. ? Nos. 247, 260.

11. Dryophis acuminata Wied.

Coluber acuminatus Wied., Abbildg., Lief. 14, 1822, t, 1; Beitr., I, 1825, p. 322.
Dryophis acuminata Günther, Cat. Colubr. Snak., 1858, p. 156.

Hab.—State of Chiapas. ? No. 259.

12. Hapsidophrys mexicanus (Duméril et Bibron).

Leptophis mexicanus Duméril et Bibron, Erpét. Gén., VII, 1, 1854, p. 536.
Hapsidophrys mexicanus Cope, Proc. Amer. Philos. Soc., 1885, p. 279.

Vulg.—Vivora azul.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 57, 58, December.

13. Drymobius boddaertii (Setzen).

Coluber boddaertii Setzen, Meyers Arch. Zool., XI, 1795, p. 59.
Drymobius boddaertii Cope, Proc. Acad. Philad., 1860, p. 561.

Vulg.—Vivora gris.

Hab.—State of Vera Cruz. Actopam, No. 295.

14. Drymobius margaritiferus (Schlegel).

Herpetodryas margaritiferus Schlegel, Ess. Serp., I, p. 151; II, p. 184.
Drymobius margaritiferus Cope, Proc. Acad. Philad., 1860, p. 561.

Vulg.—Culebra verde.

Hab.—State of Vera Cruz. Misantla, No. 14, December; Jicaltepec (Jalapa), Nos. 17, 18, 19, 20, December. State of Puebla. Hueytamalco (Teziutlan), Nos. 15, 16, December.

15. Coluber flavirufus Cope.

Coluber flavirufus Cope, Proc. Acad. Philad., 1866, p. 319.

Hab.—State of Chiapas. ? No. 255.

16. Spilotes auribundus Cope.

Spilotes pullatus auribundus Cope, Proc. Acad. Philad., 1861, p. 300.
Spilotes salvini Günth.

Hab.—State of Chiapas. ? No. 245.

17. Spilotes corais (Cuvier).

Coluber corais "Cuvier," Boie, Isis, 1827, p. 537.
Spilotes corais Duméril et Bibron, Erpét. Gén., VII, 1, 1854, p. 223.

Vulg.—Culebra.

Hab.—State of Chiapas. ? Nos. 233, 234, 237, 238.

18. Spilotes corais erebennus Cope.

Spilotes erebennus Cope, Proc. Acad. Philad., 1860, p. 564.
Spilotes corais subspecies *erebennus* Cope, Jour. Acad. Philad., 1875, p. 135.

Vulg.—Culebra negra.

Hab.—State of Vera Cruz. Jalapa, Nos. 275, 277, 361 ♀.

19. Rhinechis deppei (Duméril et Bocourt).

Elaphis deppei Duméril et Bocourt, Erpét. Gén., VII, 1854, p. 268.
Rhinechis deppei Cope, Cat. Rep. Mex. et Amér. Centr., MS.

Vulg.—Palancacoatl.

Hab.—State of Vera Cruz. S. José. Acatino, No. 303.

20. Tropidonotus rhombifer Hallowell.

Tropidonotus rhombifer Hallowell, Proc. Acad. Phil., 1852, p. 177.

Hab.—State of Vera Cruz. Misantla, No. 5, December.

21. Tropidonotus mesomelanus Jan.

Tropidonotus mesomelanus Jan., Elenco sist. Ofidi, 1863, p. 73.

Vulg.—Culebra.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 77, December.

22. Eutaenia scalaris Cope.

Thamnophis scalaris Cope, Proc. Acad. Phila., 1860, p. 369.
Eutænia scalaris Cope, Proc. Acad. Phila., 1866, p. 306.

Vulg.—Culebra pinta rayada.

Hab.—State of Puebla. Puebla, No. 74.—State of Vera Cruz? S. José Acatino, No. 299.

23. Eutaenia pulchrilatus Cope.

Eutænia pulchrilatus Cope, Proc. Am. Philos. Soc., 1884, p. 174.

Vulg.—Culebra de agua.

Hab.—State of Puebla. Teziutlan, No. 46, December.

24. Eutaenia flavilabris Cope.

Eutænia flavilabris Cope, Proc. Acad. Phila. 1866, p. 306; Proc. Am. Philos. Soc. 1884, p. 173.

Vulg.—Culebra verde de agua.

Hab.—State of Puebla. Puebla, Nos. 279, 280, 281, 282, 283, 288, 291.

25. Eutaenia proxima Say.

Coluber proximus Say, Long's Exp. Rock. Mount., I, 1823, p. 187.
Eutainia proxima Baird & Girard, Cat. Serp., 1853, p. 25.

Vulg.—Culebra ranera.

Hab.—State of Vera Cruz. Jalapa, No. 86.

26. Eutaenia sirtalis (Linnæus).

Coluber sirtalis Linnæus, Syst. Nat., I, 1766, p. 383.
Eutainia sirtalis Baird & Girard, Cat. Serp., 1853, p. 30.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 88.

27. Ninia diademata Baird & Girard.

Ninia diademata Baird & Girard, Cat. North. Am. Rep., I, January, 1853, p. 49.
Streptophorus bifasciatus Duméril et Bibron, Mem. Ac. Scien., XXIII, 1853, p. 468; Duméril et Bocourt, Miss. Scient. Mex., III, 1883. p. 545, pl. XXXII, fig. 10, 10*a*, 10*b*.

Vulg.—Culebra café.

Hab.—State of Vera Cruz. Jalapa, No. 71; Jicaltepec (Jalapa), Nos. 80, 81, 82, 83, 84, December.

28. Ninia atrata sebæ (Duméril et Bibron).

Coluber atratus Hallowel, Proc. Ac. Philad., 1845, p. 245.
Ninia atrata Hallow., var. *Sebæ*, D. & B.—Cope, Proc. Am. Philos. Soc., 1885, p. 382.
Streptophorus Sebæ Duméril et Bibron, Variété *atratus*, Hallowel.—Duméril et Bocourt, Miss. Scient. Mex., III, 1883, p. 548.

Vulg.—Culebra.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, December.

29. Storeria dekayi (Holbrook).

Tropidonotus dekayi Holbrook, N. Am. Herp., IV, 1843, p. 53, pl. XIV.
Storeria dekayi Baird & Girard, N. Am. Rep., I, 1853, p. 135.

Vulg.—Vivora gris.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 63, 64, 65, 66, 67, December.

30. Oxyrhopus clœlia (Daudin).

Coluber clœlia Daudin, Hist. Rep., VI, 1803, p. 330, pl. 78.
Oxyrhopus clœlia Günther, Cat. Colubr. Snak., 1858, p. 189.

Hab.—State of Chiapas. ?No. 242.

31. Conophis pulcher Cope.

Conophis pulcher Cope, Proc. Acad. Phila., 1868, p. 308.

Hab.—State of Chiapas. ?No. 246, var.

32. Ophibolus polyzonus Cope.

Lampropeltis polyzonus Cope, Proc. Acad. Phila., 1860, p. 258.
Ophibolus polyzonus Cope, Proc. Acad. Phila., 1865, p. 197.
Coronella formosa Schl. Jan.

Vulg.—Coralillo.

Hab.—State of Puebla. Hueytamalco (Teziutlan), Nos. 4, 42, 43, December.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 3, 7, 8, 9, December; Misantla, Nos. 10, 11, 12, 13.—State of Chiapas. ?Nos. 240, 241.

33. Erythrolamprus imperialis (Baird & Girard).

Tæniophis imperialis Baird & Girard, U. S. & Mex. Bound. Surv. Zool. Rep., p. 23, pl. 19, f. 1.
Erythrolamprus imperialis Cope, Cat. Rep. Mex. and Centr. Am., 1886, MS.

Vulg.—Vivora.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 70, December.

34. Erythrolamprus proterops Cope.

Coniophanes proterops Cope, Proc. Acad. Phila., 1860, p. 249.
Erythrolamprus proterops Cope, Cat. Rep. Mex. and Centr. Am., 1886, MS.

Vulg.—Culebra rayada.

Hab.—State of Puebla. Hueytamalco (Teziutlan), No. 55, December.

35. Erythrolamprus fissidens (Günther).

Coronella fissidens Günther, Cat. Colubr. Snak., 1858, p. 36.
Erpthrolamprus fissidens Cope, Cat. Rep. Mex. & Centr. Am., 1886, MS.

Vulg.—Vivora parda.

Hab.—State of Vera Cruz. Arroyo del Potrero, No. 305.

36. Erythrolamprus punctigularis Cope.

Coniophanes punctigularis Cope, Proc. Acad. Phila., 1860, p. 248.
Erythrolamprus punctigularis Cope, Cat. Rep. Mex. & Centr. Am., 1886, MS.

Hab.—State of Chiapas. ? No. 253.

37. Pliocercus elapoides Cope.

Pliocercus elapoides Cope, Proc. Acad. Philad., 1860, p. 253.

Vulg.—Coralillo.

Hab.—State of Puebla. Hueytamalco (Teziutlan), No. 41, December.

38. Henicognathus annulatus Duméril et Bibron.

Enicognathus annulatus Duméril et Bibron, Erpét Gén., vii, I, 1854, p. 335.

Vulg.—Coralillo.

Hab.—State of Vera Cruz. Arroyo del Potrero, No. 304.

39. Henicognathus annulata cyclura, Cope subsp. nov.

Henicognathus annulata cyclura Cope, MS.

Vulg.—Culebra,

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 78, December.

40. Rhadinæa decorata (Günther).

Coronella decorata Günther, Cat. Colubr. Snak., 1858. p. 35.
Rhadinæa decorata Cope, Proc. Acad. Phila. 1865, p. 197.

Vulg.—Culebra chata.

Hab.—State of Vera Cruz. Jalapa, No. 72.

41. Chionactis diasii Cope, sp. nov.

Conopsis lineatus Dum. et Boc., Mision Scientif. de Mexique, Reptiles, p. 565, not *Toluca lineata* Kenn.

Vulg.—Culebra, vivora parda.

Hab.—State of Puebla. Puebla, Nos. 75 type, 76, 292, 293, 294.

[Scales wide, especially on the sides, in seventeen rows. Rostral very protuberant, rapidly narrowed to an obtuse extremity, considerably visible from above, but not concave nor entering between the internasals. The latter, and the prefrontals, are considerably wider than long. Frontal longer than wide; parietals regularly rounded and not divaricate behind. Seven superior labials, all higher than long except the first and seventh, which are subquadrate. Oculars, 1-2; temporals, 1-2-2. Gastrosteges, 121; anal, 1-1; urosteges, 37. In a second specimen there are only 35 urosteges. Color brown above, with five indistinct longitudinal bands on the third and fourth, and on the sixth on each side and on the median line. Below yellow, two brown spots on each gastrostege, marking thirds of the length. Head and lateral plates unspotted. Nos. 75, 76, 292, 293, 294, collection of the Comision Geografica, from near Puebla.

I dedicate this species to Señor Augustine Diaz, C. E., president of the Comision Geografica Exploradora of Mexico. Science is much in-

debted to M. Diaz for the organization and successful conduct of the Comision.

This species has been figured and described by M. Bocourt as the *Toluca lineata* of Kennicott, from which it differs in various respects, one of which refers it, in my opinion, to another genus. Besides the typical species of Chionactis and the *C. occipitalis* Hallow. from Arizona, there are two species of Ogmius (Cope) which considerably resemble the *Chionactis diasii*. These are the *O. varians* Jan. and a new species which I call *O. acutus*. Before describing the latter I compare three Mexican species, as follows:

I. Rostral plate slightly concave above.

Occipital plates divaricate posteriorly; a dorsal series of spots; *O. varians* Jan.

II. Rostral plate flat or convex above.

Occipitals rounded without notch behind; five longitudinal bands; rostral less acute; *C. diasii* Cope.

Occipitals rounded; a series of dorsal transverse spots; rostral acute angled; *O. acutus* sp. nov.

The *O. acutus* was sent to the National Museum, by Sumichrast, from Tuchitan, on the Pacific side of the isthmus of Tehuantepec. It nearly resembles the *C. diazii* in all important respects, but has the rostral plate produced to an acute point. The coloration is totally different, resembling rather the *O. varians*. It consists in the type specimen of sixty-one black transverse spots of one scale in length and three to five scales width, separated by interspaces of a scale and a half in length. Sides, abdomen, and head, including lips, unspotted. Gastrosteges, 127; anal, 1–1; urosteges, 32. Total length, 249^{mm}; of tail, 40^{mm}; of head, 10^{mm}.—E. D. COPE.]

42. Tantilla calamarina Cope.

Tantilla calamarina Cope, Proc. Acad. Phila., 1866, 320.

Vulg.—Culebra.

Hab.—State of Puebla. Tezintlan, No. 49, December.

43. Rhabdosoma semidoliatum Duméril et Bibron.

Rhabdosoma semidoliatum Duméril et Bibron, Erpét. gén., VII, 1, 1854, p.93.

Vulg.—Culebra, Coralillo.

Hab.—State of Vera Cruz. Misantla, Nos. 51, 52, 53, 54; Jalapa, No. 297.

44. Rhabdosoma longiceps Cope, sp. nov.

Vulg.—Culebra negra.

Hab.—State of Vera Cruz. S. José Acateno, No. 301 type.

[This snake possesses all the principal characters of the *R. mutitorques* Cope (Proceedings Amer. Philos. Soc. 1885, p. 385), but differs from the dozen or so of that species now in my collection by a constantly more elongate head and scuta, especially the prefrontals and superior labials.

Scales in seventeen longitudinal rows, the median a little narrowed. Rostral plate just visible from above. Prefrontals much longer than wide, five or six times as large as internasals. Frontal subtriangular, wider than long; superciliary not very small. Postocular very small; temporals very narrow, 1–2. Superior labials six; all except first, second, and fourth, longer than high; the fifth and sixth twice as long as high; the first as high as long. Inferior labials seven, fourth largest; first of opposite sides well in contact. Postgenecials little different from adjacent scales, not in contact. Gastrosteges, 173; anal, 1; urosteges, 28. Extremity of tail with a compressed horny cap. Color everywhere blackish; some brownish shades on the sides near the head. Free edges of scuta and scutella, and of lateral scales, lighter. Total length, 445^{mm}; of tail, 44^{mm}; of head to rictus oris, 10^{mm}.

San José Acateno, Vera Cruz; No. 301.—E. D. COPE.]

45. Adelphicos quadrivirgatus Jan.

Adelphicos quadrivirgatus Jan, Arch. per la Zool., II, 1862, p. 18; Duméril & Bocourt, Miss. Scient. Mex., III, 1883, p. 554, pl. xxxii. fig. 11, 11*a*, 11*b*, 11*c*. 11*d*, 11*e*.

Vulg.—Culebra.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 79, December.

FAM. ELAPIDÆ.

46. Elaps nigrocinctus Girard.

Elaps nigrocinctus Girard, U. S. Wilkes's Astr. Exp., p. —.

Vulg.—Coralillo.

Hab.—State of Chiapas. (?) Nos. 243, 244.

47. Elaps apiatus, Jan.

Elaps apiatus Jan, Prodr. Ophid., 1859, p. 11, pl. A.

Vulg.—Coralillo.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 40, December.

48. Elaps bernadi Cope, sp. nov.

Elaps bernadi Cope. (Described on subsequent page of this volume.)

Vulg.—Coralillo.

Hab.—State of Vera Cruz. S. José Acateno, No. 300.

FAM. CROTALIDÆ.

49. Ophryacus undulatus (Jan).

Atropus undulatus Jan, Rev. et Mag. Zool., 1859, p. 157.
Ophryacus undulatus Cope, Proc. Am. Philos. Soc., 1884, p. —.

Vulg.—Vivora cornuda.

Hab.—State of Vera Cruz. Actopam, No. 296.

50. Bothrops atrox (Linnæus).

Coluber atrox Linnæus, Syst. Nat., I, 1758, p. 222: I, 1766, p. 383.
Bothrops atrox Wagler, Natür. Syst., 1830, p. 1174.

Vulg.—Nauyague, Nauyac, Xochinauyague.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 1, 2, 59, 60, 61, 62, December; Jalapa, No. 73.

51. Crotalus durissus Linnæus.

Crotalus durissus Linnæus, Syst. Nat., I, 1766.

Vulg.—Vivora de cascabel.

Hab.—State of Chiapas. ? No. 239.

52. Crotalus basiliscus Cope.

Caudisona basilisca Cope, Proc. Acad. Phila., 1864, p. 166.

Vulg.—Vivora de cascabel, Palancacoatl.

Hab.—State of Puebla. Chachapa, No. 290; Puebla, No. 284.

53. Crotalus triseriatus (Wagler).

Uropsophus triseriatus Wagler, Natür. Syst. Amphib., 1830, p. 176.
Crotalus triseriatus Cope, Proc. Amer. Philos. Soc., 1884, p. 179.

Vulg.—Vivora de cascabel.

Hab.—State of Puebla. Tezuitlan, No. 68, December.

LACERTILIA.

FAM. EUBLEPHARIDÆ.

54. Coleonyx elegans Gray.

Coleonyx elegans Gray, Ann. and Mag. Nat. Hist., XVI, 1845, p. 163. Bocourt, Miss. Scient. Mex., III, 1873, p. 49, pl. X, fig. 7, 7*a*, 7*b*, 7*c*, 7*d*.

Vulg.—Lagartija rayada.

Hab.—State of Vera Cruz. Jalapa, No. 139.

FAM. ANOLIDÆ.

55. Anolis nebulosus (Wiegmann).

Dactyloa nebulosa Wiegmann, Herp. Mex., 1834, p. 47.
Anolis nebulosus Duméril et Bocourt, Miss. Scient. Mex., III, p. 68, pl. XV, fig. 3.

Vulg.—Lagartija.

Hab.—State of Puebla. Tepexi, No. 143, October.

56. Anolis nannodes Cope.

Anolis nannodes Cope, Proc. Acad. Phila., 1864, p. 173. Duméril et Bocourt, Miss. Scient. Mex., III, p. 71, pl. XV, fig. 5.

Vulg.—Lagartija de cola larga.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 138, December; Actopam, Nos. 329, 330, 338, 339.

57. Corythophanes hernandesii (Wiegmann).

Chamæleopsis hernandesii Wiegmann, Isis, 1831, p. 298; Herp. Mex., 1834, p. 38, pl. VI.
Corythophanes (*Chamæleopsis*) *hernandesii* Fitzinger, Syst. Rep., p. 222.
Corythophanes Mexicanus Hernandez, Duméril et Bocourt, Miss. Scient. Mex. 1874, p. 122, pl. XVII, fig. 1.

Vulg.—Chupa tabaco.

Hab.—State of Vera Cruz. Misantla, No. 133.

58. Læmanctus serratus Cope.

Læmanctus serratus Cope, Proc. Acad. Phila., 1864, p. 176. Duméril et Bocourt, Comm. Scient. Mex., III, 1874, p. 116.

Vulg.—Chupa tabaco.

Hab.—State of Vera Cruz. Misantla, No. 126; Jicaltepec (Jalapa), No. 132, December.

59. Læmanctus longipes Wiegmann.

Læmanctus longipes Wiegmann, Herp. Mex., 1834, p. 46, t. IV.

Vulg.—Lagartija de cola larga.

Hab.—State of Vera Cruz. Actopam, No. 337.

60. Basiliscus vittatus Wiegmann.

Basiliscus vittatus Wiegmann, Isis, 1828, p. 373; Duméril et Bocourt, Miss. Scient. Mes., III, p. 129, pl. XVII, fig. 3.

Vulg.—Basilisco.

Hab.—State of Chiapas. ? No. 267.

61. Iguana tuberculata Laurenti.

Iguana tuberculata Laurenti, Synops. Rep., p. 49.

Vulg.—Iguana real.

Hab.—State of Puebla. Chiantla, No. 272.—State of Vera Cruz. Vega de Alatorre, No. 353.

62. Ctenosaura teres (Harlan).

Cyclura teres Harlan, Journ. Acad. Phila., 1824, pp. 246, 250, pl. XVI; Wiegman, Herp. Mex., 1834, p. 43.

Ctenosaura teres Duméril et Bocourt, Miss. Scient. Mex., III, p. 142.

Vulg.—Iguana verde.

Hab.—State of Puebla. Ialtepec (Izucar de Matamoros), Nos. 286, 364.—State of Vera Cruz. Vega de Alatorre, No. 352; Jicaltepec (Jalapa), ? No. 130, very young, December.

63. Ctenosaura pectinata (Wiegmann).

Cyclura pectinata Wiegmann, Herp. Mex., 1834, p. 42, tab. 2.

Ctenosaura pectinata, Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 140.

Vulg.—Iguana.

Hab.—State of Puebla. Izucar de Matamoras, Nos. 320, 363 ♂. Tlapanalá (Izucar de Matamoros), Nos. 188, 189, 190, 191, November.

64. Uta bicarinata (A. Duméril).

Phymatolepis bicarinatus, A. Duméril, Arch. Mus. Paris, VIII, 1856, p. 549, pl. XXIII, figs. 2, 2*a*, 2*b*; Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 165, pl. XVII*bis*, figs. 9, 9*a*, 9*b*.

Uta bicarinata, Cope, Proc. Acad. Phila., 1864, p. 117.

Vulg.—Lagartija.

Hab.—State of Puebla. Tlapanalá (Izucar de Matamoros), Nos. 127, 128, November.

65. Sceloporus torquatus formosus (Wiegmann).

Sceloporus formosus, Wiegmann, Herp. Mex., 1834, p. 50, pl. VII, fig. 2; Duméril et Bocourt, Miss. scient. Mex., III, p. 182, pl. XVIII, figs. 3, 3*a*, 3*b*, 3*c*.

Sceloporus torquatus formosus, Cope, Proc. Am. Philos. Soc., 1885, p. 402.

Vulg.—Xintete.

Hab.—State of Vera Cruz. Jalapa, Nos. 354, 355, ? 356, young.

66. Sceloporus spinosus Wiegmann.

Sceloporus spinosus. Wiegmann, Isis, 1828, p. 370: Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 174.

Vulg.—Lagartija.

Hab.—State of Puebla. Tlapanalá (Izucar de Matamoros), Nos. 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, November; Tehuacan, No. 146, October.

67. Sceloporus graciosus Baird & Girard.

Sceloporus graciosus, Baird & Girard, Proc. Ac. Philad., 1852, p. 69: Cope, Proc. Am. Phil. Soc., 1885, p. 397.

Sceloporus gracilis, Baird & Girard, Proc. Ac. Philad., 1852, p. 175: Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 190, pl. XVIII, figs. 4, 4*a*, 4*b*, 4*c*.

68. Sceloporus grammicus Wiegmann.

Sceloporus grammicus. Wiegmann, Isis, 1828, p. 370; Herp. Mex., 1834, p. 51; Duméril et Bocourt, Miss. scient. Mex., III, p. 192, pl. XVIII*bis*, figs. 12, 12*a*, 12*b*.

Vulg.—Lagartija.

Hab.—State of Puebla. Tlapanalá (Izucar de Matamoros), Nos. 151, 152, 153, 154, 155, 156, 157, 158.

69. Sceloporus microlepidotus Wiegmann.

Sceloporus grammicus. Var α Wiegmann, Isis, 1828, p. 370.

Sceloporus microlepidotus, Wiegmann, Herp. Mex., 1834, p. 51; Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 194, pl. XVIII*bis*, figs. 13, 13*a*, 13*b*, 13*c*, 13*d*.

Vulg.—Lagartija.

Hab.—State of Puebla. Teziutlan, Nos. 165, 166, 167, 168, 169, 170, 171, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, December. Puebla, Nos. 160, 321, 322, 323, 324.

70. Sceloporus æneus Wiegmann.

Sceloporus æneus, Wiegmann, Isis, 1828, p. 370; Herp. Mex., 1834, p. 52; Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 205, pl. XVIII*bis*, figs. 4, 4*a*, 4*b*.

Vulg.—Lagartija de tierra, Cuije.

Hab.—State of Puebla. Tlapanalá (Izucar de Matamoros), No. 142, November. Puebla, No. 311, var.

71. Sceloporus scalaris Wiegmann.

Sceloporus scalaris, Wiegmann, Isis, 1828, p. 370; Herp. Mex., 1834, p. 50, pl. VIII, fig. 2; Duméril et Bocourt, Miss. scient. Mex., III, p. 202, pl. XVIII*bis*, figs. 9, 9*a*, 9*b*.

Vulg.—Lagartija de tierra.

Hab.—State of Puebla. Nos. 312, 313, 314, 315.

72. Sceloporus variabilis Wiegmann.

Sceloporus variabilis, Wiegmann, Herp. Mex., 1834, p. 51; Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 200, pl. XVIII*bis*, figs. 1, 1*a*, 1*b*, pl. XIX, fig. 2.

Vulg.—Lagartija.

Hab.—State of Puebla. Tlapanalá (Izucar de Matamoros), No. 129, November.—State of Vera Cruz. Jicaltepec (Jalapa), No. 164, December. Jalapa, Nos. 140, 159, 325, 326, 327, 328.

73. Phrynosoma orbiculare (Linnæus).

Lacerta orbicularis, Linnæus, Syst. Nat., I, 1758, p. 206; I, 1766, p. 365.

Phrynosoma orbiculare, Wiegmann, Isis, 1828, p. 367; Herp. Mex., 1834, p. 53, tab. VIII, fig. 1.

Tapaya orbicularis, Hernandez, Duméril et Bocourt, Miss. scient. Mex., III, 1874, p. 221, pl. XI, figs. 1, 1*a*, *b*, *c*, *d*, *e*, *f*, *g*.

Vulg.—Camaleon.

Hab.—State of Puebla. Puebla, Nos. 107, 108, 316, 317, 318, 319, young. Teziutlan, No. 117, December.

74. Phrynosoma asio Cope.

Phrynosoma asio, Cope, Proc. Ac. Philad, 1864, p. 178.

Batrachosoma asio, Cope, Duméril et Bocourt, Miss. scient. Mex., III, p. 241, pl. XVII, figs. 9, 9*a*, 9*b*. 9*c*.

Hab.—State of Chiapas, ? No. 266.

75. Phrynosoma cornutum (Harlan).

Agama cornuta, Harlan, Journ. Acad. Philad., 1825, p. 299, pl. 20.

Phrynosoma cornutum, Gray, Griff. A. K., Syn. Rep., IX, 1831, p. 45; Duméril et Bocourt, Miss. scient. Mex., III, p. 236, pl. XII, figs. 9, 9*a*, 9*b*, 9*c*, 9*d*, 9*e*, 9*f*.

Vulg.—Camaleon.

Hab.—State of Chihuahua. Huajuguilla (Jimenez), No. 100, September.

Fam. ANGUIDÆ.

76. Barissia imbricata (Wiegmann).

Gerrhonotus imbricatus, Wiegmann, Isis, 1828, p. 381; Herp. Mex., 1834, p. 34, tab. X, figs. 2, 5.

Barissia imbricata, Gray, Cat. Liz. Brit. Mus., 1845, p. 55.

Gerrhonotus (*Barissia*) *imbricatus*, Wiegmann, Duméril et Bocourt, Miss. scient. Mex., 1879, p. 363, pl. XXI B, figs. 1, 1*a*, 2, 2*a*.

Vulg.—Lagartija, Cuije.

Hab.—State of Puebla. Puebla, Nos. 163, 306.

77. Gerrhonotus liocephalus Wiegmann.

Gerrhonotus liocephalus, Wiegmann, Isis, 1828, p. 381; Duméril et Bocourt, Miss. scient. Mex., III, 1878, p. 342, pl. XXI A, figs. 1, 2, 2*a*.

Vulg.—Lagartija.

Hab.—State of Puebla. Hueytamalco (Teziutlan), Nos. 192, 193, December.—State of Vera Cruz. Jicaltepec (Jalapa), No. 149, December.

78. Diploglossus steindachneri Cope.

Diploglossus steindachneri, Cope, Proc. Acad. Philad., 1864, p. 179.

Diploglossus (celestus) steindachneri, Cope; Duméril et Bocourt, Miss. scient. Mex., III, p. 383, figs. 3, 3*a*, 3*b*.

Vulg.—Eslaboncillo.

Hab.—State of Vera Cruz. Jalapa, Nos. 333, 334, 335.

Fam. TEIIDÆ.

79. Cnemidophorus undulatus Wiegmann.

Cnemidophorus undulatus Wiegmann, Herp. Mex., I, 1834, p. 27.

Ameiva undulata Wiegmann, Duméril et Bocourt, Miss. Scient. Mex., III, 1874, p. 254, pl. XXA, fig. 7, 7*a*, 7*b*, 7*c*, 7*d*, 7*e*, pl. XXB, fig. 1.

Vulg.—Lagartija.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 134, 135, 136, December.

80. Cnemidophorus sexlineatus (Linnæus).

Lacerta 6-lineata Linnæus, Syst. Nat., I, 1766, p. 364.

Cnemidophorus sexlineatus Duméril et Bibron, Herp. gen., V, 1839 (p. 131). Duméril et Bocourt, Miss. Scient. Mex., III, 1874, p. 273, pl. XXC, fig. 11, 11*a*, 11*b*, 11*c*, 11*d*.

Vulg.—Lagartija, Cuije.

Hab.—State of Puebla. Tlapanalá (Izucar de Matamoros), Nos. 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, November; Puebla, Nos. 307, 308.

81. Cnemidophorus communis Cope.

Cnemidophorus communis Cope, Proc. Am. Philos. Soc., 1877 (p. 95); 1879, p. 261.

Vulg.—Lagartija, Cuije.

Hab.—State of Puebla. Tlapanalá (Izucar de Matamoros), No. 125, November; Izucar de Matamoros, Nos. 141, 147.

82. Cnemidophorus costatus Cope.

Cnemidophorus costatus Cope, Proc. Am. Philos. Soc., 1877, p. 95.

Vulg.—Cuije.

Hab.—State of Puebla. Puebla, Nos. 309, 310.

83. Cnemidophorus guttatus Wiegmann.

Cnemidophorus guttatus Wiegmann, Herp. Mex., 1834, p. 29. Duméril et Bocourt, Miss. Scient., Mex., III, p. 285, pl. XXC, fig. 4, 4*a*, 4*b*, 4*c*, 4*d*.

Vulg.—Cuije.

Hab.—State of Vera Cruz. Jalapa, No. 331 var.

84. Cnemidophorus lineatissimus Cope.

Cnemidophorus lineatissimus Cope, Proc. Am. Philos. Soc., 1877, p. 94.

Vulg.—Cuije.

Hab.—State of Puebla. Chiantla, No. 148 (obsoletus.)

Fam. SCINCIDÆ.

85. Oligosoma gemmingeri Cope.

Oligosoma gemmingeri Cope, Proc. Acad. Philad., 1864, p. 180.

Lygosoma (mocoa) Gemmingerii Cope, Duméril et Bocourt, Miss. Scient. Mex., III, p. 449.

Vulg.—Eslaboncillo.

Hab.—State of Vera Cruz. Jalapa, Nos. 332, 336.

86. Eumeces furcirostris Cope.

Eumeces furcirostris Cope, Proc. Am. Philos. Soc., 1884, p. 169. (Printed March 7, 1885.)

Vulg.—Lagartija rayada.

Hab.—State of Puebla. Tezintlan, Nos. 172, 173, 174, December.

Fam. ANELYTROPSIDÆ.

87. Anelytropsis papillosus Cope.

Anelytropsis papillosus Cope, Proc. Am. Phil. Soc., 1885, p. 380.

Vulg.—Culebra chica.

Hab.—State of Vera Cruz. Jalapa, No. 87.

The present form is essentially interesting as introducing for the first time to the Western continent the family of the Anelytropidæ, or the Typhlophthalm lizards with the eye entirely concealed, and with the tongue scaly. The importance of this discovery is considerable, as it shows that the scincoid lizards have undergone in the New World the same degenerative process as in the Old World, and in the same way. This is a new fact, even supposing that the Aniellidæ of America are a degenerate form of the same family, which is not probable. Dr. Boulenger believes* that that family is a degenerate type of the Anguid stem; a view in which I suspect he is correct. Anelytropsis is a degree further down in the scale than Aniella, in having the epidermis absolutely continuous over the eye, as in other members of the family of Anelytropidæ, and as in the Typhlopid family of snakes. As in other forms of this character, the life of this type is doubtless subterranean, which accounts for its having so long escaped observation.—E. D. Cope, l. c.

* Annals and Magazine of Natural History, 1885, p. 121.

CHELONIA.

FAM. EMYDIDÆ.

88. Cinosternon leucostomum A. Duméril.

Cinosternon leucostomum Dum., Bib.-A. Duméril, Arch. Mus. Paris, VI, 1852, p. 239, pl. XVII, fig. 1, 2, 3.

Cinosternon leucostomum A. Dum., Duméril et Bocourt, Miss. scient. Mex., III, 1873, p. 25.

Vulg.—Tortuga.

Hab.—State of Puebla. Izucar de Matamoros, No. 285 ♀, 287 ♂, December—Disecados—; Laguna de S. Baltazar (Puebla), Nos. 276 ♀, 289 ♂. State of Chiapas,? Nos. 261, 264. Territory of Baja California? No. 357.

FAM. CHELONIDÆ.

89. Chelonia imbricata (Linnæus).

Testudo imbricata Linnæus, Syst. Nat., I, p. 350.

Chelonia imbricata Schweigger, Prodr. Arch. Kœnisb., I, pp. 291, 408.

Vulg.—Tortuga de carey.

Hab.—Territory of Baja California. La Paz, Nos. 358, 359.

CROCODILIA.

FAM. CROCODILIDÆ.

90. Crocodilus americanus Schneider.

Crocodilus americanus Schneider, Hist. Amph., fasc. 2, 1801 (p. 167). Duméril et Bocourt, Miss. Scient. Mex., III, 1873, p. 30.

Vulg.—Lagarto.

Hab.—State of Vera Cruz. Vera Cruz, No. 278 ♂, young. Locality? No. 271, young.

BATRACHIA.

FAM. RANIDÆ.

91. Rana halecina Kalm.

Rana halecina Kalm, Resa Til Norra Am., III, 1761, (p. 46).

Rana halecina, Linné-Bocchi, Miss. Scient. Mex., III, II, 1881, p. 10.

Vulg.—Rana.

Hab.—State of Puebla. Puebla, Nos. 118, 119, 120, 121, 122, 123, 124, 342, 345, 346, September.—State of Vera Cruz. Jalapa, No. 351.

FAM. CYSTIGNATHIDÆ.

92. Lithodytes rhodopis Cope.

Lithodytes rhodopis Cope, Proc. Ac. Philad., 1866 (p. 324).

Hylodes rhodopis Cope-Bocchi, Miss. Scient. Mex., III, II, 1881, p. 50.

Vulg.—Rana.

Hab.—State of Puebla. Puebla, No. 109.—State of Vera Cruz. Jalapa, No. 350.

Fam. BUFONIDÆ.

93. Bufo compactilis Wiegmann.

Bufo compactilis Wiegmann, Isis, 1833, p. 661.

Vulg.—Zapo.

Hab.—State of Puebla. Puebla, Nos. 340, 341.

94. Bufo intermedius Günther.

Bufo intermedius Günther, Cat. Batr. Brit. Mus. (p. 140, pl. IX*a*). Bocchi, Miss. Scient. Mex., III, II, 1882, p. 78.

Vulg.—Zapo.

Hab.—State of Puebla. Izucar de Matamoros, No. 103, November.

95. Bufo cognatus Say.

Bufo cognatus Say, Long's Exped., II, 1823, p. 190.

Vulg.—Zapo.

Hab.—State of Durango. Villa Lerdo, No. 99, September.

96. Bufo marinus (Linnæus).

Rana marina Linnæus, Syst. Nat., I, 1758, p. 211; I, 1766, p. 356.
Bufo marinus Schneider, Hist. Amph., fasc. I, 1801 (p. 219).
Bufo marinus Linné.-Bocchi, Miss. Scient. Mex., III, II, 1882, p. 82.

Vulg.—Zapo.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), No. 106, December. From the belly of *Sibon annulatum*.

97. Bufo valliceps Wiegmann.

Bufo valliceps Wiegmann, Isis, 1833, p. 657.

Vulg.—Zapo.

Hab.—State of Vera Cruz. Jalapa, Nos. 349, ? 344, young.

98. Bufo canaliferus Cope.

Bufo canaliferus Cope, Proc. Am. Philos. Soc., 1877, p. 85.

Vulg.—Zapo.

Hab.—State of Chiapas. ? , No. 268.

Fam. HYLIDÆ.

99. Hyla nigropunctata Boulenger.

Hyla nigropunctata Boulenger, Batr. Sal. Brit. Mus., 1882, p. 366.

Vulg.—Rana.

Hab.—State of Puebla. Teziutlan, Nos. 104, 105, December.

100. Hyla gracilipes Cope.

Hyla gracilipes Cope, Proc. Acad. Philad., 1865 (p. 194). Bocchi, Miss. Scient. Mex., III, II, 1881, p. 36.

Vulg.—Ranita.

Hab.—State of Puebla. Puebla, Nos. 110, 111, 112, 113, 114, 115, 116, 343, 347, 348.

101. Smilisca baudini (Duméril et Bibron).

Hyla baudini Duméril et Bibron, Erp. gen., VIII, 1841, p. 566. Bocchi, Miss. Scient. Mex., III, II, 1881, p. 29, pl. XIV, figs. 4, 4*a*, 4*b*.

Smilisca baudini Cope, Proc. Ac. Philad., 1865 (p. 194).

Vulg.—Rana.

Hab.—State of Vera Cruz. Jicaltepec (Jalapa), Nos. 98, 101, 102, December.

Fam. SALAMANDRIDÆ.

102. Amblystoma tigrinum Green.

Salamandra tigrina Green, Jour. Acad. Philad., V, p. 116.

Amblystoma tigrinum Baird, Jour. Acad. Philad. (2), I, p. 284.

Vulg.—Axolotl, Ajolote.

Hab.—State of Hidalgo. Huasca, ?, No. 274.

103. Spelerpes bellii Gray.

Spelerpes bellii Gray, Cat. Brit. Mus., (p. 46). Bocchi, Scient. Mex., III, II, 1883, p. 110, pl. XX *bis*, figs. 1, 2, 3.

Vulg.—Tlaconete.

Hab.—State of Vera Cruz. Jalapa, No. 137.

Index to the genera of reptilia and batrachia, with the corresponding numbers of their first species.

THE BRITISH MARSH-TIT.

By LEONHARD STEJNEGER.

Parus palustris dresseri, subsp. nov.

DIAGN.—Similar to typical *Parus palustris*, but much darker; the brown of the back more olive, and the rump clearer and lighter buffish brown; flanks much browner; tail shorter, the longest rectrices averaging 49^{mm}; outer pair of rectrices shorter than the rest which are nearly of equal length.

HABITAT.—Great Britain.

TYPE.—U. S. National Museum, No. 96550.

It is curious that none of the British Ornithologists have had the courage to describe this bird under a distinctive name, not even those who recognize *Parus britannicus* as a distinct species, since there is no lack of evidence in the literature that they have been aware of the difference of the British Marsh-Tit from the Skandinavian and Central European bird, for which Linnæus's name, *P. palustris*, is properly retained, and most of the modern authors, when speaking of *P. palustris* generally, or when describing it, have been obliged to qualify their reference to its occurrence in Great Britain by remarking, that examples from this island are very much darker than *P. palustris vera.*

Thus, for instance, Messrs. Dresser and Sharpe (B. of Eur., III, p. 100 *seqv.*) make several remarks to the same effect: "*Male from England.* Very much darker than continental specimens, the back especially; the rump much paler than the rest of the back, and inclining to rosy white; cheeks and center of the body underneath dingy white; the flanks dark buff, this color also extending on to the abdomen" (p. 100). "But in a comparison of specimens care must be taken to have the true Scandinavian species, and not the somber English subspecies" (p. 105). "Compared with the true *P. palustris* of Sweden, our English Marsh-Titmouse is a very much darker bird, and has the head slightly browner and less glossy. As, however, there are many continental specimens which, *in their winter dress, approach* British examples, we feel that it would not be advisable to bestow a *specific* name on our *insular form*, as the distinctions are not *so clearly* characterized as in the Coal Titmice. That our island bird, however, is *constantly* darker is apparent on comparison of a series of specimens from Great Britain and the Continent. Mr. R. G. Wardlaw Ramsay has kindly lent us some Scotch specimens which exactly agree with English birds" (p. 109) (*italics mine*). Professor Newton's remark (Yarrell, Brit. Birds, 4 ed., I, p. 497) is much to the same effect, and so are those of Mr. Seebohm (Brit. B. Eggs, I, pp. 476–477). The latter gentleman thinks that the amount of brown is not sufficiently great to warrant the separation of the British bird from the Continental one, notwithstanding the fact that he himself has described as "variety" *P.*

japonicus and recognized as deserving of a separate (though varietal name "forms" like *P. brevirostris* and *P. baicalensis.*

From the series which I have before me I see no difference between the present case and that of *P. britannicus*, neither in the quality nor in the quantity of the additional coloring matter in the British forms. The Coal-Tit is considerably more bluish in the gray, and consequently the suffusion of buff in *P. britannicus* causes the back to look more olive. Intermediate forms occur in both. Very well! Therefore we give them trinominals, calling one *P. ater britannicus*, the other *P. palustris dresseri.* I am quite unable to appreciate the consistency or logic of recognizing the former and rejecting the latter.

In addition to the difference in color, it appears to me, that *P. dresseri* has a shorter tail than true *P. palustris*, as I have found the longest tail-feathers in the former averaging 49^{mm}, against 53^{mm} in the latter, while the other dimensions seem to be nearly the same.*

* In default of a better place I wish to correct here a quotation in the synonymy of *P. borealis* as given by Sharpe and Dresser (B. of Eur., III, p. 107), and by Gadow (Cat. B. Brit. Mus., VIII, p. 51.) These gentlemen regard "*Parus fruticeti* Wallengr., Naumannia, 1854, p. 141," as a synonym of *P. borealis*, while in reality Wallengreen proposed the new name for "*P. palustris* Auctorum," regarding, as he did, *P. borealis* Selys as a synonym of *P. palustris* Lin. We hold that Linnæus's diagnosis is equally applicable to both forms, and that the name, therefore, is to be applied to that one, to which it was first restricted by Selys Longchamps. *P. fruticeti* Wallengr., therefore, is a synonym of what we consider *P. palustris vera.*

Smithsonian Institution,
Washington, D. C., January 21, 1886.

REPORT ON THE MOLLUSKS COLLECTED BY L. M. TURNER AT UNGAVA BAY, NORTH LABRADOR, AND FROM THE ADJACENT ARCTIC SEAS.

By W. H. DALL,

Honorary Curator of Mollusks, U. S. National Museum; Paleontologist, U. S. Geological Survey.

The Arctic regions have such a uniform mollusk-fauna, and, especially in the vicinity of Greenland, have been so often and so thoroughly searched for mollusks that it was not to be expected that the small collection which Mr. Turner was able to make should contain anything new or remarkable. At most, it might afford some interesting facts bearing on geographical distribution and the special fauna of Labrador.

My surprise, therefore, was great, when on examining the specimens in spirits, I found examples of a mollusk not only new to science as a species, but belonging to a generic group which does not appear to be known. Moreover, the specimen best developed was over half an inch in length.

PULMONATA.

Limnæa palustris Müller, var. **vahlii**, Beck.

Limnaea vahlii (Beck) Möller, Ind. Moll. Grönl., p. 4, 1842.

Abundant and tolerably uniform; collector's numbers 4026, 4118, and 4181; Museum numbers 73737.

Collected in small pools and streams on the uplands near Fort Chimo, June and July, 1883.

Limax (Agriolimax) hyperboreus Westerlund.

Limax hyperboreus Westerlund, Sib. L. & F. W. Moll., p. 121. Binney, Bull. U. S. Nat. Mus., No. 28, p. 473, fig. 516, 1885.

Not uncommon, also found throughout the Arctic shores of North America and Eastern Siberia.

Collector's numbers, 1798, 5859; Museum number, 73738; collected May 16, 1883, and July 23, 1884, under stones, in moist places, in willow thickets, &c., at Fort Chimo, Ungava Bay.

Zonites (Conulus) chersina Say, var. **egena**, Say.

Helix chersina Say, Journ. Acad. Nat. Sci., II, p. 156, 1821.
Helix egena Say., l. c., V, p. 120, 1825.
Helix fabricii Beck, Index, p. 21, 1837.

Arctic America and Greenland, Europe, and Siberia. Collector's number, 5859, with the preceding species; Museum number 73760.

There is nothing to distinguish these northern specimens of *chersina*, var. *egena*, from those found in similar latitudes in other regions. *Z. fulvus* of authors is found varying in a similar manner in Europe where

the analogue of *egena* has been called *Z. mortoni* by Jeffreys. The name *fabricii* should be dropped, as the Greenland specimens do not differ from those of Alaska or Kamchatka or Labrador, except as individuals vary among themselves. Were the original application of the name *fulvus* entirely free from doubt, it should, of course, take precedence of *chersina*.

Pupa decora Gould.

Pupa decora Gould, Proc. B. S. Nat. Hist., II, 263, 1847, Lake Superior.
Pupa borealis Morelet, J. de Conchyl., VII, p. 9, 1858. Kamchatka, Binney, l. c., p. 189, fig. 189, 1885.

A few specimens clearly referable to this species were obtained with the two preceding species. Collector's number, 5859; Museum number, 73739.

This would seem to be distinct from *Pupa Hoppii* Möller, but I have not been able to examine specimens of the latter.

PTEROPODA.

Clione limacina Phipps.

Clio limacina Phipps, Voy. N. Pole, app., p. 195, 1774.
Clione borealis Pallas.

Collector's numbers, 108, 159; Museum number, 73740.

Taken on the voyage to Ungava Bay in north latitude 56°, and west longitude 60° off the Labrador coast July 13, 1882, swimming at the surface.

Limacina helicina Phipps.

Clio helicina Phipps, l. c., p. 195; Martens, Spitz. English edition, p. 141, t. Q. fig. e.

Abundant, with the preceding same general region, ten to twenty-five miles off the Labrador coast, from 6 a. m. to 8 p. m., the weather being cloudy.

Collector's numbers 99, 102, 106; Museum number, 73741.

MARINE GASTROPODA.

LITORINIDÆ.

Litorina grönlandica Mörch.

L. grönlandica (Chemnitz), Mörch, Moll. Grönl., No. 60, 1875; Arctic Manual, p. 126.
L. rudis var. ?

Abundant on the rocks; of various colors, brown, gray, mottled, banded, and almost white, some of quite large size. Collector's numbers, 90, 110, 149, 156, 246, 231; Museum number, 73742. Labrador's reef; rocks near mouth of George's River, July 31; shores of Ungava Bay generally; beach at Rigolet July 1, 1882; low water Davis inlet, July 17; circumpolar.

AQUILONARIA, n. g.

Shell Lioplaciform, more or less membranous, thin, imperforate, without sculpture, but with a rough, transversely shaggy epidermis. *Operculum* subspiral, with a raised subspiral rib on the inner side. *Animal* much like *Litorina* with entire sole, short and peculiar radula (see description of the species), tissues soft and very gelatinous, with a profusion of tenacious mucus. There is no jaw, the animal is phytophagous. The mantle edge is plain, there are no opercular appendages, and the females are oviparous.

Aquilonaria Turneri, n. s. Plate III, figs. 1, 2, 3.

Shell globose-conic with five and a half full and rounded whorls regularly increasing. Shell substance white, extremely thin, and wanting near the aperture; covered with a thick, shaggy, more or less hairy, transversely rugose epidermis of a brownish color, of which the outer and anterior margins of the aperture are chiefly formed. This is tough and flexible in life, but dries out of shape when desiccated; sutures with a narrow channel except in the last whorl where the channel gradually becomes obsolete; last whorl forming more than two-thirds of the shell; aperture ovate, margin thin, not reflected; columella smooth, thin, rounding gradually into the anterior margin; inner lip without callus; base rounded, full, without any trace of an umbilicus. Operculum thin, brownish, with about three whorls, slightly transversely undulate and longitudinally finely striate; on the inner side a well-marked raised rib gyrates with the whorls near their inner edge, but does not quite reach the anterior margin of the operculum. Jaw none, radula short (about 4.00^{mm}), small, with seven longitudinal and about fifty transverse rows of teeth. Rhachidian tooth recumbent, broad, short, with a larger median and two distinct lateral cusps, beside (on each side) two less evident waves on the cutting edge. First lateral broader than long, the base with two radiating ridges, the inner one supporting four distinct cusps, the outer one with its cutting edge merely obscurely waved; second lateral, narrower, with four strong cusps; outer lateral slender with a spatulate base and simple recurved cutting edge. Soft parts very gelatinous and giving out a gelid mucus very abundantly when the preserved animal was soaked in water for dissection. Foot short, broad, bluntly rounded behind, in front squarish, the anterior edge bilamellate, the incision triangular with its apex beneath the muzzle in the median line; the upper surface over this triangle darkly pigmented, the rest of the outer surface of the animal *rina*, eyes large and very black; mantle margin smooth; opercular waxen white; muzzle short, stout, subcylindrical; tentacles as in *Lito-* lobe without appendages; sole without any median division as far as could be detected.

Max. lon. of shell, 14.25; of last whorl, 11.00; of aperture, 7.00; of operculum, 7.00; max. lat. of shell, 10.00; of aperture, 6.00; of operculum, 5.00 mm; these are dimensions of the largest specimen.

Habitat.—Labrador's reef, Ungava Bay; three specimens in the ooze and slime filling the crevices of the rocks; August 5, 1882, L. M. Turner. Collector's number, 238; Museum number, 73743.

Also, Arctic Ocean, north of Bering Strait, in the summer of 1885; three specimens by Captain Healy, of the U. S. R. S. Corwin; exact locality doubtful.

In the specimen dissected, which was a female, the minute ova were already formed, the general anatomy recalled that of *Litorina;* the alimentary canal near its termination and the ovarian canal were nearly equal in size, the former being much more prominent in *Litorina* than the latter. The short radula, the sharply-defined spiral keel on the operculum, the form of the teeth, the profuse mucus, the character of the shell and epidermis, separate this group sufficiently from *Litorina*, which seems its nearest ally. It was certainly most unexpected to receive from the well searched Arctic waters a new form of higher rank than a species, and still more singular was the coincidence by which specimens from Labrador and Bering Strait came almost simultaneously to hand. The labels of Captain Healy's collection having become illegible during transportation, the exact spot north of Bering Strait where his specimens were collected is uncertain. He dredged at various points from St. Lawrence island north to Icy Cape on both sides of Bering Strait, but not in Kotzebue Sound. The area is within that of the purely Arctic fauna, so the exact spot is of less importance. All the dredgings were in less than 65 fathoms.

BUCCINIDÆ.

Chrysodomus spitzbergensis Reeve.

Fusus spitzbergensis Reeve, Last of the Arctic Voy., II, p. 395, pl. 32, fig. 6, *a*—*b*, 1855.

Neptunea (*Sipho*) *tercbralis* Gould, Proc. B. S. Nat. Hist., VII, p. 326, 1860.

Sipho lividus (Mörch) Verrill, Proc. U. S. Nat. Mus., VI, 1883, p. 238, pl. IX, fig. 12.

One imperfect specimen found on the upland near Fort Chimo, Ungava Bay, where it had doubtless been carried by the ravens, as is their wont. Collector's number, 4441; Museum number, 73744.

The forms indicated by the above synonymy grade into one another and in a large series cannot be discriminated as valid species. Reeve's name has five years' precedence of that given by Dr. Gould, and according to the latter, was partly founded on the same specimen. It is found from Bering Strait to Spitzbergen, and is rather variable in sculpture and form even in the same locality.

? Buccinum plectrum Stimpson.

Some worn but living specimens, collected July 17, 1882, at Davis Inlet, Labrador, may belong to this species or to the next one. Collector's number, 111; Museum number, 73745.

Buccinum undatum, L. var **undulatum** Stm.

Several living specimens found with the preceding. Museum number, 73746.

Buccinum cyaneum Brugiére.

B. grönlandicum Auct., as of Chemnitz.

One living specimen from Labrador's reef, Ungava Bay, near Fort Chimo. Collector's number, 226; Museum number, 73747.

As Chemnitz's name was not binomial it cannot properly take precedence of that of Brugiére adopted by Stimpson.

TROCHIDÆ.

Margarita umbilicalis Brod. & Sow.

Two specimens were taken from the stomach of a codfish, caught in Nakvak Bay or inlet, October, 1883. The locality is about 90 miles south of Hudson Strait. Collector's number, 6157; Museum number, 73748.

This well distinguished species is more northern in its southern limits than *M. helicina*, and has been taken at Point Barrow, Cumberland Inlet, Melville Peninsula, and East Greenland; the latter locality from specimens sent by the second German Polar expedition and catalogued in their report as *Trochus helicinus*.

Dr. Paul Fischer rejects the generic name *Margarita* because it had been used by its author for the genus *Margaritiphora*, some years before it was applied to the present group. While the practice of using a second time names which have fallen into synonymy cannot be commended, it does not seem as if it gave sufficient ground for rejecting a name which has never been adopted in the original sense, and has been used more than half a century (and of late years universally) for the present group.

Margarita helicina Fabricius.

Common among the ooze in crevices of rocks at the Labrador's reef. August 5, 1885. Collector's number, 233; Museum number, 73749.

Universal in the Arctic in proper situations, but extending its range much further south than the preceding species.

ACMAEIDÆ.

Acmæa testudinalis Müller.

From rocks at Rigolet, Labrador, July 5, 1882, Davis Inlet, July 17, 1882; and dead where dropped by the ravens on the uplands near Fort Chimo, Ungava Bay, Labrador. Collector's numbers, 89, 110, 4043; Museum number, 73750.

This species ranges from the Alaskan coast to the north of Europe, all around the pole, in suitable localities.

ACEPHALA.

Mya arenaria Linné.

Rigolet, Labrador. Collector's number, 89; Museum number, 73751.

Mya truncata Linné.

Davis Inlet, Labrador. Collector's number, 110; Museum number, 73752.

Saxicava arctica Linné.

Labrador's reef, Ungava Bay, near Fort Chimo, August 5, 1885. Collector's number, 236; Museum number, 73753.

Dead shells plentiful, but living ones rare.

Cardium ciliatum Fabricius.

Collector's number, 4044; Museum number, 73754.

Fragments only. These fragments are probably subfossil. They were taken from the blue clay which forms a deposit about a mile and a quarter south of Fort Chimo on the river. The spot is known as the "Loom (or Loam?) Hole," and is a peculiarly shaped cove, or pocket, in the river bank.

Macoma tenera Leach, var. **grönlandica** Beck.

Rigolet, Labrador, July 5, 1885, and Davis Inlet. Collector's numbers, 89, 111; Museum number, 73755.

This with *T. Fabricii* and *frigida* Hanley, *inconspicua* Brod. & Sow., *fusca* Say, &c., are probably only variations of one type which appears in Northern Europe under the name of *T. balthica* Linné.

Modiolaria lævigata Gray.

Plenty on the Labrador's reef, Ungava Bay, near Fort Chimo, August 5, 1885. Collector's number, 230; Museum number, 73756.

Crenella faba Fabricius.

With the last common. Collector's number, 232; Museum number, 73757.

This species is curiously local in its range.

Mytilus edulis Linné.

Rigolet, with specimens of *Balanus balanoides* (L.) Darwin (=*ovularis* Gould, Mass. Rep., 1842), growing upon it.

Davis Inlet, Labrador, and Labrador's reef, mouth of Koksoak River, Ungava Bay, August 5, 1885. Collector's numbers, 89, 110, 224; Museum number, 73758.

The specimens from the Labrador's reef are a handsome brown on the sides, and the shell substance of the beaks is white instead of dark blue, as in the common specimens.

BRACHIOPODA.

Rhynchonella psittacea Auct.

Found, dropped by the ravens, on the uplands near Fort Chimo, about 100 feet above the sea. Collectors number, 4042; Museum number, 73759.

RECAPITULATION.

1. *Limnæa* var. *vahlii*, Beck.
2. *Agriolimax hyperboreus*, Westerl.
3. *Zonites* var. *egena* Say.
4. *Pupa decora* Gould.
5. *Clione limacina* Phipps.
6. *Limacina helicina* Phipps.
7. *Litorina* var. *grönlandica* Mke.
8. *Aquilonaria turneri* Dall.
9. *Chrysodomus spitzbergensis* Rve.
10. *Buccinum plectrum*? Stm.
11. *Buccinum* var. *undulatum* Möll.
12. *Buccinum cyaneum* Brug.
13. *Margarita umbilicalis* B. & S.
14. *Margarita helicina* Fabr.
15. *Acmæa testudinalis* Müll.
16. *Mya arenaria* L.
17. *Mya truncata* L.
18. *Saxicava arctica* L.
19. *Cardium ciliatum* Fabr.
20. *Macoma* var. *grönlandica* Beck.
21. *Modiolaria lævigata* Gray.
22. *Crenella faba* Fabr.
23. *Mytilus edulis* L.
24. *Rhynchonella psittacea* Auct.

Total, four pulmonates, two pteropods, nine marine gastropods, eight bivalves, and one brachiopod.

CONTRIBUTIONS TO THE NATURAL HISTORY OF THE COMMANDER ISLANDS.

No. 6.—Report on Bering Island Mollusca collected by Mr. Nicholas Grebnitzki.

By W. H. DALL.

The interesting collection of shells obtained by Dr. Stejneger (these proceedings Vol. VII, 1884, pp. 340–349) has recently been supplemented by another made by Mr. Nicholas Grebnitzki, Russian governor of the Commander Islands, which has been sent to the U. S. National Museum with the understanding that it was to be reported upon. Though small, it contains several additions to the first list, some of which are of much interest, and the enumeration of these gives me an opportunity of incorporating some remarks and additional notes on the species collected by Dr. Stejneger.

Beside the species collected at Bering Island, Mr. Grebnitzki had the kindness to include the following species from Petropavlovsk, Kamchatka, dredged in Avatcha Bay: *Acanthodoris pilosa* (O. F. Müll.) Bergh, white and purplish varieties; *Lacuna vincta* Montagu; *Litorina grandis* Middendorff, young specimens; *Margarita obscura* Couthouy; *Margarita olivacea* Brown and var. *gigantea* Leche; *Trophon multicostatus* Eschscholtz; and a *Bela*, closely allied to or identical with *B. turricula*.

In order to make the paper more useful I have added the species referred to Bering Island by Dr. Leche and Mr. C. Aurivillius, in their publications on the marine acephala and gastropoda of the Vega Expedition and included in the final list all those collected by Stejneger so as to make as nearly as possible a complete list of the known marine mollusk fauna of Bering Island. This adds about eighty per cent. of species to the original list. I am under the impression that the enumeration of the land and fresh-water species in the Stejneger report was sufficiently accurate for all purposes to which it is likely to be applied, though Dr. Westerlund is unable to accept one of my determinations. It is possible that I may have been in error as to the identity of *H. floccula* Mor. with the immature *H. pauper* Gld., which should probably be referred to *H. ruderata* Studer.

List of species.

Lestoteuthis fabricii (Licht.) Verrill?

L. fabricii Verrill, N. Am. Ceph., 390, 1881.

?Onychoteuthis kamtschatica Midd., Mal. Ross, II, p. 186, pl. XII, figs. 1–6, 1849.

Young specimens according pretty well with the description of Middendorf, but to a cursory examination not showing traces of the large hooks on the clavulæ of the tentacular arms, were obtained by Greb-

nitzki on Bering Island. Specimens have been submitted to Professor Verrill who has made a special study of this group and will probably be reported upon by him at a later period.

Cylichna propinqua M. Sars.

C. propinqua Dall, Point Barrow shells, p. 526, 1884.
C. reinhardti Möller, Ind. Moll. Grönl., p. 6, 1842 (*proparte*).

Found in seventy-five fathoms water near Bering Island, by the Vega Expedition (Aurivillius).

Æolidia papillosa (L.) Bergh.

Bering Island, Grebnitzki.

Cadlina pacifica Bergh.

C. pacifica Bergh, Sci. Res. Expl. of Alaska, 176, pl. VII, figs. 19–20; pl. VIII, figs. 7–18, May, 1879.

Bering Island, Grebnitzki. Unalashka and Shumagin Islands, Dall.

Acanthodoris pilosa (O. F. Müll.) Bergh.

A. pilosa Bergh, l. c., p. 240, pl. X, figs. 12–15; pl. XI, figs. 1–2; pl. XII; pl. XIII, figs. 2–5, Jan., 1880.

Bering Island, Grebnitzki.

Siphonaria thersites Carpenter.

S. thersites Cpr., 1864. Aurivillius, Vega Exp., IV, p. 374, pl. XII, figs. 19–20; pl. XIII, fig. 16, 1885.

Shores of Bering Island, Vega Expedition; thence to Puget Sound via the Aleutians and shores of the mainland, Dall.

Tonicella submarmorea Middendorff.

Chiton submarmoreus Midd., Bull. Petersb. Acad. Sci., IV, No. 8, 1846.
Chiton insignis Reeve, Conch. Icon. *Chiton*, fig. 148.
Tonicella submarmorea Dall, Sci. Res. Expl. of Alaska, p. 109, pl. I, fig. 7, 1878

Bering Island, Grebnitzki. Japan, Okhotsk Sea, Aleutians, Alaska, to Washington Territory; Middendorff and Dall, l. c.

Trachydermon ruber (L.) Carpenter.

T. ruber Dall, l. c., p. 102, pl. I, fig. 3, 1878.

Bering Island, Grebnitzki. Northern seas generally.

Placiphorella stimpsoni Gould.

Chiton (Molpalia) stimpsoni Gld., Proc. B. S. Nat. Hist., VII, p. 161, 1859; Otia, p. 118, 1862.

Bering Island, Grebnitzki, five specimens; Hakodadi Bay, Stimpson. California (*P. velata* Cpr.)?; Chile, Lobos Islands (*P. Blainvillii* Brod.)?

This species, which is identified from Gould's type, is especially interesting. It would seem as if its real home was in the Commander and Aleutian Islands. In 1874 I dredged a single middle valve of large size in twenty fathoms gravel at the Semidi Islands. This and the Bering Island specimens are finely grown.

The *P. velata* Cpr., type of the section, is found at Monterey, California. The *P. Blainvillii* Brod. (1832) is reported from the inner Lobos

Island off the Chilian coast. The *P. imporcata* and *sinuata* of Carpenter (1865) appear to differ from the others in the fine, close granular scales covering the girdle, and should form a section by themselves, characterized by that character, by the narrower and higher valves and less patulous anterior extension of the girdle, apparently from the dried specimens not papillose below; as well as a pronounced sculpture, absent from all of the *velata* type. The latter have broader, flatter valves, an enormous anterior extension of the girdle, studded with papillæ below and long tubular mail-clad but flexible spines above, and a series of the latter one opposite each end of each suture in a distinct pore. The girdle, except for these spines, is naked, and on the valves, except for rude ridges of growth and obsolete sutural ridges, there is no pronounced sculpture. For the group typified by *P. Blainvillii* the name *Placiphorella* must be retained, for the *P. sinuata* group I would propose the name *Osteochiton*. As to the species of the *Placiphorella* group, when the two incongruous forms are eliminated, we have the *P. Blainvillii*, which differs from the northern forms, according to Dr. Carpenter, by a fewer number of slits in the anterior valve, the *P. stimpsoni* of Gould, above mentioned, and the *P. velata* of Carpenter. These two are very similar and may require consolidation when a sufficient series of both can be obtained for comparison.

Leptochiton cancellatus Sowerby.

Chiton cancellatus Sby., Conch. Ill., f. 104–5, 1839.

Bering Island, Grebnitzki. Alaska, not north of the Aleutians, Dall; British seas, Norway, &c.

Acmæa testudinalis patina (Eschscholtz) Dall.

A. testudinalis (L.), var. *patina* Dall, Sci. Res. Expl. Alaska, p. 122, Dec., 1878.

Bering Island, Grebnitzki; and Vega Expedition, Aurivillius.

These specimens are nearer the typical *patina* than to the typical *testudinalis*.

Acmæa pelta Eschscholtz.

Bering Island, Grebnitzki.

Velutina cryptospira Middendorff.

Bering Island, Grebnitzki.

Litorina sitkana Philippi.

L. tenebrosa Mont., var. *costulata* (Midd.), Aurivillius, Vega Expl., IV, 325, pl. 12, fig. 6, 1885.

Bering Island, Vega Expedition.

Litorina sitkana, var. **atkana**, Dall.

L. tenebrosa Mont., var. *obtusatæa* (Midd.), Aurivillius, Vega Exp., l. c., p. 325, pl. 12, figs. 4, 5, 1885.

Bering Island, Aurivillius.

This fine, large form, which, from its colossal size at Atka Island and Kyska, I have distributed for ten years under the name above given, is, to my mind, closely related to *sitkana*, from which it differs in its larger size, smooth surface, and tendency to spiral bands of white and dark-brown. Until the whole group can be carefully studied and dissected, it would be foolish to be dogmatic in opinion about them, but I have not been able from a study of about a bushel of the shells merely, to indentify this form with *tenebrosa*, or find any special likeness in it to *obtusata*.

LACUNA.

Lacuna vincta Montagu.

Bering Island, Grebnitzki.

Subgenus HALOCONCHA.

Lacunella Dall, Proc. U. S. Nat. Mus., VII, p. 344, 1884. Not of Deshayes.
Lacunaria Dall, in errata, l. c., p. viii. Not of Conrad.

The writer having examined the last nomenclator and finding no mention of *Lacunella*, and totally forgetting Deshayes's use of the name, was careless enough to look no further, and his erratum, prepared at the last moment and without time for an exhaustive search, was as unfortunate as his first venture. The present name is substituted with some apprehension, but not until after a careful and thorough search.

Natica clausa Broderip and Sowerby.

Bering Island, Vega Expedition.

Aurivillius makes this = *N. grönlandica* (Beck) Möller, though he gives Möller's species subsequently, and speaks of it as having a horny operculum. The first mention probably should be *septentrionalis* (Beck) Möller, which is identical with *clausa*, but applied thirteen years later.

Turritella (Tachyrhynchus) erosa Couthouy.

T. erosa (Couthouy) Aurivillius, l. c., p. 322, pl. 12, fig. 7; pl. 13, fig. 17.
T. polaris Beck, Möller. Index, Moll. Grönl., 1842.

Bering Island, dredged in 65 fathoms, Vega Expedition.

This species, common to the Arctic seas, is very much larger in the Arctic Ocean than in the Aleutians or on the New England coast.

Cerithiopsis stejnegeri Dall.

Bering Island, one fine specimen, Grebnitzki.

Tritonium oregonense Redfield.

Triton oregonense Redfield, Ann. Lyc. Nat. Hist. N. Y., IV, p. 165, pl. XI, figs. 2*a*, 2*b* (immature), 1846 (Str. of Fuca). Gould, Expl. Exp., Shells, p. 241, 1852.
Fusus oregonensis "Say" Reeve. Conch. Icon., IV, Mon. *Fusus*, figs. 61*a–b*, 1848 (North America).
Tritonium cancellatum Midd., Mal. Ros., II, 165, pl. III, figs. 1–4, 1849. Not of Lamarck.

Tritonium (Lagena) oregonense H. & A. Ad., Gen. Rec. Moll., I, p. 104, 1858.
Priene oregonensis A. Ad., Journ. Lin. Soc., VII, 106, 1864. Cpr., Rep. Br. As., 1863, pp. 597, 661, &c.
Tritonium cancellatum Schrenck, Amurl. Moll., p. 431, 1867. Not of Lamarck (Hakodadi Bay).
Tritonium oregonense Lischke, Jap. Meer. Conch., II, p. 166, 1871; III, p. 31, 1874. Dunker, Ind. Moll. Jap., p. 30, 1882.
Priene cancellata Tryon (pars), Man., III, pp. 33, 34, pl. XVI, figs. 165–167, 1880.
Tritonium cancellatum Aurivillius, Vega Exp., Vet. Arb., IV. p. 346, pl. XIII, fig. 8 (dentition), 1885.

Monterey, California, northward to the Aleutians, Dall; Bering Island, 5–10 fms. hard bottom, Vega Expedition, one specimen; Kamchatka, Dall; Kurile Islands; Okhotsk Sea and Japan, Middendorff, Schrenck, Dunker and Stimpson.

With but one specimen of this shell it was not remarkable that Mr. Aurivillius should fall into line with several older naturalists who have asserted the identity of the Alaskan shell with that from Patagonia, although Reeve, Gould, Arthur Adams, Carpenter, Lischke, Dunker, and its describer have pointed out the distinctions between them in various publications. But from the first there has been an amount of blundering in regard to the habitat of the few shells related to this species which seems surprising.*

Chemnitz correctly figured and described the Patagonian shell from his own cabinet and assigned it a proper habitat. Were he consistently as binomial throughout as he is in this instance his specific name should stand. Lamarck followed, and the first to blunder was Reeve, who figured the southern shell and assigned it an Alaskan habitat while figuring the real but immature Alaskan shell on the same plate and merely assigning it to "North America." This led others into error. Carpenter, in his first (but not his second) report to the British Association, assigns both *cancellatum* and *scaber* (King) to the Arctic, an error which he realized later. Tryon, in his latest manual, has followed this account, and, although referring to Gould's figures of the Patagonian living animal taken on the spot by Couthouy, queries its southern distribution. It would seem, since he gives no figure of the adult *oregonense*, that his material was insufficient to come to a decision upon.

One reason why so much confusion has prevailed is perhaps that the *oregonense*, while a very common shell from Monterey, Cal., to the Aleuti-

* To make the matter clearer the synonymy of the Patagonian species is appended:

Tritonium cancellatum Lamarck.

Murex magellanicus Chemnitz, Conchyl. Cab., X, p. 275, tab. 164, fig. 1570, 1788 (Magellan Strait).
Triton cancellatum Lamarck, An. S. Vert., ed. I, VII, p. 187, 1822; ed. 2, Deshayes, IX, p. 638, 1843 (S. America).
Fusus cancellatus Reeve, Conch. Icon., IV, Mon. *Fusus*, fig. 62 (only). 1848 (Unalashka, Kamchatka)!
Priene cancellatus A. Adams, Journ. Lin. Soc., VII, p. 106, 1864 (Patagonia).
Priene cancellata Tryon (pars), Man., III, p. 34, pl. 16, fig. 164 (only).

ans, is almost always broken, defaced, truncated, and unpleasing by the time the waves have cast it on the beach. The shell is so thin and the epidermis so strong that the young shells in drying always break; I have seen many hundreds but never one adult with the apex complete. The epidermis is also much more fugitive than in the southern form and rarely covers the shell, or, when it does, it comes off as soon as the shell is dried for the cabinet. The fry has a pretty horn-colored shell, with revolving keels like a *Torellia;* the young animal much resembles a pteropod, has two ciliated, wing like, lateral flaps with which it progresses and is brilliantly colored with metallic grass-green. I have taken it in the tow-net far from land, which may account for its wide distribution. The adult animal is pinkish flesh-color more or less mottled with slaty or purple streaks in great variety; the foot is short for the size of the animal, the nucleus of the concentric operculum is not terminal but just within the margin on one side of the longer axis of it, as in some (but not most) buccinums.

The adult shell is more turreted, has deeper channels and coarser sculpture than the *cancellatum;* the epidermis is longer, thicker, and coarser; the transverse riblets in the young are 12–13 to the whorl, in the adult, 19–21; in *cancellatum* the adult has 34–38 of them and they extend more distinctly over the periphery; in *oregonense* the sutures are deeper, there is a flattened space on the whorl just in front of them, the whorls do not increase in such rapid proportion, and the mouth of the shell is shorter in proportion to the whole length than in *cancellatum.* The varices in the latter are less numerous, less constant, and less raised above the ordinary riblets than in *oregonense.* I have probably examined in the field more specimens of *oregonense* than all other naturalists put together have ever seen. In the National Museum is a good series of it and of the true *cancellatum* from Patagonia, the latter brought back by the Wilkes exploring expedition. With this material I have no hesitation in declaring, in common with Gould, Carpenter, A. Adams, Lischke, and Dunker, the distinctness of the two species. It should also be remembered that the most adjacent extremes of their distribution are separated by some thousands of miles. I have no confidence in any reported occurrence of *cancellatum* in Japan, the statement being doubtless due to an erroneous identification, or an error in labelling. Peru is the furthest north that I have heard claimed for *cancellatum*, and this with much doubt; *oregonense* is not known south of San Diego, Cal., if it even reaches so far, as it has never yet been reported south of Santa Barbara.

Trichotropis insignis Middendorff.

Bering Island, Grebnitzki.

This species is extremely variable in form and sculpture. *T. solida* Aurivillius presents some resemblance to certain of these varieties, with which it should be compared, though their identity cannot be assumed.

Margarita helicina Fabricius.

Bering Island, Grebnitzki.

Margarita varicosa Mighels.

Bering Island, one specimen dredged at 65 fathoms by the Vega Expedition.

Margarita vorticifera Dall.

Bering Island, Grebnitzki.

Purpura lima Martyn.

P. Freycinetii Deshayes, 1839. Aurivillius, l. c., p. 334, pl. 12, figs. 1, 2, 1885.

Bering Island, collected by the Vega Expedition.

This species differs from *P. lapillus* of all varieties in never having a toothed aperture. The real analogue of *P. lapillus* on the northwest coast, paradoxical as the statement may at first appear, is *P. crispata* and not *P. lima*.

Strombella callorhina Dall, var. stejnegeri Dall.

Bering Island, Grebnitzki; dredged in 5–10 fathoms at Bering Island by the Vega Expedition.

The specimens sent by Mr. Grebnitzki were rude and worn, though living; from most of them the delicate striation was nearly all worn away, and the strength and sharpness of the transverse ribbing was very variable.

Chrysodomus (Tritonofusus) kroyeri Möller.

Fusus arcticus Philippi.
Fusus cretaceus Reeve (when dead and chalky).

Bering Island, 75 fathoms, dredged by the Vega Expedition.

Chrysodomus spitzbergensis Reeve.

Fusus terebralis Gould.
Sipho lividus Mörch.

Bering Island, Grebnitzki, one very young specimen. An adult was collected by Stejneger.

Columbella (Astyris) rosacea Gould.

Bering Island, Grebnitzki.

Volutharpa ampullacea Middendorff.

Bering Island, Grebnitzki. Several specimens had no operculum and only traces of the opercular gland.

Buccinum tenue (Gray) Stimpson.

Bering Island, dredged in 65 fathoms by the Vega Expedition. The var. *elatior* Midd. was obtained in 75 fathoms.

Buccinum cyaneum Brugiére, var. **mörchianum** Fischer.

Bering Island, Grebnitzki; Vega Expedition, dredged in five to ten fathoms on hard stony bottom.

Buccinum percrassum Dall.

Cf. Kobelt, Mon. Buc., Mart. und Chemn. neueste Ausg.

Two specimens of this form, whose nearest relative is *B. polare* (though at first sight it looks much more like *B. cyaneum*) were discovered among some *B. cyaneum*, var. *mörchianum*, collected by Stejneger, too late to insert in my preceding paper on Bering Island mollusks. The soft parts had not been observed before. The shell is thick, like the Arctic form figured by Dr. Kobelt from photographs of my type, but smaller and much darker colored. The operculum is disproportionately large for a *Buccinum*, nearly filling the aperture, and making a striking contrast with that of *B. mörchianum*, which is always minute and much of the time absent entirely.

Pleurotoma beringi Aurivillius.

P. beringi Aurivillius, Vega Exp., l. c., p. 354, t. 13, fig. 3, 1885.

Bering Island, Vega Expedition, dredged in 75 fathoms, sand, one specimen; several others were obtained between that and St. Lawrence Island in 55 fathoms, sand. This is a very interesting and characteristic species somewhat resembling a dextral *P. vinosa*.

Bela violacea Mighels and Adams.

Pleurotoma violacea Migh. & Ad., Bost. Soc. Nat. Hist. Proc. I, p. 50, 1841. Bost Journ. Nat. Hist., IV, p. 51, pl. IV, fig. 21, 1842. Verrill, Conn. Acad. Trans., V, 482, 1882. Not of Aurivillius, l. c., p. 348, 1885.

Bering Island, Grebnitski.

Prof. Verrill regards this form as a variety of the previously described *Pleurotoma bicarinata* Couthouy (1839). It has many other synonyms, but I cannot agree that it is nearly related to *simplex* Midd., *arctica* A. Adams, *gigas* Verkruzen, etc., as supposed by Mr. Aurivillius. It may be, however, that he is not acquainted with the genuine *violacea* and so has been misled by specimens incorrectly labelled.

Saxicava rugosa Linné.

S. pholadis Leche, Vega Exp., l. c., III, p. 440, 1883.

Shores of Bering Island, Vega Expedition.

Cuspidaria (Cardiomya) pectinata Cpr., var **beringensis** Leche.

Neæra behringensis Leche, l. c., p. 438, pl. 32, figs. 1, 2, 1883.

Bering Island, dredged on a sandy bottom at the depth of 65 fathoms by the Vega Expedition. Port Etches, 15 fathoms mud, and elsewhere in Alaska in about the same latitude, Dall.

Tapes staminea Conrad.

Venerupis petitii Deshayes, Midd. and Leche, l. c., p. 440, 1883.
Tapes diversus Sowerby fide Dunker.

Shore at Bering Island, Vega Expedition.

Modiolaria lævigata Gray?

M. laris Beck, Leche, l. c., p. 450, pl. 34, figs. 29, 30, 1883.

Shore at Bering Island, Vega Expedition.

The two forms figured by Leche as *lævigata* and *lævis* certainly exist; but the differences between them are such as ordinarily characterize the sexes in diœcious acephala, and I have always so referred them. Further investigation may be needed to settle this.

Pecten (Propeamusium) alaskensis Dall?

Pecten Hoskynsi Forbes, var. *major* Leche, l. c., p. 452, 1883.

Near Bering Island in 75 fathoms, Vega Expedition.

In a study of the deep-sea pectens of this group, in connection with the Pectinidæ of the Blake dredgings, I have determined that the genuine *Pecten hoskynsi* is not an Arctic species; the shells called *Hoskynsi* by Jeffreys and others from Arctic Norway, &c., are *P. pustulosus* Verrill, which has no internal ribs; from Alaskan waters and the adjacent Arctic seas the only pecten yet found belonging to this group is the *P. alaskensis* Dall (1871), which has many more internal ribs than the Atlantic forms and was pronounced distinct by Jeffreys. It is probable that this is what Dr. Leche refers to, because it is not rare in the region and might be expected to occur there. Still in the absence of figures or specimens I do not feel like expressing a dogmatic opinion in regard to it.

Placunanomia macroschisma Deshayes.

Bering Island, Grebnitzki.

This completes the list of additions and the following table will sum up the total mollusk-fauna, giving at one glance the known species, the collectors, and something of the range of the forms referred to:

FAUNAL SUMMARY.

Species of Commander Islands.	Collected by—			Range.				
	Steijneger.	Grebnitzki.	Vega Exp.	Japan.	Kamchatka.	Arctic.	Aleutians.	California.
Gonatus amœnus	×					×	×	
Lestoteuthis fabricii (?)		×		×	×			
Cylichna propinqua			×			×	×	
Eolidia papillosa	×	×					×	
Cadlina pacifica		×					×	
Acanthodoris pilosa		×				×	×	
Limax (Agriolimax) hyperboreus	×		×		×	×	×	
Vitrina exilis	×		×	×	×	×	×	×
Hyalina radiatula	×				×	×	×	
Conulus fulvus var	×		×	×	×	×	×	
Patula ruderata var. pauper	×		×	×	×			
Pupilla decora and arctica	×		×		×	×	×	
Limnæa ovata	×		×		×		×	
Limnæa humilis	×				(?)			
Siphonaria thersites			×				×	
Trachyradsia aleutica	×						×	
Tonicella marmorea	×			×	×	×	×	×
Tonicella submarmorea		×		×	×	×	×	
Trachydermon ruber		×		×	×	×	×	
Schizoplax brandtii	×				×		×	
Leptochiton cancellatus		×						
Placiphorella stimpsoni		×		×				(?)
Cryptochiton stelleri	×			×	×	×	×	×
Acmæa testudinalis patina		×			×	×	×	×
Acmæa pelta	×	×					×	×

FAUNAL SUMMARY—Continued.

Species of Commander Islands.	Collected by—			Range.				
	Stejneger.	Grebnitzki.	Vega Exp.	Japan.	Kamchatka.	Arctic	Aleutians.	California.
Velutina cryptospira		×			×		×	
Piliscus commodus	×					×	×	
Crepidula grandis	×			×	×	×	×	
Litorina sitkana	×			×	×		×	×
Litorina var. subtenebrosa			×	×	×	×	×	
Litorina var. atkana			×				×	
Lacuna vincta	×	×		×	×	×	×	×
Haliotis reflexa	×						×	
Natica clausa			×	×	×	×	×	
Natica russa	×				×		×	
Tachyrhynchus erosa			×	×	×	×	×	
Trichotropis insignis	×	×			×		×	
Tritonium oregonense			×	×	×		×	×
Cerithiopsis stejnegeri	×	×					×	
Margarita helicina	×	×		×	×	×	×	
Margarita verticifera		×			×	×	×	
Margarita varicosa			×		×	×	×	
Purpura lima			×	×	×	×	×	×
Trophon truncatus	×					×	×	
Strombella var. stejnegeri	×	×	×			×		
Tritonofusus Kroyeri			×			×	×	
Chrysodomus liratus	×				×	×	×	
Chrysodomus spitzbergensis	×	×			×	×	×	
Volutharpa ampullacea		×		×	×	×	×	
Astyris rosacea		×			×	×	×	
Buccinum tenue			×			×	×	
Buccinum var. mörchianum	×	×	×		×		×	
Buccinum percrassum	×					×		
Pleurotoma (Bela) violacea		×				×	×	
Pleurotoma beringi			×				(?)	
Pholas crispata	×			×				×
Pholadidea penita	×			×				×
Saxicava rugosa	×		×	×	×	×	×	×
Mya truncata	×				×	×	×	
Cuspidaria var. beringensis			×				×	
Siliqua patula	×				×			×
Mactra falcata	×					×	×	
Macoma middendorffi	×						×	
Tapes staminea	×		×	×	×		×	×
Cardium grönlandicum	×			×	×	×	×	
Cardium blaudum	×				×		×	
Pisidium æquilaterale	×						×	
Modiolaria discors	×			×	×	×	×	
Modiolaria lævigata (var. ?)			×		×	×	×	
Modiola modiolus	×			×	×	×	×	×
Mytilus edulis	×			×	×	×	×	×
Pecten (?) alaskensis			×				×	
Placunanomia macroschisma		×		×	×		×	×
Total, 74 species	45	23	25	28	44	41	63	17

There is doubtless quite a number of species which would be revealed by dredging, which is a difficult task in such seas for persons whose busy time is precisely that season of the year when dredging can best be done. It is probable, however, that the additions thus made would, like the eighty per cent. of additions now chronicled, only confirm the remarks with which my report closed (l. c., p. 349).

"These figures show that the fauna of the Commander Islands, as far as known, is intimately related to the general Arctic fauna, and especially to the Aleutian fauna, somewhat less so to the Kamchatka fauna, but presents in itself nothing distinctive. While the faunal aspect of the mollusca is boreal, there is a number greater than might be

expected of species common to Japan and California, of which the two Pholads are the most noteworthy, as they have not yet been indicated from the Aleutian Islands, though it seems hardly possible if found living at the one locality that they can be absent from the other."

Noting that the connection with Japan is rather that the northern forms extend southward to Japan than that any characteristic Japanese forms extend north, the final paragraph still remains unshaken.

"The collection, though small, is valuable as closing a gap in our knowledge of the geographical distribution of the mollusca of the North Pacific, and the slight but still interesting confirmatory zoological evidence which it adds to the hydrographic determinations which have shown that the main current of the sea between Kamchatka and the Aleutian chain is a cold set of Arctic water southward, and that no perceptible warm northward tropical stream or branch of the Kuro Siwo can be traced zoologically or hydrographically in this direction."

It is probable that Mr. Grebnitzki sent those forms which he believed not to have been represented in Dr. Stejneger's collection rather than a complete series, and that he has actually a series nearly as full as that enumerated here from all sources.

NOTE.—Since the above was written I have examined the Gould collection now in the State cabinet at Albany, N. Y. This has experienced some vicissitudes, which may account for the fact that the shell now standing for the type of *Conulus pupulus* is not a *Conulus* at all, but the young of a conical flattened Japanese *Hyalina* (?) of a group entirely foreign to the Kamchatkan region. The *H. pauper* of Gould is the shell I have regarded as the adult *H. floccula* Mor., and which Dr. Westerlund perhaps correctly refers to a variety of *H. ruderata* Studer. I may add that to the preceding list should be added the *Acanthinula harpa* Say, collected at Bering Island by the Vega, on the authority of Dr. Westerlund, but not found by Grebnitzki or Stejneger.

ON THE OCCURRENCE OF A NEW SPECIES OF RHINOPTERA (R. ENCENADÆ) IN TODOS SANTOS BAY, LOWER CALIFORNIA.

By ROSA SMITH.

In the year 1882, Miss Fanny E. Fish, then residing near Encenada, Lower California, found, on the beach near that place, one jaw of hexagonal teeth which evidently belong to a species of *Rhinoptera*. The teeth were sent to me for identification and have now been presented by me to the U. S. National Museum.

It is a lower jaw and has fourteen series of hexangular teeth, the sinistral outer row nearly twice as broad as the narrowest inner series, the dextral outer series a little broader, just equaling two of the narrowest series and one and a half times broader than long. The teeth of the two sides of the jaw differ from each other. Inside the sinistral outer series are four rows of smaller teeth, as broad as long, nearly uniform in shape and size, the width of the four rows collectively equaling one and two-fifths times the width of the series of the broad teeth just inside them; the teeth in this row are the broadest of the jaw and about twice as broad as long. The seventh sinistral series has teeth that are somewhat enlarged, two-thirds the diameter of the sixth and widest series just described, scarcely broader than long. Inside the dextral outer row are two rows of enlarged teeth, slightly larger than the seventh sinistral series; immediately inside these are three rows of narrow teeth, similar to the four rows of small teeth next the sinistral marginal row; the seventh dextral row and the central series contain small teeth that coalesce into a single row a little back of the center of the jaw. The jaw anteriorly has fifteen series of teeth, and posteriorly only fourteen, by the coalescence of the teeth of the central and seventh dextral series, as above stated.

The jaw is weather-worn, and has lost a few of the teeth, including both its front and back margins.

This jaw can only belong to a species of *Rhinoptera*, and among the described species the only one which closely approaches it is *Rhinoptera polyodon* Günther, based on a pair of jaws of unknown origin. From the latter it differs in being somewhat unsymmetrical, the broadest series of teeth being the sixth (from one side, eighth from the other), and also in having the teeth in smaller number (fourteen rows instead of nineteen.)

It is probable, therefore, that the jaws from Todos Santos belong to a distinct species, which I may name *Rhinoptera encenadæ*.

San Diego, Cal., *November* 20, 1885.

AN ANNOTATED LIST OF THE MAMMALS COLLECTED BY THE LATE MR. CHARLES L. McKAY IN THE VICINITY OF BRISTOL BAY, ALASKA.

By FREDERICK W. TRUE,

Curator of the Department of Mammals.

The collection of mammals made by Mr. Charles L. McKay, whose untimely death is a matter for sincere regret, is one of very considerable interest.

Mr. McKay went to Alaska in 1881, and was accidentally drowned April 19, 1883. He was stationed at Fort Alexander, on Bristol Bay, and most of the specimens collected are from localities within a radius of a hundred miles from the fort.

The collection comprises 59 specimens, representing 23 species. Some of the labels contain special data regarding the specimens to which they are attached, and additional facts are given in a note-book found among Mr. McKay's papers. Others are not labeled.

The collection appears to indicate that the mammalian fauna of the Bristol Bay region does not differ from that of other districts in the same latitude lying further to the east.

CANIDÆ.

1. Vulpes fulvus decussatus (Desmarest). *Cross Fox.*

Two very fine male specimens (13618, 13619), from Nushagak, captured on February 20 and 15, 1882, respectively.

MUSTELIDÆ.

2. Putorius erminea (Linné) Griffith. *Ermine.*

Six specimens. No. 14085 is a female in summer pelage; mammæ, 6 pairs. No. 14077, female, taken at Ugashik River, November 10, 1881, is in winter pelage.

3. Putorius vison (Schreber) Gapper. *Mink.*

Two specimens. No. 13622, from Nushagak, captured October 5, 1881.

4. Lutra canadensis (Turton) F. Cuvier. *Otter.*

A young specimen was obtained at some point on the Nushagak River, and a larger male at Calluganuck.

URSIDÆ.

5. ? Ursus americanus Pallas. *Cinnamon Bear.*

Under No. 7, Mr. McKay wrote in his note-book as follows: "*Ursus americanus cinnamoneus;* two specimens, young. Skinned and brought in by the Indians, Kokwok, April 30, 1882." The specimens are cubs,

about 60^{cm} long, of a dark-cinnamon color. The muzzle is not especially lighter than the body. One, No. 13616, has a complete snowy-white collar, and is also white on the belly. The fore claws are strongly curved and sharp; they extend about 2^{cm} beyond the fur. The hind claws are smaller and protrude only about 1^{cm} beyond the fur. The hair is uniform in color from base to tip, and strongly crenulate.

OTARIIDÆ.

6. **Callorhinus ursinus** (Linné) Gray. *Fur Seal.*

One specimen. Locality not given.

SORICIDÆ.

7. **Sorex Forsteri** Richardson. *Forster's Shrew.*

Mr. McKay obtained three shrews (Nos. 14090–14092), which I have provisionally identified with this species. No. 14092 was sent to Dr. George A. Dobson for examination. Nos. 14090 and 14091 differ very considerably in coloration and proportions, but agree in dentition. They may belong to two distinct species. Exact localities are not given.

VESPERTILIONIDÆ.

8. **Vespertilio lucifugus** Le Conte.

A specimen from Iliamna Lake was collected in the spring of 1882. Iliamna Lake is in latitude 60°, and is, I believe, the most northern locality in America from which specimens of Chiroptera have been obtained. Mr. W. J. Fisher procured numerous specimens of the same species in Kodiak Island.

LEPORIDÆ.

9. **Lepus timidus** Linné. *Arctic Hare.*

Two specimens. No. 13620, collected at Nushagak, December 30, 1881.

LAGOMYIDÆ.

10. **Lagomys princeps** Richardson. *Pika.*

Two specimens from the Chigmit Mountains, collected during the winter of 1882.

"Said to be very plentiful in the mountains. The Indians in their vicinity have a superstitious dread about killing them, and cannot be hired to do so." (McKay's note-book.)

HYSTRICIDÆ.

11. **Erethrizon dorsatus epixanthus** (Brandt) Allen. *Yellow-haired Porcupine.*

Four specimens. No. 13621, a female, from Kokwok, collected April 10, 1882; Nos. 14087, 14088, fœtal, from Nushagak.

The Kokwok specimen is peculiar in the color and disposition of its spines and hair, and might merit subspecific designation were it not that the porcupines vary indefinitely in these particulars.

On the upper surfaces of the body the basal half of the under fur is white, the distal half is dark brown. The long hairs are yellow in the distal half, but some are white in the basal half, while others are brown. The hairs are about 15^{cm} long. With the under fur, they completely conceal the spines, except on the neck, rump, and tail. Spines are absent from the sides and are few in number and weak in the middle of the back. On the rump, however, they are numerous and strong, and, as already stated, are not mingled with, nor concealed by, long hair. They do not extend beyond the under fur, but are visible in it.

ZAPODIDÆ.

12. Zapus hudsonius Coues. *Jumping Mouse.*

Two specimens. Nushagak, August 21, 1882. "Rare; caught in a cache." (McKay's note-book.)

This rodent has been taken in somewhat higher latitudes in British America, but has not, I believe, been hitherto recorded from Alaska.

MURIDÆ.

13. Arvicola riparius Richardson. *Meadow Mouse.*

Seven specimens, Nos. 14099–14103, 14106, 14147. Localities not definitely given.

14. Evotomys rutilus Gapperi (Vigors) Coues. *Red-backed Mouse.*

One specimen, No. 14104. Locality not definitely given.

15. Myodes obensis Brants. *Lemming.*

A single young specimen, in summer pelage.

16. Cuniculus torquatus (Pallas) Coues. *White Lemming.*

Four specimens, in winter pelage, taken at Nushagak in the winter of 1882–'83. "Not very common. Found in the tundras, &c." (McKay.)

17. Fiber zibethicus (Linné) Cuvier. *Muskrat.*

Three specimens. No. 13626 taken at Nushagak, September 10, 1881; No. 13959, at Ugashik, July, 1881. No. 14076 is a pure albino.

CASTORIDÆ.

18. Castor fiber Linné. *Beaver.*

A young specimen (No. 13627), taken at Kokwok, December 17, 1881.

SCIURIDÆ.

19. Sciurus hudsonius Pallas. *Red Squirrel.*

Three specimens, taken in the vicinity of Lake Iliamna in the winter of 1882, belong to the subspecies *hudsonius*.

20. Spermophilus empetra Pallas. *Parry's Spermophile.*

No. 13958, taken at Nushagak, approaches the subspecies *Kodiacensis* in the small amount of rufous which is present. The sides and belly are lightly suffused with that tint, while on the shoulders and extremities it is somewhat stronger.

21. Arctomys pruinosus Gmelin. *Hoary Marmot.*

Two young specimens, respectively from the Upper and Lower Aleknagik Lakes; a third still younger. The white on the head of No. 13649 is very pure, and reaches back nearly to the base of the ears and downward to the eyes.

BOVIDÆ.

22. Ovis canadensis Dalli Nelson. *Dall's Sheep.*

Dall's sheep, of which two specimens, a male and female, were obtained by Mr. McKay, were reported to him to be plentiful in the Chigmit Mountains. The specimens procured were from that region.

The following measurements were made upon the flat skins and the horns:

	Male.	Female.
	cm.	*cm.*
Length from point between horn-cores to base of tail	139.5	133.5
Length from point between horn-cores to extremity of nose	.....	18.5
Length of horn, measured around the curve	94.5	20.0
Circumference of horn at base	28.5	.....
Distance between the points of the two horns	58.5	.....

The color of the hair in both sexes is cream-white throughout. The horns are also very light, but the hoofs are dull brown. The horns of the male are flat toward the tip and quite sharply pointed.

CERVIDÆ.

23. Rangifer tarandus caribou (Kerr). *Woodland Caribou.*

A male and a female were obtained at Nushagak in the early part of 1882.

NOTES ON SOME FISHES COLLECTED AT PENSACOLA BY MR. SILAS STEARNS, WITH DESCRIPTIONS OF ONE NEW SPECIES (CHÆTODON AYA).

By DAVID S. JORDAN.

A small tank of fishes lately sent by Mr. Silas Stearns to the museum of the Indiana University contains, among others, the following interesting species from the "Snapper Banks," near Pensacola. The type of the species which is regarded as new to science has been presented to the United States National Museum.

1. **Exoccetus heterurus** Rafinesque.

Exocœtus noveboracensis Mitchill.

One specimen, without barbels, answering very well to the account given by Jordan & Meek (Proc. U. S. Nat. Mus., 1885, 59).

2. **Exoccetus furcatus** Mitchill.

A young specimen, without barbels, agreeing well with our account, above cited, and corresponding almost exactly in size and in other respects to the figure given by Vinciguerra of his *Exoœctus maculipinnis*, from Tunis (Risultati Ittiologici del Violante, 1883, 113, tabola 1, f. 6).

3. **Siphostoma mackayi** Swain & Meek.

Two specimens differing somewhat from the original types of this species. Dorsal rays about 32, on $2\frac{1}{2}+5\frac{1}{2}$ rings. Rings 18+36. Form more slender than in the types (the specimen smaller however), the dark cross-bars more marked, about 14 in number, and broader than the interspaces. Light spots obsolete.

A manuscript species of this genus, *Siphostoma miurum*, Swain & Meek, from Key West, has been once or twice mentioned. The description of this species has been suppressed by its authors, because, in some way, its type has been lost or destroyed. The name is therefore null.

4. **Chætodon aya**, sp. nov. (No. 37747, U. S. N. M.)

Head $2\frac{1}{2}$ in length (3 with caudal); depth, $1\frac{3}{5}$ (2). D. XII, 18. A. III, 17. Scales, 9–36–17. Length of type, $1\frac{1}{2}$ inches.

Body short and deep, strongly compressed. Snout narrow, sharp, considerably produced, its length from eye $2\frac{2}{3}$ in head, its outline forming in front of eye a sharp angle with the profile of the head. Anterior profile steep and straight from before eye to first dorsal spine. Eye large, about as long as snout (in young), a little longer than post-orbital part of head.

Dorsal fin high, the second spine highest, very strong, as long as head. Soft dorsal high, higher than the posterior spines, the longest rays about half head. Anal similar to soft dorsal, its second spine stouter than

third, and about equal to it in length, about half length of head. Caudal fin somewhat rounded, $1\frac{1}{2}$ in head. Ventrals not quite reaching anal; pectorals still shorter.

Scales of moderate size, the soft parts of the vertical fins less scaly than usual. Lateral line running very high and ceasing abruptly under first ray of soft dorsal.

Color, in spirits, light yellowish, with two oblique jet-black cross-bands, and no other spots or ocelli. The first band involving first and second dorsal spines, then extending downward and forward, close behind the line of the profile and across the eye and across the cheek, where it is fainter. This band is a little narrower than the eye.

The second band is more than twice as broad as the first. It begins abruptly with nearly all the membrane of the fourth and fifth dorsal spines, covering the fifth spine from its base to near its tip. The posterior border of the black band extends from near the tip of the fourth spine in a straight line across the dorsal fin and the body to near the base of the last anal ray. The anterior margin runs in a slightly concave line from the base of the fourth spine to the middle of the base of the anal; the lower border follows the base of the anal fin without including any of it. The band is broadest on the dorsal fin and gradually narrows downward. Middle line of forehead with a dusky shade. No dark on soft dorsal, caudal, caudal peduncle, anal, pectorals, ventrals, or opercles.

This species is distinguished from *Ch. ocellatus* (=*maculocinctus* Gill), *Ch. sedentarius*, and other related species by the above-mentioned features of the coloration.

The type, a young example in good condition, was "spewed up" by a Red Snapper (*Lutjanus aya*) at the Snapper Banks near Pensacola.

5. **Cryptotomus ustus** Cuv. and Val.

The following description may be compared with that of *Cryptotomus beryllinus* (Jordan & Swain), given in Proc. U. S. Nat. Mus., 1884, p. 101, and that of *Cryptotomus dentiens* (Poey), given by me earlier in the present volume of these Proceedings.

Head 3 in length ($3\frac{3}{5}$ in total); depth, 3 ($3\frac{3}{5}$); length of specimen, 9 inches.

Body less elongate than in *C. beryllinus*, moderately compressed. Upper profile much less steep than in *C. dentiens*, less evenly convex than in *C. beryllinus*, little convex above the eye, and somewhat concave before it; snout longer than in other species, its length (measured along the axis) $2\frac{1}{3}$ in head. Distance from eye to angle of mouth half greatest depth of head, 3 in length of head, and $2\frac{1}{5}$ times diameter of eye. Eye small, $6\frac{2}{3}$ in head.

Jaws pale, some of the teeth each with a reddish brown spot. Upper jaw with a cutting edge of closely coalesced teeth. Outside of this is an irregular series of enlarged and projecting canines; the hindmost of

these near the middle of the side of the jaw, directed outward and backward; before this two smaller canines, and in front of the jaw about four more on each side, some of them directed downward and forward, the others variously divergent. Teeth of lower jaw compressed, larger than in any of the other species, mostly in two series, the posterior series ceasing anteriorly in front of the middle of the side of the jaw, the anterior series extending a little farther back than the front of the posterior series. The posterior series extends horizontally along the edge of the bone in front; the anterior series has its teeth placed on the edge of the bone in front, those behind inserted lower and lower, so that the last teeth of this series are placed entirely below the first of the posterior series, thus—

In the front of the jaw are a few teeth imbricated outside the anterior series, forming a partial third row. Upper lip double for its entire length.

Fins and scales about as in *Cryptotomus beryllinus*, the last rays of the soft dorsal and anal rather higher; the former 3 in head.

Color, in spirits, olive gray, with irregular marblings of slaty gray; four diffuse darker blotches along base of dorsal, as in *C. beryllinus*, but with none of the pale streaks shown in that species. Dorsal, pale olive, finely mottled with darker cross-lines. A black blotch on the membrane of the first and second spines. Caudal and anal, dull olive, nearly or quite plain. Pectorals and ventrals pale.

This is evidently the *Callyodon ustus* Cuv. & Val., but not the *Callyodon dentiens* of Poey, which is represented by a specimen before me from Havana.

Callyodon retractus Poey, is probably identical with *C. dentiens*. In any case, it cannot be *C. ustus* or *C. beryllinus*, as the snout is said to be shorter and steeper than in *C. dentiens*.

The *Callyodon auropunctatus* Cuv. & Val., is very close to *C. dentiens*. Comparing the description given of the former by Guichenot (Scarides p. 60) with my specimen of the latter, I see no difference except in the color of the spots on the scales and fins which are brownish rather than "dorée," as stated by Guichenot, or "aurore," as described by Valenciennes. The characters given below are taken by me from the original type in the museum at Paris.

The five known American species of *Cryptotomus* may be thus compared:

a. Posterior canine present, preceded by about two smaller canines.

b. Lateral teeth of lower jaw unequal, the posterior teeth much larger than those near the middle of the side of the jaw, which are wholly coalescent; profile strongly convex above eye, thence nearly straight to tip of snout; distance from eye to angle of mouth, about twice diameter of eye; snout (measured along axis) nearly 3 in head ..... DENTIENS.

bb. Lateral teeth of lower jaw subequal, arranged in two rows which are not parallel; profile slightly convex above eye, thence somewhat concave; distance from eye to angle of mouth nearly 3 times diameter of eye; snout (axially) $2\frac{1}{3}$ in head ..... USTUS.

aa. Posterior canine single; teeth otherwise essentially as in *C. ustus;* snout rather sharp, $2\frac{3}{5}$ in head; front canines small; lower lip not double for its whole length ..... AUROPUNCTATUS.

aaa. Posterior canines, none; lateral teeth in each jaw subequal, those of the lower jaw larger than those of the upper.

c. (Teeth of outer (anterior) series in upper jaw numerous, large, divergent, canine-like, free to their bases; lower jaw with numerous canines; body elongate, the depth 4 in length; snout pointed, 3 in head; eye large, profile not steep, gently arched; diameter of eye greater than its distance from angle of mouth, color chiefly rosy.) (Cope.*) ..... ROSEUS.

cc. Teeth of outer (anterior) series in upper jaw few, small, non-divergent, not canine-like, and scarcely differentiated; lower jaw without enlarged teeth; body moderately elongate, the depth $3\frac{1}{2}$ in length; snout rather sharp, $2\frac{3}{4}$ in head; profile gently curved, not steep; diameter of eye, $1\frac{1}{2}$ in distance from eye to angle of mouth; color chiefly olive gray ..... BERYLLINUS.

6. **Prionotus stearnsi** Jordan & Swain.

Adult example. Head $2\frac{4}{5}$ in length ($3\frac{1}{3}$ with caudal); depth $4\frac{1}{5}$ ($5\frac{1}{5}$). Dorsal IX, 12; anal 12; scales in transverse series about 50; pores in lateral line about 52; length of specimen, $14\frac{1}{2}$ inches.

Body rather robust, formed much as in *P. tribulus;* width of nape between occipital spines not quite one-fifth the length of the head. Head very large, broad, and unusually smooth, the profile, except for the prominence of the orbital region, forming a very gentle and somewhat regular arch. Snout very broad, truncate at tip, its breadth at tip $3\frac{1}{5}$ in head, its length $2\frac{2}{5}$; edge of snout granular, without any spines.

Surface of all bones of head very finely, evenly, and regularly striated, the striæ much finer than in *P. tribulus*, their granulations all minute.

Mouth wide, the maxillary reaching front of eye, its length about $2\frac{1}{2}$ in head. Band of palatine teeth well developed. Eye large, placed high, its diameter $5\frac{1}{2}$ in head. No cirri. Interorbital space about as in *P. tribulus*, rather broad and moderately concave, wider than the eye, and about 5 in head.

Bone at anterior portion of orbital rim very prominent, serrulate, its principal ridge ending in a stout, blunt spine. Supraorbital rim little prominent and without spine. No cross-groove on top of head. A slight, bluntish spine behind eye. No spines on temporal ridge. Outer pair of occipital spines short, strong, compressed, not quite reaching front of dorsal. Inner pair and their ridges obsolete. Opercular and preopercular spines short, the latter with no smaller one at its base. Upper opercular spine very weak. Humeral spine moderate. Membranaceous flap of opercle with about five rows of scales. No spine on cheek-bone.

Gill-rakers short and few, little longer than in *P. ophryas*, the longest about one-third interorbital width, about half longer than the inter-

**Cryptotomus roseus* Cope, Trans. Am. Phil. Soc., 1871, 462.

spaces, and perhaps five times as high as broad. About nine gill-rakers developed.

Scales comparatively large, those on the back little reduced in size, about ten before dorsal fin. Seven scales in a vertical row from first ray of soft dorsal to lateral line.

Dorsal fins rather low and strong (the first injured), with its anterior margin not granulated; the third $2\frac{2}{3}$ in head. Soft dorsal moderate, its longest ray $3\frac{1}{4}$ in head. Caudal very slightly concave, its longest rays $1\frac{4}{5}$ in head.

Pectoral fins rather short, reaching third ray of anal, $2\frac{1}{2}$ in body, their length little more than length of head. Detached rays tapering, a little more than half head. Ventrals about reaching vent, $1\frac{1}{4}$ in head.

Color, in alcohol, nearly plain brownish olive, with dark shades at the bases of many of the scales, giving a mottled appearance; head everywhere conspicuously reticulate with blackish, in fine pattern. Pectoral fin dusky, with a net-work of fine black cross-streaks. Dorsals similarly marked, the spinous dorsal with a diffuse black blotch between the fourth and sixth spines. Caudal plain, slightly dusky. Anal and ventrals pale. Pectoral filaments nearly so.

The specimen here described in splendid condition, is larger in size than any other individual of any species of *Prionotus* which I have ever seen.

7. Gnathypops mystacinus Jordan.

A fine specimen, considerably larger than the original type. Maxillary a little longer, $4\frac{1}{2}$ in body.

8. Malthe vespertilio L.

A specimen with the snout very long, $4\frac{2}{5}$ in length to base of caudal.

9. Canthigaster rostratus Bloch.

(*Tetrodon ornatus* Poey)

A small specimen, about 2 inches long, agreeing fairly with Günther's description. Upper and lower edge of caudal abruptly jet-black, this color extending as a dark stripe along median line of caudal peduncle above and below. No cross-bands on tail (these appearing with age?). Belly with conspicuous two-rooted prickles; some prickles and granulations on the back.

The name *Psilonotus*, formerly adopted for this genus by Dr. Gill and the writer, is preoccupied.

To the list of fishes from the stomachs of *Lutjanus aya* on the "Snapper Banks" of Pensacola, given in these Proceedings for 1884, p. 39, the following may be added:

Siphostoma mackayi Swain & Meek.
Exocœtus furcatus Mitchill.
Anthias vivanus Jordan & Swain.
Chætodon aya Jordan.
Cryptotomus ustus Cuv. & Val. (not from stomachs).
Pomacentrus caudalis Poey.
Prionotus ophryas Jordan & Swain.
Prionotus stearnsi Jordan & Swain.
Porichthys porossimus Cuv. & Val.
Canthigaster rostratus Bloch.
Malthe vespertilio L.

INDIANA UNIVERSITY, *January* 27, 1886.

A REVIEW OF THE AMERICAN SPECIES OF TETRAODONTIDÆ.

By DAVID S. JORDAN and CHARLES L. EDWARDS.

In the present paper we have attempted to review the synonymy of the American species of Puffers or *Tetraodontidæ*, and to give analytical keys by which the genera and species may be distinguished. The specimens examined have been chiefly collected by Professors Jordan and Gilbert. These are in the museum of the Indiana University, while duplicate series are in the U. S. National Museum.

We accept the family of *Tetraodontidæ* as including all the Plectognathous fishes, in which the teeth in each jaw are coalesced into a bony plate, which in each jaw is divided by a median suture. The American species of this group, all referred by Dr. Günther to the single genus *Tetrodon*, fall into five groups which are certainly natural and apparently well defined, and which we regard as distinct genera.

These may be defined as follows:*

a. Frontal bones articulated with the supraoccipital and the postfrontals confined to the sides, the ethmoid little prominent to view above and short or narrow; back not carinated; snout heavy and broad; vertebræ in moderate or small number (7 to 8+9 to 13); dorsal and anal fins each with 6 to 15 rays; skin smooth or more or less prickly, without scutes (*Tetrodontinæ*).

b. Frontal bones expanded sidewise and forming the lateral roofs of the orbits, the postfrontals limited to the posterior portions. Marine species.

c. Nostril, on each side, with two distinct openings; frontal region longer than broad.

d. Dorsal and anal fins comparatively long, falcate, each of 12 to 15 rays; caudal lunate; vertebræ about 20; nostrils sessile or nearly so, not forming a distinct papilla; mucous tubes on upper part of head and on sides of body very conspicuous ..... LAGOCEPHALUS, 1.

dd. Dorsal and anal fins comparatively short, rounded, each of 6 to 8 rays; caudal usually rounded; vertebræ about 8+10; nostrils at the summit of a hollow, simple (or lobed) papilla; mucous tubes inconspicuous.

SPHÆROIDES, 2.

cc. Nostril on each side, with a bifid tentacle, without distinct opening; frontal region broader than long; fins and vertebræ as in *Sphæroides*.

TETRAODON, 3.

bb. Frontal bones narrowed and excluded from the orbit, the postfrontals being elongated and projected forwards and connected with the prefrontals; dorsal and anal fins short, rounded; snout very obtuse; vertebræ 8+11; nostrils (probably) as in *Sphæroides*. Fluviatile species.

COLOMESUS, 4.

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*The osteological characters here given are mostly copied from Professor Gill's "Synopsis of the Plectognath Fishes" (Proc. U. S. Nat. Mus., 1884, 411), and were by him derived chiefly from the plates in Hollard's "Études sur les Gymnodontes" (Ann. des Sciences Naturelles, Paris, 1857, viii).

aa. Frontal bones separated from the supraoccipital by the intervention of the postfrontals, which are connected together and laterally expanded but short, the ethmoid prominent above, enlarged and narrowed forwards; nostrils obsolete, imperforate; head compressed, the snout slender and produced; back compressed to a sharp edge or keel; dorsal and anal fins short and rounded (rays 5 to 8); vertebræ 8+9; skin smooth or prickly, without scutes (*Canthigasterinæ*).....CANTHIGASTER, 5.

I.—LAGOCEPHALUS.

TETRAODON species, Linnæus and of early authors (not type, as later restricted).

LAGOCEPHALUS Swainson, Nat. Hist. and Class'n Fishes, ii, 194, 328, 1839 (*stellatus; pennanti* = *lagocephalus* L.).

PHYSOGASTER Müller, Abhandl. Akad. Wiss., Berlin, 1839 (1841), 252 (*lunaris; oblongus*); (name preoccupied).

GASTROPHYSUS Müller, Wiegmann's Archiv. ix, 330, 1843 (*lunaris*).

Les Promécocephales (PROMECOCEPHALUS) Bibron, MSS., Révne de Zoologie, 1855, 279 (*argentatus; lunaris; spadiceus; lævigatus; lagocephalus* ("Bloch, nec L."); *inermis*).

GASTROPHYSUS Bleeker, Nat. Tydskr. Ned. Ind., &c., about 1855.

TETRODON Gill, Cat. Fish. East. Coast N. Am., 1873, 15 (*lævigatus*, &c.).

LAGOCEPHALUS Jordan & Gilbert, Syn. Fish. N. A., 1883, 859 (*lævigatus*, &c.).

Type *Tetrodon lagocephalus* Linnæus.

This genus is close to *Sphæroides* in all technical respects, but it seems to be sufficiently distinguished by its nostrils and the form and development of its fins. This increase in the number of fin-rays marks a slight step in the direction of the genus *Xenopterus* (*Chonerhinus*). The species reach a larger size than do those of our other genera, and the body is more elongate in form. This is the only genus which is represented in the fauna of Europe.

The name of this genus offers no difficulty, *Lagocephalus* being prior to *Gastrophysus*, while *Physogaster*, which has nearly the same date as *Lagocephalus*, is preoccupied. The characters assigned by Swainson to *Lagocephalus* are valueless, but the indicated types belong to this group. Only one American species is certainly referred to *Lagocephalus*. A second one has been doubtfully noted as occurring in Brazil.*

ANALYSIS OF SPECIES OF LAGOCEPHALUS.

a. Belly covered with large, subequal, three-rooted spines, the body otherwise smooth. Dorsal rays 14; anal rays 12. Interobital space flat, shorter than snout, 1½ times diameter of eye; body elongate, its depth 4½ in length; tail slender, a ridge of skin on its lower edge on each side. Olive-green above, sides and below lustrous silver-white.....LEVIGATUS, 1.

*Dr. Günther mentions a specimen from Brazil, which he refers to a variety of *Lagocephalus lunaris* (Bloch & Schneider), a species otherwise only known from the East Indian fauna. This specimen is described as having the interorbital space and neck covered with spines (like the belly), the length of the head equal to its distance from the dorsal fin, and a broad dark band across the middle of the back.

Lagocephalus lævigatus.*

Ostracion cathetoplateo oblongus Artedi, genera 58, species No. 13, 1738 (after *Orbis lagocephalus* Grew, &c.).

Tetrodon lævigatus Linnæus, Syst. Nat., ed. xii, 411, 1766 (on a specimen collected at Charleston by Dr. Garden); Schöpf, Schrift. Naturf. Freunde, 1788, 189 (Rhode Island); Gmelin, Syst. Nat., 1447, 1788 (copied); Walbaum, Artedi Piscium, 595, 1792 (copied); Bloch & Schneider, Syst. Ichthyol., 1801, 506 (copied); Turton, Syst. Nat., 1806, 891 (copied); Günther, Cat. Fish. Brit. Mus., viii, 1870, 274 (Bahia; Gulf of Mexico); Gill, Cat. Fish. E. Coast N. Am., 1873, 15 (name only); Poey, Enum. Piscium Cuben., 171, 1875 (Cuba); De Kay, N. Y. Fauna, Fishes, 329, 1842 (New York); Storer, Hist. Fish. Mass., 224, 1857 (Nantucket); Baird, U. S. Fish. Com., 1871–72, 823 (Wood's Holl); Poey, Syn. Piscium Cubensis, 431, 1868 (Cuba).

Apsicephalus (*Promeçocephalus*) *lævigatus* Hollard, Études sur les Gymnodontes, 1857 (figures of skulls).

Gastrophysus lævigatus Bleeker, "Natuurh. Verh. Holl. Maatsch. Wet. Haarlem, 1863, xviii, 22."

Lagocephalus lævigatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 367 (Beaufort, N. C.); Goode, Proc. U. S. Nat. Mus., 1879, 109, (St. John's River, Florida); Goode & Bean, Proc. U. S. Nat. Mus., 1879, 122 (Pensacola, Fla.); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 305 (Galveston); Jordan & Gilbert, l. c., 1882, 619 (Charleston); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 860; Jordan, Cat. Fish. N. Am., 141, 1885.

Tetrodon lagocephalus Bloch, Ausl. Fische, I, 126, taf. 140; Bloch & Schneider, Syst. Ichth., 1801, 503 (not of Linnæus).

Tamboril Parra, Dif. Piezas de Hist. Nat., 1787, 37, lam. 10 (Havana).

Le Tetrodon Mal-Armé Lacépède, Hist. Nat. Poiss., i, 497, 1798 (copied).

Tetrodon currus Mitchill, Trans. Lit. & Phil. Soc., i, 472, 1815 (New York; young); De Kay, N. Y. Fauna, Fishes; 1842, 328 (copied).

Tetrodon mathematicus Mitchill, Trans. Lit. & Phil. Soc., i, 474, 1815 (New York).

Tetrodon pachycephalus Ranzani, Nov. Comm. Ac. Sci. Inst. Bonon., iv, 1840, 73, pl. 11, f. 2 (Brazil).

Holacanthus melanothos Gronow, Systema, ed. Gray, 1854, 24; (based on *T. lævigatus* of Linnæus).

Tetrodon lineolatus Poey, Synops. Piscium Cuben., 432, 1868 (Cuba); Poey, Enum. Piscium Cuben., 172, 1875 (Cuba; Young).

Habitat.—Tropical and temperate shores of Atlantic coast of America; Cape Cod to Brazil.

The synonymy of this common species offers no difficulty. First described under the specific name of *lævigatus*, it has been known by the same name by nearly all authors subsequent to Linnæus.

II.—SPHÆROIDES.

TETRAODON species Linnæus, Systema Naturæ, ed. x, 1758, 332 (several species: *testudineus* mentioned first).

Les Spharoides Lacépède, Hist. Nat. Poiss., ii, 1, 1798 (French name only).

SPHÆROIDES Lacépède, Pillot edition, Hist. Nat. Poiss., vi, 279, 1831 (*tuberculatus* = *spengleri*).

CIRRHISOMUS Swainson, Nat. Hist. Class'n Fishes, ii, 1839, 194, 328 (*spengleri*).

* Macleay, Cat. Austr. Fish., ii, 273, 1881, records this species from Port Jackson, Australia. This breadth of range needs verification.

CHEILICHTHYS Müller, Abhandl. Akad. Wiss. Berlin, 1839 (1841?), 252 (*testudineus?*).

HOLACANTHUS species, Gronow, Systema Ed. Gray, 1854, 23 (includes all *Tetrodontidæ* and *Diodontidæ*). (Name preoccupied.)

ANCHISOMUS Kaup MSS., Richardson, Voyage Herald, 1854, 156 (*geometricus = testudineus*, etc.).

Les Stenometopes (STENOMETOPUS) Bibron l. c. (*testudineus, spengleri, plumieri, marmoratus, angusticeps* (no diagnosis).

Les Amblirhynchotes (AMBLYRHYNCHOTUS) Bibron, l. c. (*honckeni, oblongus, richei*).

? Les Aphanacanthes (APHANACANTHUS) Bibron, Revue de Zoölogie, 1855, 279 (*reticulatus* Bibron MSS. No diagnosis).

? Les Epipedorhynches (EPIPEDORHYNCHUS) Bibron, l. c. (*freycineti*, etc., MSS. species. No diagnosis).

? Les Geneions (GENEION) Bibron, l. c. (*maculatum* Bibron MSS.).

? Les Cataphorhynques (CATAPHORHYNCHUS) Bibron, l. c. (*lampris, longispinis* Bibron MSS.).

APSICEPHALUS Hollard, Études sur les Gymnodontes 1867, 324 (as substitute for and including the foregoing names of Bibron and *Promecocephalus* also, the type specified being a *Dilobomycter*).

? LIOSACCUS Günther, Cat. Fish., Brit. Mus., viii, 1870, 287 (*cutaneus*).

TETRODON Jordan & Gilbert, Syn. Fish., N. A. 859, 1883 (*testudineus*).

CIRRHISOMUS Gill, Proc. U. S. Nat. Mus., 1884, 421 (*spengleri*).

Type *Tetrodon spengleri* Bloch.

The reasons for using the name *Tetraodon* for Müller's *Arothron* instead of the present group are given farther on, under the head of *Tetraodon*.

If, as we suppose, *Tetraodon* is not available as the name of the present group, the name *Sphæroides* seems to us to have the clear right of priority. In the first volume and the first half of the second volume of his Histoire Naturelle des Poissons, Lacépède uses French names only, and it is in this part of his work that his "*Sphéroide tuberculé*," the type of his genus, "les Sphéroides," occurs. This name should then be passed over. Among the several reprints of Lacépède's work, there is, however, one now before me, in which the name of "Pillot" appears on the title page as "Editeur." In this edition (volume 6, published in 1831) Latin names are given to all the species, and the Latin form "*Sphæroides tuberculatus*" is here applied. The name *Sphæroides* dating, then, from 1831, has clear priority over *Cirrhisomus* of Swainson (1839) and *Cheilichthys* of Müller (1841). The name is also preferable to either of these in other respects. Lacépède's diagnosis is, of course, worthless, as the genus is based on a front view of a species (*tuberculatus=spengleri*) of which he had referred a side view to the genus *Tetrodon*. Most of the species of *Sphæroides* are American, as those of *Tetraodon* are chiefly East Indian. The species reach in general a much smaller size than those of *Lagocephalus*.

In all our species the nasal openings are comparatively large and placed at the summit of a simple hollow papilla. In some East Indian species, probably referable to this genus, this nasal papilla is two-lobed, a nasal opening in each lobe.

ANALYSIS OF SPECIES OF SPHÆROIDES.

a. Caudal fin lunate or truncate, with the angles notably produced.

b. [Body everywhere perfectly smooth; interorbital space broad, about equal to length of snout and twice diameter of eye; caudal truncate, its angles produced. Dorsal rays 10. Light brown, with darker spots on the back] ..... PACHYGASTER, 2.

bb. Body more or less prickly, both above and below; the spines above slender; profile steep; a dark spot or band at base of pectoral.

c. [Color brownish above, faintly vermiculated with paler, sides yellowish; spines on the head long, close-set, like seals' bristles; dorsal region from a little behind nares to above ends of pectoral fins spinous; belly spinous; interorbital width 1¼ in eye (in specimen 4 inches long); caudal fin truncate, or slightly concave, with prominent angles, D. 8, A. 7; eye 3½ in head] ..... TRICHOCEPHALUS, 3.

cc. Color brownish above, with small irregular bluish-gray spots; sometimes three faint blackish cross-bands, the foremost on the forehead, the others on the back before the dorsal; numerous fine sharp spines on the upper side of the body, from the nostrils to the base of the dorsal, and below from the throat to the vent; a slight fold along each side of the tail; caudal fin weakly concave; eye 4 in head, about equal to the interorbital width. D. 8, A. 7 ..... FÜRTHII, 4.

aa. Caudal fin rounded or subtruncate, the middle rays longest (rarely the uppermost very slightly produced).

d. Nape with a pair of fleshy flaps; interorbital area very narrow, deeply concave, channel-like, not broader than the eye; sides with small fleshy cirri; belly and anterior part of back with slender, two-rooted prickles; body comparatively elongate, the snout produced, a little longer than the rest of the head; caudal rounded; dorsal rays 7; color smoky gray, sides yellowish-brown, covered with innumerable small spots of a sky-blue color, each with a sharply defined black edge; a row of obscure large blackish cross-blotches along lower part of sides from snout to caudal peduncle (as in *S. spengleri*); a black streak on base of pectoral ..... ANGUSTICEPS, 5.

dd. Nape without dermal flaps; interorbital space broader, flattish or somewhat concave; snout about as long as rest of head.

e. Interorbital space rather narrow, somewhat concave, its width less than half the length of the snout; sides with a series of about 12 black blotches or bars bounding the pale color of the abdomen; back without curved cross-streaks or circles; upper ray of caudal slightly produced.

f. Sides of head and body always smooth, except sometimes a strip behind pectorals; spines larger, higher, more distinctly stellate and much less closely set than in *C. turgidus*, sometimes confined to the belly or the nuchal region, and often, especially in old specimens, wanting altogether, so that the skin is perfectly smooth; sides often with small whitish fleshy flaps or cirri, especially in the young. Color greenish or grayish, with fine bluish spots and vermiculations. Black blotches on lower part of sides nearly round; caudal fin with a broad dusky bar at base and tip, the middle pale ..... SPENGLERI, 6.

ff. Sides of head and body always prickly; as is the back from upper lip to base of dorsal; belly prickly from lower lip to vent; prickles all similar, small, mostly 3-rooted, stiff and close set, rather largest posteriorly on back and belly, never obsolete; sides without cirri; color dark olivaceous above, somewhat marbled and dotted with black; black blotches on lower part of sides in the form of short cross-bars, somewhat oblique, the one nearest behind pectoral most conspicuous; caudal fin plain or nearly so, the tip darker.....MACULATUS, 7.

ee. Interorbital space rather broad and flattish, its width more than half length of snout; sides with no distinct series of dark blotches bounding the white of the belly; back and sides with numerous irregular round black spots and usually with curved cross-streaks, often appearing as arcs of concentric circles.

g. Skin of back and sides perfectly smooth; skin of belly smooth or with a few prickles embedded in folds of the skin. Color brown, with very numerous small round dark spots above; usually pale curved cross-bars present, in the form of concentric rings, one on middle of back in front of dorsal, another surrounding this, the remainder appearing as bars, anteriorly running downwards and backwards, posteriorly downwards and forwards. No cirri. (*Adult form of S. testudineus?*).....POLITUS, 8.

gg. Skin of back from nape to before dorsal fin covered with small, sparsely-set prickles; belly from throat to before anal with prickles which are rather larger and more closely set; axil usually prickly; sides sometimes with cirri.

h. Curved lines and streaks on the back whitish, paler than the ground color; usually arranged as follows: a circle or rhomb on the middle of the back before the dorsal fin; an ellipse surrounding this; before this three or four cross-streaks extending downward and backward, the one at the nape and the one behind the eyes connected on the median line; back and sides with many irregular round blackish spots of different sizes; a dark bar at base of pectoral, caudal dusky at base, then pale, the posterior half blackish.....TESTUDINEUS, 9.

i. Snout rather short, the eye nearer the end of the snout than the gill-opening.....*Annulatus* 9 (*a*).

ii. Snout rather longer, the eye nearer the gill-opening than the end of the snout.....*Testudineus* 9 (*b*).

hh. Curved lines, streaks, and circles on the back black, darker than the ground color; snout rather short, the eye being nearer end of snout than gill-openings; in all other respects essentially as in *testudineus*.....FORMOSUS, 10.

2. Sphæroides pachygaster.

Tetrodon (*Cheilichthys*) *pachygaster* Müller & Troschel in "Schomburgk's Hist. Barbadoes, about 1840, 677." (Barbadoes.)

Tetrodon pachygaster Günther, VIII, 287, 1870. (Copied.)

Habitat.—West Indian fauna. "A scarce species around Barbadoes."

This species is known to us only from the brief diagnosis copied by Günther from Müller & Troschel.

It is probably the adult form (length 14 inches) of some species which is prickly when young. It may be the same as *S. trichocephalus*, or possibly an old example of *S. testudineus*. The latter is not known, however, to have the angles of the caudal produced even in old examples.

3. Sphæroides trichocephalus.

Tetrodon trichocephalus Cope, Proc. Ac. Nat. Sci. Phila., 1870, 120 (Newport, R. I.); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 862 (copied); Jordan, Cat. Fish. N. Am., 1885, 441 (name only).

Habitat.—West Indian fauna; Gulf Stream.

This species is known to us only from Cope's description of a small specimen taken in the Gulf Stream off Newport. It is apparently very close to *S. fürthi*, and it is not unlikely that it will prove to be the young *S. pachygaster;* but as the latter species is known only from a poor description of a single specimen, it is not possible to form any positive opinion.

4. Sphæroides fürthi.

Tetrodon fürthi Steindachner, Ichthyol. Beitr. v. 22, 1874 (Panama); Jordan, Proc. U. S. Nat. Mus., 1885, 393 (Panama).

Habitat.—Panama fauna.

Specimens of this species, agreeing well with Dr. Steindachner's description, were obtained by Professor Gilbert at Panama in 1883. These specimens have been destroyed by fire, so that we are compelled to fall back on Dr. Steindachner's description for comparison. The differences between this species and *S. trichocephalus* are not very evident from the comparison of the descriptions, but as the two belong to different faunal regions it is probable that other differences would appear on comparison of specimens.

5. Sphæroides angusticeps.

Tetrodon angusticeps Jenyns, Voyage of Beagle, Fishes, 154, 28, 1842 (Galapagos Is.), Günther, viii, 287, 1870 (copied); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 631 (Panama); Jordan, Proc. U. S. Nat. Mus., 1885, 393 (Panama).

Anchisomus angusticeps Richardson, Voyage of Herald, Fishes; 1854, 159, (Galapagos).

Canthogaster lobatus Steindachner, Ichthyol. Notizen, x, 18, taf. 5, f. 3, 1870, (Altata: from a shriveled specimen.)

Habitat.—Panama fauna; Altata to the Galapagos Islands.

This strongly marked species was first described from large specimens in poor condition, with the spines obsolete, or lost. Next it was redescribed by Dr. Steindachner from a young example, shriveled in strong alcohol. Later two large examples (12 inches), one in the museum of Yale College, the other now in the National Museum, were examined by Professors Jordan and Gilbert. These authors observe:

"These specimens agree perfectly with Dr. Steindachner's Altata specimen (type of *Canthogaster lobatus*), but the nostrils are formed as in typical species of *Tetrodon* (= *Sphæroides*), *i. e.*, tubular with two lateral openings near the summit. Jenyns' description of *T. angusticeps* was evidently drawn from a specimen in poor condition. This would account for the alleged absence of prickles on the skin. In all other respects the description agrees with the specimens before us—the narrow, channel-like interorbital space, the minute, papilliform protuber-

ances on the skin, and the pair of fleshy flaps behind the nape being conspicuous features of the species."

In some regards, this species resembles *S. spengleri*, of which it may be regarded as the Pacific Coast representative.

6. Sphæroides spengleri.

Tetrodon spengleri Bloch, Naturgeschichte der Fische, I, 135, 1782, taf. 144 ("India"); Gmelin, Systema Naturæ, 1788, 1446 (copied); Walbaum, Artedi Piscium, 1792, 592 (copied); Bloch & Schneider, Syst. Ichthyol., 1801, 504. Turton, Syst. Nat., 1806, 890 (copied); Cuvier, Regne Animal, Ed. ii, 1828 (name only); Günther, VIII, 285, 1870 (Madeira, Lanzarote, Cape Verde Islands, West Africa, Santa Cruz, Cuba); Cope, Trans. Am. Phil. Soc., 1871, 479 (Saint Martins, New Providence, Tortugas); Poey, Enumeratio, 1875, 173; Goode & Bean, Proc. U. S. Nat. Mus., 1882, 235 (name only); Jordan & Gilbert, Synopsis Fish N. A., 1882, 861; Jordan; Cat. Fish N. Am., 1885, 141.

Le Tetrodon spenglerien, Lacépède, Poissons, I, 501, 1797 (copied).

Crayracion spengleri Kner, Novara Fische, 410, 1867. (Rio Janeiro.)

Chilichthys spengleri Goode, Bull. U. S. Nat. Mus., V, 22, 1876. (Bermudas.)

Cirrisomus spengleri Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 366.

Cirrhisomus spengleri Swainson, Nat. Hist. Fishes, etc., Vol. ii, 328. 1839; Gill, Proc. U. S. Nat. Mus., 1884, 421 (name only).

Le Tetrodon Plumier, Lacépède, Hist. Nat., Poiss., 1, 504, 1797. (Martinique; on a drawing by Plumier.)

Tetrodon plumieri Bloch & Schneider, Syst. Ichthyol., 1801, 508. (After Lacépède.

Le Sphéroïde tuberculé Lacépède, II, 1, 1798. (Martinique; on a drawing (front view) by Plumier.)

Sphæroides tuberculatus Pillot, Edition of Lacépède, 1831, VI, 279 (copied).

Tetrodon marmoratus Ranzani, Nov. Comm. Ac. Sci. Inst., Bonon., IV, 72, pl. 10, f. 1, 1840 (Brazil); Lowe, "Trans. Zool. Soc., ii, 193" (Madeira); Valenciennes "in Webb and Berthelot, Poiss., Îles Canaries, pl. 20, f. 2." (Canaries.)

Tetrodon turgidus Poey, Synopsis, 432, 1868 (Cuba); Poey, Enumeratio, 1875, 172 (not of Mitchill); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 306. (Pensacola; Galveston.)

Tetrodon nephelus Goode & Bean, Proc. U. S. Nat. Mus., 1882, 235 (Gulf of Mexico); Goode & Bean, Proc. U. S. Nat. Mus., 1882, 412 (Indian River, Pensacola); Jordan & Gilbert, Synopsis, Fish, N. Am., 1883, 966; Bean, Cat. Intern. Fish. Exhib., 1883, 43 (Key West, Fla.); Jordan, Bull. U. S. Fish Comm., 79 (Key West); Jordan, Proc. U. S. Nat. Mus., 1884, 146 (Key West); Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 234 (Cedar Key); Jordan, Cat. Fish. N. Am., 41, 1885.

Habitat.—West Indian Fauna. Coast of Texas and Western Florida to Brazil and West Africa.

This is the most common species of the genus about the Florida Keys and the Gulf Coast, and probably throughout the West Indies generally.

The very large series of specimens of this species, obtained by Dr. Jordan at Key West, shows remarkable variations in the development of the prickles on the skin. This indicates that the latter character must be used with great caution in the distinction of species in this group.

In Dr. Jordan's paper on the fishes of Key West (Proc. U. S. Nat. Mus.,

1884, 147) is a full description of the coloration of *Sphæroides spengleri*, together with the following account of the variations in the prickles:

"Young examples have the back and belly covered with rather large, not close-set, stellate prickles, as described in the original account of *Tetrodon nephelus*. Of the larger specimens, some have prickles only on the back, others on the belly only, one or two only a small area behind the eyes near the median line, while a majority of the largest (as well as some of the smaller ones) are entirely smooth. There is no doubt that these specimens all belong to one species, and that this is the original *Tetrodon nephelus* of Goode and Bean. The loss of the prickles is probably to some extent dependent on age."

Half-grown examples usually correspond very closely to the current descriptions of *C. spengleri*, and there seems to be no doubt that the original *Tetrodon spengleri* of Bloch, was based on such specimens. *Tetrodon plumieri* is evidently the same and the "*sphæroide tubereulé*" of Lacépède is founded on a front view of the same fish. Ranzani's description and figure of *Tetrodon marmoratus*, as Professor Goode has already stated, represents *S. spengleri* very well.

This description of Lacépède was originally accompanied only by a French form of the name, but in a reprint of Lacépède, edited by Pillot in Paris, in 1831, the Latin form, *Sphæroides tuberculatus* is supplied.

7. Sphæroides maculatus.

Toad-fish Schöpf, "Beobacht. Gesellsch. Naturf. Frennde, viii, 189, 1788 (Rhode Island).

Tetrodon hispidus var. Walbaum, Artedi Piscium, 1792, 594 (after Schöpf) (not of Linnæus).

Tetrodon hispidus var. *maculatus* Bloch & Schneider, Syst. Ichth., 1801, 504 (after Schöpf).

Tetrodon turgidus Mitchill, Trans. Lit. & Phil. Soc. 1, 473, pl. 6, f. 5, 1815 (New York); Cuvier, Règne Animal, Ed. ii, 1828 (name only). Storer, Rept. Fishes, Mass. 1839, 169 (Massachusetts); DeKay, New York Fauna, Fishes, 1842, 321, pl. 55, f. 178 (New York); Ayres, Boston Journ. Nat. Hist. 1842, 285 (Brookhaven, Long Island); Baird, Ninth Smithsonian Rept., 1854, 352 (Great Egg Harbor, N. J.); Storer, Synopsis Fish. N. A., 1846, 241 Bean, Proc. U. S. Nat. Mus., 1880, 76 (Wood's Holl, Noank, Conn., East shore of Va., Cohasset Narrows, Mass.); Jordan & Gilbert, Proc. U. S. Nat. Mus. 1882, 619, (Charleston); Jordan & Gilbert, Syn. Fish. N. A., 1883, 861, Jordan Cat. Fish. N. Am. 141, 1885.

Gastrophysus turgidus Gill, Cat. Fish, East Coast, 1861 (name only).

Cirrhisomus turgidus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 366 (Beaufort); Goode & Bean, Bull. Essex Inst., 1879, xi, 3 (Salem, Provincetown, Mass.); Goode, Proc. U. S. Nat. Mus., 1879, 109 (St. John's River, Florida).

Chilichthys turgidus Gill, Cat. Fish. East Coast N. A., 15, 1873 (name only).

Habitat.—Atlantic coast of United States; Cape Ann to Northern Florida.

This well-known species is common along our Atlantic coast, its range apparently not extending farther southward than the Carolinas. The numerous specimens before us are from Wood's Holl and Beaufort. On

the specimens examined by us we find no variation in the development of the prickles, and we regard this species as more constant in this respect than are most of the tropical forms. This is the only species of *Sphæroides* commonly found on coasts of temperate regions. Its strong resemblance to *S. spengleri* indicates the probability that it is a geographical variety of the latter, but we have seen no intermediate examples.

The name *Tetrodon hispidus* var. *maculatus* is based on the excellent description of Schöpf, and see no reason why it must not stand in place of the later name of *turgidus*.

8. Sphæroides politus.

Tetrodon politus Girard, U. S. Pac. R. R. Expl., 1859, 340 (San Diego, California); Günther, Fish. Centr. Amer., 1869, 489 (San José de Nicaragua); Günther, viii, 281, 1870 (San José, California); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 274 (Punta San Ygnacio, Gulf of California); Jordan & Gilbert, l. c., 1880, 453 (San Diego, Cal.); Jordan & Gilbert, l. c., 1882, 631 (Panama); Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 108 (Mazatlan); Jordan & Gilbert, Syn. Fish, N. Am., 1883, 860. Jordan, Proc. U. S. Nat. Mus., 1885, 392 (San Diego, Mazatlan); Jordan, Cat. Fish. N. Am., 140, 185. Rosa Smith, Fishes of San Diego (San Diego).

Habitat.—Pacific coast of Tropical America, San Diego to Panama.

All the specimens thus far known of this species are of large size (about a foot in length). These differ from *S. testudineus* (*annulatus*) only, so far as we can see, in the absence of prickles. With the knowledge which we now have of the variations in this respect in *S. spengleri*, we see little reason to doubt that *Sphæroides politus* is simply the adult form of *S. testudineus annulatus*. However, till this matter is clearly proven, we may admit it as a doubtful species.

9. Sphæroides testudineus.

a. Atlantic specimens (*testudineus*).

Ostracion oblongus glaber Artedi, Species 21, Genera 60. Balk, Amœn. Acad., 1, 591, 1749.

Orbis tavis varicgatûs (the Globe-fish) Catesby, Nat. Hist. Carol., 1743, pl. 28, ("Virginia").

Tetraodon testudineus Linnæus, Syst. Nat., Ed. X, 1758, 332 (based on Balk and Artedi); Linnæus, Syst. Nat. Ed. xii, 1766, 410; Gmelin, Syst. Nat., 1788, 1446 (copied); Walbaum, Artedi Piscium, 1792, 590 (copied); Günther, viii, 282, 1870 (Jamaica, Dominica, St. Croix, Puerto Cabello, British Guiana, Bahia); Poey, Enumeratio, 1875, 172 (Havana); Jordan & Gilbert, Syn. Fishes. N. A., 1883, 861 (West Indies); Bean, Cat. Intern. Fish. Exhib., 1883, 43, Indian River, Fla.); Gill, Proc. U. S. Nat. Mus., 1884, 421, Bean & Dresel, Proc. U. S. Nat. Mus., 1884, 151 (Jamaica); Jordan, Proc. U. S. Nat. Mus., 1885, 372 (Panama); Jordan, Cat. Fish. N. Am., 1885, 140 (not of Bloch, who has used this name for an East Indian species).

Cirrosomus testudineus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 366 (Beaufort, N. C.); Goode, Proc. U. S. Nat. Mus., 1879, 109 (Mouth of St. Johns, Fla).

Tetrodon punctatûs Bloch & Schneider, Syst. Ichth., 1801, 506 (Brazil) (description inaccurate?); Müller & Troschel "in Schomburgk's British Guiana, 111, 641," 1842 (Guiana).

Tetrodon geometricus Bloch & Schneider, Syst. Ichth., 1801, 508 (based on Catesby) Cuvier, Règne Animal, 11, 1828 (name only); Cope, Proc. Ac. Nat. Sci. Phila., 120, 1870 (Newport, Mexico, Panama).

Tetrodon ammocryptus Gosse, Nat. Soj. Jamaica, 287, 1851 (Jamaica).

Anchisomus reticularis (Kaup), Richardson, Voyage Herald, 1854, 161, pl. 31 (not *Tetrodon reticularis* Bloch & Schneider, which is *Tetrodon testudineus* of Bloch, not of Linnæus).

Tetrodon reticularis Cope, Trans. Am. Phil. Society, 1871, 479 (St. Martins).

Holacanthus leionothos Gronow, Syst. Nat., Ed. Gray, 1854, 24.

Tetraodon bajacu Castlenau, Anim. Amér. Snd, Poiss., 98, 1855, pl. 47, f. 3.

Tetrodon punctatus Poey, Syn. Pisc. Cab., 1868, 432 (Havana).

b. Pacific examples, var. *annulatus*.

Tetrodon annulatus Jenyns, Zoöl. Beagle, 1842, 153 (Galapagos Islands); Steindachner, Ich. Beitr., v. 23 (Mazatlan).

Tetrodon testudineus annulatus Jordan, Cat. Fish. N. Am., 1885, 141.

Anchisomus geometricus (Kaup), "Richardson, Voyage Herald, 156, 1854, pl. 30" (Galapagos).

Tetrodon geometricus Günther, Fish. Centr. Amer., 1868, 489 (Panama, Galapagos).

Tetrodon heraldi Günther, Cat. Fish. Brit. Mus., viii, 1870, 283 (Galapagos Islands, Panama).

Tetrodon testudineus Jordan & Gilbert, Bull. U. S. F. C., 1882, 111 (Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 370 (Cape San Lucas); Jordan & Gilbert, l. c., 381 (Panama).

Habitat.—Both coasts of Tropical America; var. *testudineus*, from Virginia to Bahia; var. *annulatus* from Gulf of California to Galapagos Islands.

This species is common through the West Indies and it ranges occasionally northward, as far as the coast of Virginia. On the Pacific coast it seems to be equally common.

We have seen from either coast only young examples of this species (2 to 6 inches long) and all of these have the spines on the back and belly well developed. The adult form, as elsewhere stated, is probably the species called *Sphæroides politus*.

We have been unable to distinguish Atlantic specimens (*testudineus*) from Pacific specimens (*annulatus*), but in deference to the opinion of Dr. Günther, we have separated the synonymy into two series, and we have also indicated in the key the supposed differences of the two forms.

The extensive synonymy of this species needs no special remark. The name *testudineus* is the earliest given binomially by Linnæus to any Tetrodont, and its application to the present species has been unquestioned since the error of Bloch and his copyists was corrected by Günther. Both Linnæus and Balk correctly describe the dark spots and the pale curved lines or "sutures" on the back.

10. Sphæroides formosus.

Tetrodon formosus Günther, Cat. Fish. Brit. Mus., viii, 183, 1870 ("South America").

Habitat.—("South America.")

This species is known to us only from the description of Dr. Gün-

ther, based on a single specimen. This description agrees fairly well with *S. testudineus* in all respects except the color of the curved streaks on the back. These markings are said to be dark, while in all the examples of *S. testudineus* which we have seen they are paler than the ground color. Further comparison will probably show the absolute identity of *testudineus*, *annulatus*, *politus*, and *formosus*, but for the present, the last two may stand in our list as doubtful species.

III.—TETRAODON.*

CRAYRACION Klein, Missus, iii, 18, 1742 (includes all the *Tetrodontidæ*, *Diodontidæ*, etc.; the first species mentioned, "*lævissimus*," being *Lagocephalus lagocephalus*) (pre-Linnæan).

TETRAODON Hasselquist, "Iter Palestin., 1757, 400" (*fahaka=lineatus* L.) (pre-Linnæan).

TETRAODON Linnæus, Syst. Nat., Ed. x, 1758, 332 (in part; *testudineus; lineatus, lagocephalus*, etc.).

Les Oroïdes Lacépède, Hist. Nat. Poiss., 1, 256, 1797 (*commersonieu;* names in French only).

OVUM Bloch and Schneider, Syst. Ichth., 1801, 530 (*commersoni;* name preoccupied in mollusks).

TETRODON Swainson, Nat. Hist., Class'n Fishes, 1839, ii, 194, 328 (*testudineus* Bloch= *reticularis;* no *Linnæan* species included).

AROTHRON Müller, Abhandl. Berl. Akad., 1839 (1841?) 252, (*testudinarius=reticularis*, etc.).

TETRAODON Bibron, Revue de Zoologie, 1855, 279 (*lineatus; patoca; dorso-unicolor* Bibron MSS.; *bouronensis* Bibr. MSS.).

Les Dilobomyctères (DILOBOMYCTER) Bibron, l. c. (*reticularis; hispidus; maculatus; meleagris; nigropunctatus; mappa; diadematus; longicauda; sordidus; immaculatus*).

Les Dichotomyctères (DICHOTOMYCTER) Bibron, l. c. (*fluviatilis*).

? Les Ephippions (EPHIPPION) Bibron, l. c. (*maculatum* Bibron MSS.).

BRACHYCEPHALUS Hollard, Études sur les Gymnodontes, 1857, 332 (includes *Tetraodon* and *Dichotomycter* of Bibron, the former group being regarded as the type, no species mentioned, but the type therefore properly *T. lineatus*.

CRAYRACION Bleeker, Atlas Ind. Ichth., Gymnodontes, 1867 (*immaculatus*, etc.) (after Klein).

TETRODON Gill, Proc. U. S. Nat. Mus., 1884, 421 (*lineatus=fahaka*).

Type *Tetraodon lineatus* Linnæus.

In the subdivision of the old genus *Tetraodon*, there is some doubt as to which of the several minor groups should retain the original name. We may therefore glance for a moment at the history of the group.

The name *Tetraodon* first appears as a generic term, so far as known to us, in Hasselquist's Travels in Palestine, edited by Linnæus, in 1757. We have not examined this work, but our impression is that it is binomial in form, and that the name *Tetraodon* is here associated only with

* This name, usually and preferably spelled *Tetrodon*, was originally given as *Tetraodon* by Linnæus. The latter form should therefore be used.

Tetraodon fahaka, the *Tetraodon lineatus* of the Systema Naturæ, and a member of the group called *Arothron*.

If this work of Hasselquist be taken in consideration, the name *Tetraodon* must be assigned to the present group.

But the conventional starting point of binomial nomenclature is later, and in the Systema Naturæ, Linnæus includes all the species of the present family known to him, in the genus *Tetraodon*.

We must then consider the later attempts at restriction of the group.

In 1839, Swainson made the first attempt at generic division.

Retaining the name *Tetrodon* for the bulk of the species (including our genera *Sphæroides* and *Tetraodon*), he separated from it *Lagocephalus*, *Leiodon* (or *Leisomus*), *Cirrhisomus*, and *Canthigaster* (or *Psilonotus*).

The first and last of these were well defined. The others, *Leiodon* (based on the absence of prickles) and *Cirrhisomus* (based on the presence of cirri), rest on characters of no systematic importance. Under the generic name of *Tetrodon*, four species are mentioned as types. Three of these belong to the *Arothron* group; the other is a *Chelonodon*. But none of them are Linnæan species, although one of them (*testudineus* Bloch, not L.) was supposed by Swainson to be such. If we regard, with Dr. Gill, this subdivision to be properly a restriction of the Linnæan genus, the name *Tetraodon* would again be synonymous with *Arothron*. But it may be objected that the *Tetrodon* of Swainson contained no species known to Linnæus, and hence its composition cannot be considered as a proper restriction. This objection seems to us a valid one.

The next subdivision seems to be that of Müller (1841), who retained the name of *Tetrodon* for none of his divisions.

Next (1855) we have the subdivision of Bibron.* By him the group was divided into a large number of genera, part of them without definition and all of them with French names only. For one of his sections the name *Tetraodon* was retained. This group, as arranged by Bibron, included a single Linnæan species as type. This one, *lineatus*, is a member of the group called by Müller, *Arothron*. This seems to be the first proper restriction of *Tetrodon*, and, so far as we can see, it must stand, making *Tetraodon* the equivalent of *Arothron*.

*We are indebted to Dr. E. J. Nolan, of Philadelphia, for the following list of the nominal genera of Bibron and their constituent species:

Prométocephales Bib. T. argentatus, Lac.; lunaris Schn., spadiceus Richards, lævigatus, Lin., lagocephalus Bloch, non Lin. (l'espèce décrite par ce dernier est un Rhyncote Bib.), inermis Schlegel; (diagnosis given).

Stenometopes Bib. D. testudineus, Lin., Spengleri Bloch, Plumieri Lacép., marmoratus Lowe, angusticeps Jenyns, lævissimus Bib., Kieneri Bib., binummulatus Bib., Bernieri Bib., subflavus Bib., Pleei Bib. (no diagnosis).

Dilobomycterе Bib. T. reticularis Schn., hispidus Bloch, maculatus Lacep., meleagris Lac., nigro-punctatus Schn., mappa Les., diadematus Rüpp., longicauda Bib., sordidus Rüpp., immaculatus Lacep., Rupelli Bib. (diagnosis given).

Tetraodon Bib. T. lineatus Lin., patoca Ham. (Buchanan), dorsonnicolor Bib., Bouronensis Bib. (diagnosis given).

Later, 1857, Hollard worked over the material of Bibron, and adopted —on skeletal characters only—an arrangement of genera, not unlike that given in the present paper. His genera are *Xenopterus* (not American), *Rhynchotus* (= *Canthigaster*), *Batrachops* (= *Colomesus*), *Brachycephalus* (= *Tetraodon*), *Apsicephalus* (= *Sphæroides* and *Lagocephalus*), *Monotreta* (not American).

Hollard supplies a Latin form to the French names of Bibron, and using the name *Tetrodon* as a general term, he places Bibron's *Tetraodon* as a subgenus under his own *Brachycephalus*.

In 1867, Bleeker, probably regarding *lineatus* as the proper type of *Tetraodon*, seems to have suppressed the latter name as a synonym of the name *Crayracion* used by Klein, before the date of the Systema Naturæ. Other ichthyologists do not give Klein's names precedence over those of Linnæus, and under the rules of nomenclature which we adopt, *Crayracion* must be disregarded.

In 1873, Professor Gill used the name *Tetrodon* as synonymous with *Lagocephalus*, and in 1885 as synonymous with *Arothron*. In 1883, Jordan and Gilbert regarded *T. testudineus* as its type, thus making it synonymous with *Sphæroides*.

It seems evident to us, from the above data, that it is best to regard *Tetraodon lineatus* as the type of *Tetraodon*, and thus to make the latter name the equivalent of *Arothron*.

The numerous species of *Tetraodon* belong chiefly to the East Indies, but one being known from American waters.

ANALYSIS OF SPECIES OF TETRAODON.

a. Entire body, except snout and caudal peduncle, thickly beset with long, robust quill-like spines, which are longest and most numerous on the belly. Snout short, cuboid; interorbital space wide, concave, its width greater than length of snout, and nearly twice diameter of eye; nasal tentacle bifid to the base, the inner surface of each division thickly covered with minute, cup-shaped depressions, the openings of the nostrils. Length of tentacle half its distance from eye and one-fourth diameter of eye. No cirri or dermal flaps or folds. D. 9, A. 10. Color dark brown, everywhere above with round white spots, most numerous on caudal peduncle, the largest half diameter of pupils; a dark area around base of pectorals, bounded by a white line. Several parallel longitudinal black streaks below pectorals. Size large (about 12 inches).

ERETHIZON, 11.

Amblyrhynchotus Bib. T. Honckenii Bloch, oblongus Bloch, Richei Fréminville, alboguttatus Bib. (diagnosis given).

Aphanacanthes Bib. T. reticulatus Bib. (no diagnosis).

Epipédorhynque Bib. T. Freycinetii Bib., Leschenaultii Bib., Germærtii Bib. (no diagnosis).

Gencion Bib. T. (G.) maculatum Bib. (diagnosis given).

Catophorhynque Bib. C. lampris Bib., longispinis Bib. (diagnosis given).

Batrachops Bib. T. psittacus, Schn. (Ostracion tetraodon Seba) (diagnosis given).

Monotreta Bib. T. cutcutia Ham. (Buchanan) (diagnosis given).

Dichotomycter Bib. T. fluviatilis Ham. (Buchanan) (no diagnosis).

Ephippion Bib. E. maculatum Bib. (diagnosis given).

Xenopètres Bib. X. Belangerii Bib. (diagnosis given).

Rhynchotes Bib. T. Gronovii Cuv., margaritatus Rüpp., striolatus Quoy et Gaim., Peronii Bib., latero-fasciatus Bib. (diagnosis given).

11. Tetraodon erethizon.

Arothron erethizon, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 631 (Panama); Jordan, Proc. U. S. Nat. Mus., 1885, 393 (Panama).

Habitat.—Panama fauna.

Six large specimens of this species were taken by Prof. Frank H. Bradley at Panama. These are now in the museum of Yale College and in the U. S. National Museum.

Several others were obtained in 1883 by Professor Gilbert. These have been destroyed by fire. No young examples have been taken.

IV.—COLOMESUS.

Les Batrachopes (BATRACHOPS) Bibron, Révue Zoölogique, 1855, 279 (*psittacus*).

BATRACHOPS Hollard, Études sur les Gymnodontes, 1857, 321 (*psittacus*); (name preoccupied).

COLOMESUS Gill, Proc. U. S. Nat. Mus., 1884, 422 (*psittacus*).

Type *Tetrodon psittacus* Bloch & Schneider.

Our knowledge of this genus rests wholly on the figure of its typical species given by Hollard. If this figure be correct, it represents a strongly marked type, considered by Professor Gill as forming a distinct subfamily (*Colomesinæ*). The single known species inhabits fresh waters.

ANALYSIS OF SPECIES OF COLOMESUS.

a. (Body covered with small, two-rooted spines, except on snout, around the pectoral fin and on caudal peduncle; some spines behind dorsal in very old examples. Spines on sides, with their points turned toward the back. Snout very obtuse, its length less than the width of the interorbital space, which is convex. Eye small, not one-third interorbital width. Brownish, with 6 dark cross-bands on the back, the two bands between dorsal and pectoral sometimes confluent.) PSITTACUS, 12.

12. Colomesus psittacus.

Tetrodon psittacus Bloch & Schneider, Syst. Ichth., 1801, 505, taf. 95 ("Malabar"); Günther, viii, 286, 1870. (Essequibo R., Surinam. Rio Capin, Pará.)

Cheilichthys psittacus Müller & Troschel, "Schomburgk's, British Guiana iii, 641" (Surinam); Steindachner, "Verh. Zool.-Bot. Ges. Wien, 1861, taf. 4, f. 2."

Batrachops psittacus Hollard, Études sur les Gymnodontes, 1857, 322.

Le Tetrodon perroquet Lacépède, 1, 217. (Copied.)

Cheilichthys asellus Müller & Troschell, "Schomburgk Brit. Guiana, iii, 641." 1842. (Surinam.)

Habitat.—Rivers of Guiana and Brazil.

This species is known to us only through the descriptions above cited. Among the American species, it seems to be the only one with fluviatile habit.

V.—CANTHIGASTER.

CANTHIGASTER Swainson, Nat. Hist. Class'n Fishes, ii, 1839, 194 (diagnosis only; no species mentioned).

PSILONOTUS Swainson, Nat. Hist., Class'n Fishes, ii, 1839, 328 (*rostratus : electricus*) (preoccupied in *Hymenoptera*).

TROPIDICHTHYS Bleeker, Nat. Tyds. Nederl., Ind., iv, 1854 (*valentini.*)
ANOSMIUS Peters, Wiegmann's Archiv, 1855, 274 (*tæniatus*, etc.).
Les Rynchotes (RHYNCHOTUS) Bibron, Revue de Zoologie, 1855, 279; (*Gronovii; margaritatus, striolatus: peronii, laterofasciatus.*)
RHYNCHOTUS Hollard, Études sur les Gymnodontes, 1857, 320 (*peroni.*)
ANOSMIUS Günther, Cat. Fishes, Brit. Mus., viii, 300, 1870.
CANTHIGASTER Bleeker, Atlas. Ichth. Gymn., 1867-80, etc.
PSILONOTUS Gill, Proc. U. S. Nat. Mus., 1884, 421 (*rostratus.*)

Type *Tetrodon rostratus* Bloch.

This genus is strongly marked as to its external characters, and still more peculiar as to its skeleton. Professor Gill has lately raised it to the rank of a separate family under the name of *Psilonotidæ*.

The proper name of the genus has been involved in some confusion, owing to the use by Swainson of two different names for it.

On page 194 of his miserable work on the classification of fishes, Swainson gives an analytical key to the genera, and applies to the present group the name of *Canthigaster* (correctly written *Acanthogaster*). No species are here mentioned by Swainson, but in this case his diagnosis is accurate and sufficient. On page 328, these genera are again defined, the present one in nearly the same way, but under the name of *Psilonotus*. Two species (*rostratus: electricus*) are here mentioned as types.

Professor Gill has preferred to adopt the last-mentioned name, regarding *Canthigaster* as unidentifiable except through the medium of the species mentioned under the diagnosis of *Psilonotus*. Dr. Bleeker has preferred to take the earlier name of *Canthigaster*. In this case it is certainly true that no doubt could exist as to what Swainson intended to include under *Canthigaster*, even had the second diagnosis been omitted; moreover, the name *Psilonotus* is preoccupied. We see, therefore, no sufficient reason for setting this name aside, objectionable as it is.

The species of *Canthigaster* are somewhat numerous and belong mostly to the East Indian fauna. As a rule, they are smaller in size than most of the other Tetrodonts.

ANALYSIS OF SPECIES OF CANTHIGASTER.

a. No black ocellus under the dorsal fin.

b. Upper parts dark brownish, without white spots; caudal fin with its upper and lower margins abruptly black; the middle of the fin pale, immaculate; an irregular brownish band or series of dots from pectoral to upper margin of caudal, continuous with the dark band on the latter, lower band of caudal continued on lower side of tail; adult specimens (always?) with chestnut-colored bands on the caudal peduncle and on the chin; dark streaks about eye; abdomen with very small, two-rooted spines; body otherwise smooth; snout moderately produced, rather more than twice the concave interorbital space; caudal fin slightly lunate; dorsal rays about 6. .....ROSTRATUS, 13.

bb. Upper parts everywhere behind head covered with round whitish spots, not larger than the pupil, and separated from each other only by a network of the brown ground color; fins all unmarked, pale; spines on the belly and on the front part of back; snout produced, its upper profile slightly concave. Dorsal rays, 9 .....PUNCTATISSIMUS, 14.

13. Canthigaster rostratus.

Tetrodon rostratus Bloch, Naturg. der Fische, 1, pl. 146, Abt., 1782 ("India"); Gmelin, Systema Naturæ, 1788, 1447 (copied); Walbaum, Artedi Piscium, 1792, 593 (copied); Bloch & Schneider, Syst. Ichth, 1801, 505 (copied); Turton, Syst. Nat., 1806, 891 (copied).

Tetrodon rostratus Günther, viii, 303 (Madeira, Funchal, Porto Praya); Goode, Am. Journ. Sci. Arts., 1877, 290 (Bermuda); Günther, Shore Fishes Challenger, 9, 1880 (Bermuda).

Psilonotus rostratus Swainson, Nat. Hist. Fishes, etc., vol. ii, 328, 1839 (name only).

Canthigaster rostratus Jordan, Proc. U. S. Nat. Mus., 1886 (Pensacola).

Le Tetrodon Museau-Allongé Lacépède, Poissons, 1, 502, 1798 (copied).

Tetrodon capistratus Lowe, "Proc. Zool. Soc. London, 1839, 90" (Madeira).

Psilonotus (or *Anchisomus*) *caudacinctus* Richardson, "Voyage Herald, 1854, 162, pl. 30, f. 1–3" (locality unknown).

Tetrodon caudacinctus Günther, viii, 303, 1870 (copied).

Canthogaster caudicinctus Cope, Trans. Am. Phil. Soc., 1871, 479 (St. Martin's).

Tetrodon caudacinctus Poey, Enumeratio, 1875, 73 (Havana).

Tetrodon ornatus Poey, Synopsis Pisc. Cubens, 1868, 433 (Havana); Günther, viii, 303, 1870 (St. Croix.)

Habitat.—West Indian fauna. Pensacola to the Madeiras and Bermudas.

This species is known to us only from a single young specimen taken by Mr. Silas Stearns at Pensacola. This specimen agrees very closely with Dr. Günther's description of *T. rostratus*. It agrees also with the *T. ornatus* of Poey in all respects except that there are no chestnut-colored bars on the tail. According to Poey, however, these markings are wanting in the young. There is not much doubt, therefore, of the identity of *T. ornatus* and *T. rostratus*. The *Tetrodon caudacinctus* is not unlikely the same species, as Poey has supposed. Richardson's description does not apply so well to our specimen, however, as do those of the other authors mentioned.

Dr. Günther has identified this species with the *Tetrodon rostratus* of Bloch. Bloch's figure represents it very poorly. It is, however, evidently drawn from some species of *Canthigaster*, and there is no other one known so much like it as this. It must, however, be regarded as somewhat uncertain. If Bloch's name be set aside on this account, the present species may stand as *Canthigaster capistratus*.

14. Canthigaster punctatissimus.

Tetrodon punctatissimus Günther, Cat. Fish. Brit. Mus., VIII, 302, 1870 (Panama. "South America").

Psilonotus punctatissimus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 370 (Cape San Lucas). Jordan, Cat. Fish. N. Am., 141, 1885 (name only).

Tetrodon oxyrhynchus Lockington, Proc. Acad Nat. Sci., Phil., 1881, 116 (Gulf of California).

Habitat.—Panama fauna. Gulf of California to Panama.

This species is known to us only from numerous specimens, the largest, three inches in length, collected by John Xantus, at Cape San Lucas.

RECAPITULATION.

(W=West Indian fauna; U=East coast United States; P=Panama fauna; C=West coast United States.)

1. LAGOCEPHALUS Swainson.
   1. *Lagocephalus lævigatus* Linnæus. U. W.
2. SPHÆROIDES Lacépède.
   2. *Sphæroides pachygaster* Müller & Troschel. W. (Species unknown to late writers.)
   3. *Sphæroides trichocephalus* Cope. W. U. (Species imperfectly known.)
   4. *Sphæroides fürthi* Steindachner. P.
   5. *Sphæroides angusticeps* Jenyns. P.
   6. *Sphæroides spengleri* Bloch. W. U.
   7. *Sphæroides maculatus* Bloch & Schneider. U.
   8. *Sphæroides politus* Girard. P. C. (Doubtful species; probably the adult form of *S. testudineus.*)
   9. *Sphæroides testudineus* Linnæus. W. P. U. (Possibly includes two species, *testudineus* (Atlantic) and *annulatus* (Pacific.)
   10. *Sphæroides formosus* Günther. W. (Doubtful species; probably a form of *S. testudineus.*)
3. TETRAODON Linnæus.
   11. *Tetraodon erethizon* Jordan & Gilbert. P.
4. COLOMESUS Gill.
   12. *Colomesus psittacus* Bloch. W.
5. CANTHIGASTER Swainson.
   13. *Canthigaster rostratus* Bloch. W. U. (Perhaps more than one species included in the synonymy.)
   14. *Canthigaster punctatissimus* Günther. P.

List of nominal species with identifications.

[Tenable specific names are in italics.]

Nominal species.	Date.	Identification.
Tetraodon *testudineus*, Linnæus	1758	Sphæroides testudineus.
Tetraodon *lævigatus*, Linnæus	1766	Lagocephalus lævigatus.
Tetrodon *spengleri*, Bloch	1782	Sphæroides spengleri.
Tetrodon *rostratus*, Bloch	1788	Canthigaster rostratus.
Tetrodon hispidus var. *maculatus*, Bloch & Schneider	1801	Sphær. maculatus.
Tetrodon plumieri, Bloch & Schneider	1801	Sphær. spengleri.
Tetrodon punctatus, Bloch & Schneider	1801	?Sphær. testudineus.
Tetrodon geometricus, Bloch & Schneider	1801	Sphær. testudineus.
Tetrodon *psittacus*, Bloch & Schneider	1801	Colomesus psittacus.
Tetrodon curvus, Mitchill	1815	Lagocephalus lævigatus.
Tetrodon mathematicus, Mitchill	1815	Lagoc. lævigatus.
Tetrodon turgidus, Mitchill	1815	Sphær. maculatus.
Sphæroides tuberculatus (Lacépède)	1831	Sphær. spengleri.
Tetrodon capistratus, Lowe	1839	Canth. rostratus.
Tetrodon marmoratus, Ranzani	1840	Sphær. spengleri.
Tetrodon pachycephalus, Ranzani	1840	Lagoc. lævigatus.
Tetrodon (Cheilichthys) pachygaster, Müller & Troschel	1840	Sphær. pachygaster.
Tetrodon *angusticeps*, Jenyns	1842	Sphær. angusticeps.
Tetrodon anuulatus, Jenyns	1842	Sphær. testudineus (annulatus).
Cheilichthys asellus, Müller & Troschel	1842	Colom. psittacus.
Tetrodon ammocryptus, Gosse	1851	Sphær. testudineus.
Holacanthus melanothos, Gronow	1854	Lagoc. lævigatus.
Holacanthus leionothos, Gronow	1854	Sphær. testudineus.
Psilonotus *or* Anchisomus caudacinatus, Richardson	1854	Canth. rostratus.
Tetraodon bajacu, Castelnau	1855	Sphær. testudineus.
Tetrodon *politus*, Girard	1859	Sphær. (testudineus) politus.
Tetrodon lineolatus, Poey	1868	Lagoc. lævigatus.
Tetrodon punctatus, Poey	1868	Sphær. testudineus.
Tetrodon ornatus, Poey	1868	Canth. rostratus.
Tetrodon *trichocephalus*, Cope	1870	Sphær. trichocephalus.
Canthogaster lobatus, Steindachner	1870	Sphær. angusticeps.
Tetrodon heraldi, Günther	1870	Sphær testudineus (annulatus).
Tetrodon *formosus*, Günther	1870	Sphær. formosus.
Tetrodon *punctatissimus*, Günther	1870	Canth. punctatissimus.
Tetrodon *furthi*, Steindachner	1874	Sphær. fürthi.
Tetrodon oxyrhynchus, Lockington	1881	Canth. punctatissimus.
Tetrodon nephelus, Goode & Bean	1882	Sphær. spengleri.
Arothron *erethizon*, Jordan & Gilbert	1882	Tetraodon erethizon.

INDIANA UNIVERSITY, *January* 25, 1886.

DESCRIPTION OF A MELANISTIC SPECIMEN OF BUTEO LATISSIMUS (Wils).

By ROBERT RIDGWAY.

The melanistic plumage of *Buteo latissimus* having remained hitherto unknown, so far as the writer is aware, the following description is presented of a specimen recently acquired by the National Museum from Mr. J. W. Preston, of Baxter, Iowa. It is the only example which the writer has seen, or indeed heard of, except the two others seen by Mr. Preston, as recorded farther on.

Melanistic ♀ *adult* (No. 107,427, U. S. Nat. Mus., Crystal Lake, Hancock County, Iowa, May 3, 1883; J. W. Preston): Plumage of head, neck, and body, entirely continuous dark sooty brown, without the faintest indication of markings, even on the lower tail-coverts or lining of the wing; back darker, with a chalky cast in certain lights. Wings similar to the general plumage, but somewhat lighter brown, on account of paler, but not well defined, borders to the feathers; secondaries lighter brown than the coverts, without trace of markings except near the end, where crossed by a broad dusky subterminal band and very narrow paler terminal margin; primaries uniform dusky brown on outer webs, growing gradually blackish terminally; inner webs of the three outer quills chiefly white anterior to their emargination (the portion near the shaft brownish), the white crossed by several very distinct but irregular bands of blackish; inner webs of remaining primaries, and also of secondaries, brown, with a greater or less number (according to the length of the feather) of dusky bands, the webs mottled with whitish along the edge. Upper tail-coverts with concealed pale grayish broad bars (approaching white in places), there being about two bars on each feather. Tail black, narrowly tipped with grayish brown, crossed at about 1.50 inches from the end by a broad band (about 1 inch wide) of brownish gray, becoming white on edges of inner webs, and approaching white on the anterior portion of the band on the middle rectrices; another much narrower and much less distinct dull grayish band crosses the tail about 4.75 inches from the tip, the portion on inner webs more or less whitish on some of the feathers, but on none extending clearly to the edge of the web; extreme base of the tail light sooty grayish. Feathers of the head, neck, and body, above and below, sooty gray beneath the surface, the extreme base even scarcely approaching white; the feathers of the entire occiput, however, abruptly snow-white for about the basal half. Forehead entirely sooty blackish, but anterior portion of the lores grayish white, finely streaked with black.

Wing, 11.50; wing formula, 3, 4–5–2–6–7–8–9, 1, 10; outer three primaries abruptly and deeply emarginated on inner webs; tail, 7.00; culmen, .80; tarsus, 2.40; middle toe, 1.40.

This specimen presents an exceedingly close general resemblance to the browner examples of *Buteo fuliginosus* Sel., which is said to be the melanistic phase of *B. brachyurus* Vieill. An adult female of *B. fuliginosus* differs, however, as follows:—

Dimensions.

	Wing.	Tail.	Culmen.	Depth of bill at base.	Tarsus.	Mid. toe.
B. latissimus	11.50	7.00	.80	.68	2.40	1.40
B. fuliginosus	12.00	6.60	.80	.70	2.25	1.55

Wing formula.

B. latissimus: 3, 4–5–2–6–7–8–9, 1, 10. } Both with only three outer primaries
B. fuliginosus: 3=4–5, 2–6–7–8, 1–9–10. } emarginated on inner webs.

Color.

B. latissimus.—Forehead dark fuliginous; tail with two broad bands of brownish gray.

B. fuliginosus.—Forehead white, with blackish shaft-streaks; tail with five or more narrow bands of brownish gray.

Mr. Preston, writing under date of January 25, 1886, says: "This is the third specimen that I have seen. Twelve years since my attention was called to a peculiar little black hawk flying with a number of *B. pennsylvanicus* [*i. e. latissimus*], and from that time until the capture of this specimen I had looked for another in vain. In the spring of 1884 I came very near securing another, which was in migration with others of the species. The present example was shot by myself in a small oak grove on Crystal Lake, Hancock County, Iowa, May 3, 1883. A number of Broad-wings were sheltering in the woods at the time, as a cold storm prevailed. While attempting to get nearer one of them this bird flew from a small tree near me, and as its color was peculiar I secured it, and found it to be my long-sought-for 'Black Hawk.' Dissection proved it to be an adult female, with ova much enlarged. My measurements were lost, but I remember the iris to have been red."

SUPPLEMENT TO THE LIST OF MESOZOIC AND CENOZOIC INVERTEBRATE TYPES IN THE COLLECTIONS OF THE NATIONAL MUSEUM.

By JOHN BELKNAP MARCOU.

This list contains a few additional types found during the arrangement of the remainder of the Mesozoic and Cenozoic invertebrate collections of the National Museum, with the addition of a few new ones lately published.

I am indebted to Mr. R. T. Hill for his assistance in finding some of these types.

LIST OF WORKS REFERRED TO.

U. S. N. Ast. Exp. S. Hem. Vol. II=The U. S. Naval Astronomical Expedition to the Southern Hemisphere during the years 1849-'50-'51-'52, Lieut. J. M. Gilliss, Superintendent. Vol. II, House of Representatives, Thirty-third Congress, first session, Ex. Doc. No. 121. Washington, 1855.

Rep. Expl. Expd. in 1859 by Capt. J. N. Macomb=Report of the Exploring Expedition from Santa Fé, New Mexico, to the Junction of the Grand and Green Rivers of the Great Colorado of the West, in 1859, under the command of Capt. J. N. Macomb, Corps of Topographical Engineers (now Colonel of Engineers); with Geological Report by Prof. J. S. Newberry, Geologist of the Expedition. Washington, D. C.

JURASSIC SPECIES.

Ammonites ? Conrad.

U. S. N. Ast. Exp. S. Hem. vol. ii (not described, but figured), pl. xii, fig. 5. Mus. No. 5120.

Cucullæa Haguei Meek.

Rep. Geol. Expl. 40th Parallel, vol. iv, part 1, pp. 134, 135, pl. xii, figs. 1*a*, *b*. Mus. No. 12546.

Cyprina ? Dallii White.

Juras. Neocomian, Bull. U. S. Geol. Surv., vol. i, No. 4, p. 102, pl. vi, fig. 1. Mus. No. 19266.

Lithotrochus Andii (D'Orbigny sp.) Conrad.

U. S. N. Ast. Exp. S. Hem., vol. ii, p. 283, pl. xli, fig. 3. Mus. No. 5119.

Ostrea (Alectryonia) procumbens White.

Rev. Foss. Ostreidæ N. A., p. 290, pl. xxxv, figs. 6, 7, and 8. Mus. No. 8355.

Ostrea gregaria (Sowerby) Conrad.

U. S. N. Ast. Exp. S. Hem., vol. ii, p. 283, pl. xli, fig. 1. Mus. No, 5117.

Ostrea irregularis (Munster) Conrad.

U. S. N. Ast. Exp. S. Hem., vol. ii, p. 283, pl. xlii, fig. 9. Mus. No. 5116.

Ostrea strigilecula White.

Rep. Geogr. & Geol. Expl. & Surv. w. 100th Meridian, vol. iv, p. 163, pl. xii; figs. 3*a-d*. Rev. Foss. Ostreidæ N. A., p. 289, pl. xxxv, figs. 9-11. Mus. No. 8581.

Pecten (Neithea) alatus (Von Buch) Conrad.

U. S. N. Ast. Exp. S. Hem., vol. ii, p. 283, pl. xli, fig. 2. Mus. No. 5107.

Terebratula meridionalis Conrad.

U. S. N. Ast. Exp. S. Hem., vol. ii, p. 282, pl. xlii, fig. 10. Mus. No. 5121.

Terebratula subexcavata Conrad.
U. S. N. Ast. Exp. S. Hem., vol. ii, p. 282, pl. xli, fig. 4. Mus. No. 5109.

Terebratula subtetraëdra Conrad.
U. S. N. Ast. Exp. S. Hem., vol. ii, p. 282, pl. xlii, fig. 8. Mus. No. 5118.

CRETACEOUS SPECIES.

Cardium curtum Meek and Hayden.
Proc. Acad. Nat. Sci., Philad., vol. xiii, p. 442 (not figured). Mus. No. 1917.

Cerithium Pillingi White.
Bull U. S. Geol. Surv., No. 22, p. 13, pl. v, figs. 3–6. Mus. No. 13408.

Cerithium totium sanctorum White.
Bull. U. S. Geol. Surv., No. 22, p. 13, pl. v, figs. 12, 13. Mus. No. 13409.

Coralliochama orcutti White.
Bull. U. S. Geol. Surv., No. 22, pp. 10–12, pls. i–vi. Mus. No. 12698.

Enclimatoceras (Nautilus) Ulrichi White.
Bull. U. S. Geol. Surv., vol. 1, No. 4, p. 105, pls. vii–ix. Mus. Nos. 8349 and 12346.

Exogyra aquila (Goldfuss) White.
Rev. Foss. Ostreidæ N. A., p. 304, pl. liii, figs. 1 and 2. Mus. No. 9609.

Exogyra arietina (Roemer) White.
Rev. Foss. Ostreidæ N. A., p. 303, pl. lvi, figs. 3–5. Mus. No. 9866.

Exogyra costata (Say) White.
Rev. Foss. Ostreidæ N. A., p. 304, pl. lvi, fig. 1, and pl. lvii, figs. 1 and 2. Mus. Nos. 1744 and 2213.

Exogyra costata (Say) *var* **fluminis** White.
Rep. U. S. Geogr. and Geol. Surv. west 100th Meridian, vol. iv, part 1, p. 174, pl. xvii, figs. 3*a–d*. Mus. No. 8654.

Exogyra læviuscula (Roemer) White.
Rep. U. S. Geogr. and Geol. Surv. west of 100th Meridian, vol. iv, part 1, p. 183, pl. xvii, figs, 2*a–d*, and Rev. Foss. Ostreidæ N. A., p. 305. pl. lii, fig. 5. Mus. No. 8646.

Exogyra Walkeri White.
11th Ann. Rep. U. S. Geol. and Geogr. Surv. Terr., p. 278, pl. i, figs. 1*a*, *b*, and Rev. Foss. Ostreidæ N. A., p. 307, pl. liv, figs. 1 and 2. Mus. No. 8039.

Gervillia recta (M. & H.) Meek.
Cret. No. 5, Rep. U. S. Geol. and Geogr. Surv. Terr., 4°, vol. ix, pp. 66, 67. (pl. xxix, figs. 1*a*, *b*). Mus. No. 7843.

Gryphæa pitcheri (Morton) White.
Rev. Foss. Ostreidæ N. A., p. 302, pl. xlix, figs. 1–3. Mus. No. 9733.

Gryphæa vesicularis (Lamarck) White.
Rev. Foss. Ostreidæ N. A., p. 303, pl. xliii, figs. 1–5. Mus. No. 2340.

Inoceramus deformis Meek.
4th Ann. Rep. U. S. Geol. and Geogr. Surv. Terr., p. 296 (not figured). Mus. No. 7744.

Inoceramus umbonatus Meek.
Cret. No. 2, Rep. U. S. Geol. and Geogr. Surv. Terr., 4°, vol. ix, p. 44, pl. iii, figs. 1*a–c*; pl. iv, figs. 1*a*, *b*, and 2*a*, *b*. Mus. Nos. 480, 2038, and 2039.

Lucina profunda White.
Proc. U. S. Nat. Mus., vol. iii, pp. 158, 159, and vol. iv, p. 138, pl. —, figs. 5, 6. Mus. No. 8362.

Margaritana nebrascensis Meek.

Cret. No. 1; Rep. U. S. Geol. and Geogr. Surv. Terr., 4, vol. ix, pp. 114, 115, pl. i, figs. 5*a–e*, and Rev. Non-Marine Foss. Moll., p. 21, pl. iv, figs. 1 and 2. Mus. No. 7719.

Nerita ——? White.

Bull. U. S. Geol. Surv., No. 22, p. 12, pl. v, figs. 7, 8. Mus. No. 13411.

Ostrea (Alectryonia) Blackii White.

Proc. U. S. Nat. Mus., vol. ii, p. 293 (not figured specimen), 12th Ann. Rep. U. S. Geol. and Geogr. Surv. Terr., p. 11, pl. xvii, fig. 5, and Rev. Foss. Ostreidæ N. A., p. 292 (not the figured specimen). Mus. No. 8024.

Ostrea (Alectryonia) larva (Lamarck) White.

Rev. Foss. Ostreidæ N. A., p. 296, pl. xlii, figs. 2–9. Mus. No. 2401.

Ostrea carinata (Lamarck) White.

Rev. Foss. Ostreidæ N. A., p. 293, pl. xliii, figs. 2–4. Mus. No. 18616.

Ostrea diluviana (Linnæus) White.

Rev. Foss. Ostreidæ N. A., p. 295, pl. xl, fig. 1, and pl. xli, figs. 1 and 2. Mus. No. 8300.

Ostrea elegantula Newberry.

Rep. Expl. Exp. in 1859, by Capt. J. N. Macomb, p. 33, and Rev. Foss. Ostreidæ N. A., p. 295, pl. xxxvi, figs. 5–7. Mus. No. 18611.

Ostrea plumosa (Morton) White.

Rev. Foss. Ostreidæ N. A., p. 299, pl. xxxvii, figs. 5, 6. Mus. No. 18602.

Ostrea testicostata (Gabb) White.

Rev. Foss. Ostreidæ N. A., p. 301, pl. l, figs. 3 and 4. Mus. No. 18613.

Ostrea vomer (Morton) White.

Rev. Foss. Ostreidæ N. A., p. 302, pl. xlviii, figs. 8–10. Mus. No. 2414.

Pachymya austinensis (Shumard) White.

11th Ann. Rep. U. S. Geol. and Geogr. Surv. Terr., p. 298, pl. viii, fig. 1*b*. Mus. No. 8043.

Pteria (Oxytoma) erecta White.

Proc. U. S. Nat. Mus., vol. iii, pp. 157–158, and vol. iv, p. 139, pl.—, figs. 7 and 8. Mus. No. 8771.

Solarium wallalense White.

Bull. U. S. Geol. Surv., No. 22, p. 14, pl. v, figs. 1 and 2. Mus. No. 13412.

Solemia bilex White.

Proc. U. S. Nat. Mus., vol. iii, p. 158, and vol iv, p. 139, pl.—, fig. 9. Mus. No. 8913.

Tancredia americana (M. & H.) Meek.

Cret. No. 5, Rep. U. S. Geol. and Geogr. Surv. Terr., 4to, vol. ix, p. 142, pl. xxxviii, figs. 1*b–e*. Mus. Nos. 186 and 2017.

Trochus (Oxystele) euryostomus White.

Bull. U. S. Geol. Surv., No. 22, p. 12, pl. v., figs. 9–11. Mus. No. 13410.

Unio ——? Meek.

6th Ann. Rep. U. S. Geol. and Geogr. Surv. Terr., pp. 444 and 476 (not figured nor described, but mentioned). Mus. No. 7868.

LARAMIE SPECIES.

Anomia gryphorhyncus (Meek) White.

Rev. Non-Marine Foss. Moll., p. 16 or 422, pl. xii, fig. 15. Mus. No. 9050.

Bulinus ? rhomboideus (M. & H.) Meek.

Rep. U. S. Geol. and Geogr. Surv. Terr., 4to, vol. ix, p. 542, pl. xliii, fig. 17; Rev. Non-Marine Foss. Moll., p. 45 or 451, pl. xxv, fig. 9. Mus. No. 19181.

Corbicula umbonella (Meek) White.

Rev. Non-Marine Foss. Moll., p. 32 or 432, pl. xxi, figs. 7–10. Mus. No. 12468.

Corbula subtrigonalis (M. & H.) Meek.

Rep. U. S. Geol. and Geogr. Surv. Terr., 4to, vol. ix, pp. 529–530, pl. xl, figs. 3*a–b* and Rev. Non-Marine Foss. Moll. p. 36, pl. xix, fig. 10. Mus. No. 2183.

Goniobasis macilenta White.

12th Ann. Rep. U. S. Geol. and Geogr. Surv. Terr., p. 93, pl. xxx, fig. 10*a*, and Rev. Non-Marine Foss. Moll., p. 56, pl. vi, fig. 12. Mus. No. 1916.

Goniobasis ? subtortuosa (M. & H.) Meek.

Rep. U. S. Geol. and Geogr. Surv. Terr., 4to, vol. ix, p. 569, pl. xlii, figs. 17*a*, *b*, and figs. 75 and 76, p. 569. Rev. Non-Marine Foss. Moll., p. 57 or 463, pl. xxvii, fig. 34. Mus. No. 19180.

Melania wyomingensis (Meek) White.

12th Ann. Rep. U. S. Geol. and Geogr. Surv. Terr., p. 95, pl. xxviii, figs. 6*a*, *b*. Rev. Non-Marine Foss. Moll., p. 54 or 460, pl. xxvi, figs. 1, 2. Mus. No. 9018.

Ostrea glabra (M. & H.) White.

Rev. Foss. Ostreidæ N. A., p. 307, pl. lxi, figs. 2 and 3. Mus. No. 11889.

Physa kanabensis White.

Rep. Geol. Eastern Uinta Mts., J. W. Powell, p. 119 (not figured). Mus. No. 8890.

Unio priscus (M. & H.) Meek.

Rep. U. S. Geol. and Geogr. Surv. Terr., 4, vol. ix, p. 516, pl. xliii, figs. 8*a*, *b*, and *d*. Rev. Non-Marine Foss. Moll., p. 26 or 432, pl. xiv, fig. 1. Mus. Nos. 2162 and 2180.*

Unio vetustus (Meek) White.

Rev. Non-Marine Foss. Moll., p. 24 or 430, pl. vii, figs. 2–4. Mus. No 8147.

EOCENE SPECIES.

Anodonta decurtata Conrad.

Amer. Jour. Conch., vol. vi, p. 200, pl. xi, fig. 8, and Rev. Non-Marine Foss. Moll., p. 73, pl. xxix, figs. 27 and 28. Mus. No. 13574.

Cardita planicosta (Lamarck) White.

Bull. U. S. Geol. Surv. No. 18, pp. 7–9, pl. i, figs. 1–3. Mus. No. 13405.

Limnæa (Leptolimnæa) minuscula White.

Proc. U. S. Nat. Mus., vol. iii, p. 160, and Rev. Non-Marine Foss. Moll., p. 40, pl. xxix, figs. 24 and 25. Mus. No. 8907.

Ostrea compressirostra (Say) Heilprin.

Rev. Foss. Ostreidæ N. A., p. 309, pl. lxv, figs. 1 and 2. Mus. No. 18597.

Ostrea sellæformis (Conrad) Heilprin.

Rev. Foss. Ostreidæ N. A., p. 311, pl. lxii, figs. 1 and 2, and pl. lxiii, fig. 1. Mus. No. 18598.

Ostrea thirsæ (Gabb) Heilprin.

Rev. Foss. Ostreidæ N. A., p. 311, pl. lxiii, figs. 4–6. Mus. No. 570.

Ostrea vicksburgensis (Conrad) Heilprin.

Rev. Foss. Ostreidæ N. A., p. 312, pl. lxiii, figs. 2 and 3. Mus. No. 6182.

Physa pleromatis White.

Rep. Geogr. & Geol. Surv. west 100th meridian, vol. iv, part i, p. 211, pl. xxi, figs. 1*a*, *b*. Rev. Non-Marine Foss. Moll., p. 44, or 450, pl. xxx, figs. 6, 7, and 8. Mus. Nos. 8867 and 8876.

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* Mus. No. 2180 are the specimens from which the composite figures 8*a*, *b* are made up.

MIOCENE SPECIES.

Helix (Aglaia) fidelis (Gray) White.
Bull. U. S. Geol. Surv. No. 18, p. 14, pl. iii, figs. 1–3. Mus. No. 13400.

Helix (Monodon) Dallii Stearns (Ms.).
Bull. U. S. Geol. Surv. No. 18, pp. 14, 15, pl. iii, figs. 4–6. Mus. No. 13401.

Helix (Patula) perspectiva (Say) White.
Bull. U. S. Geol. Surv. No. 18, p. 14, pl. iii, fig. 7. Mus. No. 13402.

Gonostoma Yatesii (Cooper) White.
Bull. U. S. Geol. Surv. No. 18, p. 16, pl. iii, figs. 8–12. Mus. No. 13403.

Ostrea subfalcata (Conrad) Heilprin.
Rev. Foss. Ostreidæ N. A., p. 313, pl. xlviii, figs. 1–3. Mus. No. 1668.

Unio condoni White.
Bull. U. S. Geol. Surv. No. 18, pp. 13, 14, pl. ii, figs. 1–3. Mus. No. 13404.

POST-TERTIARY AND TERTIARY SPECIES OF DOUBTFUL AGE.

Ostrea lurida (Carpenter) Heilprin.
Post-Pliocene Rev. Foss. Ostreidæ N. A., p. 316, pl. lxii, figs. 3 and 4. Mus. No. 18614.

CATALOGUE OF THE COLLECTION OF RECENT ECHINI IN THE UNITED STATES NATIONAL MUSEUM (CORRECTED TO JULY 1, 1886).

By RICHARD RATHBUN.

INTRODUCTION.

The following catalogue is published for a twofold purpose. First, in order to secure a permanent record of the species and specimens of Echini contained in the U. S. National Museum, which have now, with few exceptions, been completely identified and labeled; and second, to present in convenient form for reference such data as that collection affords respecting the distribution of the numerous members of that group.

The National Museum collection of Echini is second, in this country, only to that of the Museum of Comparative Zoology, at Harvard College, both in size and comprehensiveness, but we have no means of comparing it with European collections, although it is probably excelled by few, if any, in the old world. It now contains 152 species that have been determined, but many species are represented by large series of specimens, covering a wide range of distribution, both geographical and bathymetrical, and thus affording excellent opportunities for the study of variation under different conditions of environment. The materials composing this collection have been derived from many sources, and credit is given in the list to all contributors, but a few of these are deserving of special mention.

The most important contributions have been made by the U. S. Fish Commission, beginning in 1871 and continuing down to date. The explorations of this Commission have extended along the eastern coast of North America, from the Grand Bank of Newfoundland to the northern coast of South America, and from the littoral zone into the deepest water yet recorded off the Atlantic coast of the United States. At the south, they have covered a large part of the Gulf of Mexico and Caribbean Sea, including the shores of several of the West Indian Islands and the Bahamas. Interesting specimens from the fishing banks of Eastern North America have been received, through the Commission, from the Gloucester fishermen, many of whom were constantly engaged in making collections in its behalf, from 1878 to 1880. Not all of the Echini collected by the Fish Commission have yet been turned over to the Museum, but representatives of nearly all the species obtained and the bulk of the specimens have already been sent in. The number of species with which the Commission is credited on the following pages is 54.

Of the interesting deep-sea collections made by the U. S. Coast Survey steamer Blake, under the supervision of Mr. Alexander Agassiz, off the eastern coast of the United States, and in the Gulf of Mexico and

Caribbean Sea, from 1877 to 1880, the Museum has received a nearly complete series of all the species. Many specimens have also been obtained from the southern and western coasts of Florida by Mr. Henry Hemphill and Dr. Edward Palmer, who spent considerable time in that region, in the service of the Museum, from 1883 to 1885.

For Alaskan Echini the Museum is chiefly indebted to Mr. William H. Dall, who, during his several visits to Alaska and the adjacent waters of Siberia, made very extensive collections both from the shore and by dredging, thereby securing an exceedingly large number of specimens of this group. Other materials from the Alaskan region have been sent in by observers of the U. S. Signal Service, by the officers of the U. S. revenue steamer Corwin, and by several naval officers.

From the western coast of North America south of Alaska, valuable specimens have been contributed by Mr. J. G. Swan, from Puget Sound, Neeah Bay, and British Columbia; by Prof. D. S. Jordan, while in the service of the U. S. Fish Commission, from Washington Territory and California; by Mr. A. Forrer and Prof. R. E. C. Stearns, from California, Lower California, and Mexico; by Mr. John Xantus and Mr. L. Belding, from Lower California and Mexico; and by Lieut. Commander H. E. Nichols, U. S. N., from various sources. The collection of Echini obtained by Mr. John Xantus at the southern extremity of California was, at the time it was made (1859 to 1861), one of the most important that had been procured from that region, and a large number of his specimens are still preserved in the Museum in good condition.

So far as the writer is aware, no account has ever been published of the collection of Echini made by the Wilkes United States Exploring Expedition around the world, from 1838 to 1842, and it is now impossible to determine how extensive that collection may have been. The very valuable zoological materials obtained on that cruise, including the Crustacea and Zoophytes described by Dana and the Mollusks described by Gould, did not come into the possession of the Museum until several years after they left the hands of the naturalists engaged in studying them, and in the mean time they suffered greatly from the destruction of specimens and the loss of labels, due to insufficient accommodations in the store rooms in which they were kept. They received further damage at the time of the Smithsonian fire in 1865, and at the burning of the museum of the Chicago Academy of Science in 1871. Only a few specimens of Echini that can be referred to that Expedition have been found in the Museum collection, and these are all denuded tests, mostly without other indication of their origin than the simple inscription "U. S. Ex. Ex.," written directly upon the specimen.

The Echini collected by the North Pacific Exploring Expedition, Dr. William Stimpson naturalist, from 1853 to 1856, fared somewhat better, notwithstanding the fact that the Crustaceans and Mollusks were almost entirely destroyed in the great Chicago fire above referred to. This expedition visited numerous islands in the Pacific Ocean, and the eastern coast of Asia as far north as Kamtchatka and Bering Strait;

but marine collecting was limited to the littoral zone and the shallow waters near shore. The Echini were described by Mr. Alexander Agassiz in the following paper:

Synopsis of the Echinoids collected by Dr. W. Stimpson on the North Pacific Exploring Expedition, under the command of Captains Ringgold and Rodgers. Jour. Acad. Nat. Sci. Phila., 1863, pp. 352–361.

Forty-three species in all were enumerated, and a few new species described. Two of these species have since been regarded as varieties of others contained in the same list, reducing the total number to 41. Of this collection only 27 species are now positively known to be in the National Museum, although specimens of some of the other species have since been received from other sources. Following is a corrected list of the species mentioned by Mr. Agassiz, those in italics being still in the museum:

Phyllacanthus dubia.
imperialis.
Arbacia pustulosa.
Diadema setosum.
Centrostephanus Rodgersii.
Echinothrix turcarum.
Colobocentrotus atratus.
Mertensii.
Heterocentrotus mammillatus.
Echinometra lucunter.
Parasalenia gratiosa.
Strongylocentrotus depressus.
Dröbachiensis.
eurythrogrammus.
globulosus.
intermedius.
nudus.
purpuratus.
tuberculatus.
Sphærechinus granularis.
pulcherrimus.
Temnopleurus Hardwickii.
Temnopleurus Reynaudi.
torenmaticus.
Microcyphus maculatus.
Mespilia globulus.
Phymosoma crenulare.
Echinus angulosus.
Hipponoë variegata.
Echinocyamus pusillus.
Fibularia australis.
Laganum Putnami.
Peroniella decagonalis.
Echinarachnius mirabilis.
parma.
Echinodiscus lævis.
Rotula Rumphii.
Maretia alta.
Lovenia subcarinata.
Echinocardium australe.
Paleostoma mirabilis.

During the past few years, very valuable contributions of Echini have been made by Dr. W. H. Jones, U. S. N., from the islands of the Central and Southern Pacific Ocean, and the west coast of South America, including the Galapagos Islands. The collections received from Dr. Jones have been mainly preserved in alcohol, and include many fine and carefully prepared specimens. Several interesting species from China and Japan have been received from Dr. F. C. Dale, U. S. N., and Mr. P. L. Jouy, naturalists of the U. S. S. Palos, surveying in those waters, and small collections have been donated from time to time by other naval officers stationed in foreign countries.

European materials have been obtained mostly by exchange with the Bergen Museum, Norway, the Rev. A. M. Norman, of England, and Prof. C. Möbius, of Kiel, Germany.

The synonymy of the species of Echini has been published in such detail by Mr. Alexander Agassiz that it has been deemed inexpedient

to give in this list more than the name by which each species is now designated, together with the authority for the combination used. The classification and nomenclature of Mr. Agassiz have been strictly followed, and those who desire further information on the subject are referred to the following monographs by that author:

Revision of the Echini. Illustrated Catalogue of the Museum of Comparative Zoology, at Harvard College, No. VII. Memoirs, Mus. Comp. Zool., vol. iii. In four parts, text and plates. Cambridge, 1872–'74.

Reports on the Results of Dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877–'78), in the Caribbean Sea (1878–'79), and along the Atlantic Coast of the United States (1880), by the U. S. Coast Survey steamer "Blake," Lieut.-Com. C. D. Sigsbee, U. S. N., and Commander J. R. Bartlett, U. S. N., commanding. XXIV. Part I. Report on the Echini. By Alexander Agassiz. Mem. Mus. Comp. Zool., vol. x, No. 1, pp. 1–94, 32 plates, 1883.

Report on the Scientific Results of the Voyage of H. M. S. Challenger during the years 1873–'76. Zoology. Vol. iii. Part ix. Report on the Echinoidea. 1881.

Notes are given with only a few species, as the greater part of the material contained in the collection has already been discussed in one connection or another, though mostly in brief reports covering special collections or limited faunal regions. The report upon the Echini of the North Pacific Exploring Expedition, by Mr. Agassiz, has been mentioned above. Subsequently Mr. Agassiz examined the entire collection of Echini belonging to the National Museum, in connection with the preparation of his "Revision of the Echini," in which many references to this collection will be found. The Blake Echini are described in the second monograph of Mr. Agassiz, above cited. Prof. A. E. Verrill has described or noticed all the species collected by the U. S. Fish Commission on the Atlantic coast of the United States, north of Cape Hatteras, in numerous papers, each generally covering the explorations of a single season. In the following report to the U. S. Fish Commissioner, Professor Verrill has fully discussed the species known from the Southern New England coast up to 1872:

Report upon the Invertebrate Animals of Vineyard Sound and Adjacent Waters, etc. Report U. S. Comm. Fish and Fisheries, Part I, for 1871 and 1872 (1874), pp. 295–478.

The subsequent notices of Echini by Professor Verrill have mostly appeared in the American Journal of Science since 1872, in the series of papers entitled "Brief Contributions to Zoology from the Museum of Yale College." These have been mainly devoted to preliminary accounts of the explorations of the Fish Commission from year to year, with brief descriptions of the marine invertebrates.

The Echini collected by the Fish Commission in the Gulf of Mexico and Caribbean Sea have been noticed by the writer in the last volume of these Proceedings, as follows:

Report upon the Echini collected by the United States Fish Commission steamer Albatross in the Caribbean Sea and Gulf of Mexico, January to May, 1884. By Richard Rathbun. Proc. U. S. Nat. Mus., viii, pp. 83–89, 1885.

Report upon the Echini collected by the U. S. Fish Commission steamer Albatross in the Gulf of Mexico, from January to March, 1885. By Richard Rathbun. Proc. U. S. Nat. Mus., viii, pp. 606–620, 1885.

An important work of reference with respect to the Echini of the west coast of America is the following by Prof. A. E. Verrill:

Notes on the Radiata in the Museum of Yale College, with Descriptions of new Genera and Species. Trans. Conn. Acad. Arts and Sci., vol. i, part 2, pp. 247-613, pls. iv-x, 1867-'71.

In the present catalogue, the arrangement of the record of specimens under each species is mainly in accordance with the plan that has generally been followed by the Departments of Fishes and Marine Invertebrates in preparing National Museum lists, excepting that the writer has found it more convenient for reference to place the Museum catalogue numbers at the end of each entry, inclosed in parentheses, instead of before it. The entries are arranged geographically from the north toward the south, and are frequently grouped under a few geographical headings to facilitate reference and to permit of brevity. Where species are represented from the Atlantic coasts of both Europe and America, the specimens from the former country are first recorded; and where, as in the case of *Strongylocentrotus Dröbachiensis*, we have species common to both the Atlantic and Pacific Oceans, the former region is given preference over the latter in the list.

With the Fish Commission specimens, the locality is generally given first, followed by the depth of water, the character of the bottom, the number of the dredging station, and, finally, the National Museum catalogue number. Where specimens are combined from several stations, this order is not always followed.

The following general abbreviations have been used: U. S. Fish Comm., for U. S. Fish Commission; U. S. Expl. Exped., for the Wilkes United States Exploring Expedition; N. Pac. Expl. Exped., for the North Pacific Exploring Expedition; Mus. Comp. Zool., for the Museum of Comparative Zoology at Harvard College; fath., for fathoms; sta., for station.

The abbreviations employed to designate the character of the bottom immediately following the depth of water are explained in the following table:

Materials.	Colors.	Other qualities.
C. for clay. Cr. for coral. F. for foraminifera. G. for gravel. M. for mud. O. for ooze. P. for pebbles. R. for rocks. S. for sand. Sh. for shells. Spg. for sponges. St. for stones.	bk. for black. bn. for brown. bu. for blue. dk. for dark. gn. for green. gy. for gray. lt. for light. rd. for red. wh. for white.	brk. for broken. crs. for coarse. fne. for fine. glb. for globigerina. hrd. for hard. rky. for rocky. sft. for soft. sml. for small

The writer is under many obligations to Mr. Alexander Agassiz for the opportunity of making comparisons with the unrivaled collection of Echini at the Museum of Comparative Zoology, and for personal assistance in identifying several difficult species. He is also greatly indebted to Mr. J. Walter Fewkes, of the same museum, for kind assistance in his work at the time of making these comparisons.

CATALOGUE.

Suborder DESMOSTICHA Hæckel.

Family CIDARIDÆ Müller.

Subfamily GONIOCIDARIDÆ Hæckel.

CIDARIS Klein.

1. **Cidaris metularia** Blainville.
   Zanzibar, Africa; Cheney, Mus. Comp. Zoology (3589).
   Unknown locality (3439).

2. **Cidaris Thouarsii** Valenciennes.
   Puerto Balandre, Gulf of California; W. J. Fisher, Stearns's Coll. (10007).
   Lower California:
      La Paz; L. Belding (5391); A. Forrer, 1885 (10011).
      Cape St. Lucas; John Xantus (2470, 3488).
   Western coast of Mexico; A. Dugés (12580).
   Panama; Sternberg (2363, 2364, 2365, 2366, 2369); Capt. J. M. Dow ? (3541).
   Chatham Island, Galapagos Islands; Dr. W. H. Jones, U. S. N., 1884 (8730, 8748).
   West coast of North America; Lieut. Comdr. H. E. Nichols, U. S. N., 1881 (6744).

3. **Cidaris tribuloides** Blainville.
   Nassau, New Providence, Bahamas; U. S. Fish Comm., 1886 (14528).
   Florida (2473); Indian Key, Hemphill (14309); Key Vaccas, Hemphill (14310).
   Off Key West, Florida; U. S. Fish Comm., 1885:
      Lat. 24° 25′ 30″ N., long. 81° 47′ 45″ W., 50 fath.; sta. 2316 (10703).
      Lat. 24° 26′ N., long. 81° 48′ 15″ W., 37 fath., Cr.; sta. 2315 (10702).
      Lat. 25° 04′ 30″ N., long. 82° 59′ 15″ W., 26 fath., S.; sta. 2414 (10698).
   Off the Dry Tortugas, Florida; U. S. Coast Survey str. Blake, A, Agassiz, 1877–'78:
      Lat. 24° 43′ N., long. 83° 25′ W., 37 fath.; sta. 11 (6824).
      Lat. 24° 34′ N., long. 83° 16′ W., 36 fath.; sta. 12 (6795).
   Off Havana, Cuba; U. S. Fish Comm., 1885:
      Sta. 2324, 33 fath., Cr. (10701).
      Sta. 2342, 201 fath., Cr. (10755).
   Gulf of Mexico; U. S. Fish Comm., 1885:
      Lat. 28° 28′ to 28° 45′ N., long. 84° 25′ to 85° 02′ W., 21–30 fath., S. Cr.; sta. 2405, 2407, 2408 (10699, 10734).
      Lat. 29° 11′ 30″ to 29° 15′ 30″ N., long. 85° 29′ to 85° 29′ 30″ W., 25–27 fath., S. G. Cr.; sta. 2372, 2373, 2374 (10697, 10754).
   Off Cape Catoche, Yucatan; lat. 22° 07′ 30″ N., long. 87° 06′ W., 21 fath., Cr.; U. S. Fish Comm., sta. 2363, 1885 (10700).
   Albatross Bank, off Jamaica; lat. 17° 44′ 05″ N., long. 75° 39′ W., 23 fath., Cr., brk. Sh.; U. S. Fish Comm., sta. 2138, 1884 (7479).
   St. Thomas, West Indies, shore; U. S. Fish Comm., 1884 (8390).
   Sabanilla, U. S. of Colombia, shore; U. S. Fish Comm., 1884 (8391, 8612).
   Off Aspinwall, Panama; lat. 9° 32′ N., long. 79° 54′ 30″ W., 34 fath., brk. Sh.; U. S. Fish Comm., sta. 2146, 1884 (7489).
   Caledonia Bay, Panama (5176).

DOROCIDARIS A. Agassiz.

4. Dorocidaris Bartletti A. Agassiz.

Off Havana, Cuba; U. S. Fish Comm., 1885; stations 2320, 2322, 2324, 2325, 2327, 2330, 2331, 2334, 2335, 2337, 2349; 33 to 204 fath., Cr. S. (10659 10660, 10661, 10662, 10707); 1886 (14584).

Albatross Bank, off Jamaica; lat 17° 44′ 05″ N., long. 75° 39′ W., 23 fath., Cr. brk. Sh.; U. S. Fish Comm., sta. 2138, 1884 (7479).

Off the Windward Islands; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79:

Off Barbados, 94 fath., sta. 276 (6836).

Off Montserrat, 88 fath., sta. 155 (6832).

5. Dorocidaris Blakei A. Agassiz.

North of Little Bahama Bank; lat. 27° 22′ N., long. 78° 07′ 30″ W., 338 fath., gy. S.; U. S. Fish Comm., sta. 2655, 1886 (14585). A fine series, in perfect condition.

Off Havana, Cuba; U. S. Fish Comm., 1884:

Sta. 2152, 387 fath., Cr. (7484).

Sta. 2153, 283 fath., Cr. (7481).

Sta. 2162, 122 fath., Cr. (7486).

South of Cuba; U. S. Fish Comm., 1884:

Lat. 19° 55′ 46″ N., long. 75° 49′ 23″ W., 400 fath., M. fne. S.; sta. 2128 (7487).

Lat. 19° 56′ 06″ N., long. 75° 47′ 32″ W., 254 fath.; sta. 2134 (7483).

Off Barbados, Windward Islands, 200 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79 (6833).

6. Dorocidaris papillata A. Agassiz.

Atlantic Ocean, off the Capes of Delaware; lat. 38° 39′ N., long. 73° 11′ W., 130 fath., S.; U. S. Fish Comm., sta. 1043, 1881 (5080, 7615).

Atlantic Ocean, off South Carolina; lat. 32° 33′ 15″ N., long. 77° 30′ 10″ W., 257 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 320, 1880 (6835).

Atlantic Ocean, off South Carolina and Georgia; U. S. Fish Comm., 1885:

Lat. 32° 35′ N., long. 77° 30′ W., 247 fath., gy. S.; sta. 2625 (12938).

Lat. 30° 44′ N., long. 79° 26′ W., 440 fath., S.; sta. 2415 (10756).

Off the east coast of Florida; U. S. Fish Comm., 1886:

Lat. 31° 09′ N., long. 79° 33′ 30″ W., 352 fath., gy. S., Cr. brk.; sta. 2669 (14590).

Lat. 30° 58′ 30″ N., long. 79° 38′ 30″ W., 294 fath., gy. S., brk. Cr.; sta. 2668 (14588).

Lat. 30° 47′ 30″ N., long. 79° 49′ W., 270 fath., gy. S.; sta. 2666 (14586).

Lat. 29° 16′ 30″ N., long. 79° 36′ 30″ W., 438 fath., gy. S.; sta. 2661 (14591).

Off Havana, Cuba; U. S. Fish Comm., 1884–'85:

Sta. 2152, 2154, 2157, 2161, 2162; 29–387 fath., Cr. (7476, 7478, 7482, 7485, 7488).

Sta. 2319, 2322, 2324, 2327, 2336, 2337, 2342, 2345–2349; 33–230 fath., S. Cr. (10710).

Sta. 2323, 163 fath., Cr. (10709).

Sta. 2341, 143 fath., Cr. (10708).

Off Havana, 1886 (14589).

South of Cuba; U. S. Fish Comm., 1884:

Lat. 19° 56′ 04″ N., long. 75° 48′ 55″ W., 274 fath., M. fne. S., sta. 2129 (7480); 254 fath., sta. 2134 (12948).

6. Dorocidaris papillata A. Agassiz—Continued.

Lat. 19° 55′ 58″ N., long. 75° 47′ 07″ W., 250 fath., Cr.; sta. 2135 (7477, 10753).

Off Sta. Lucia, Windward Islands, 164 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 218, 1878–'79 (6834).

Unknown locality; probably Mediterranean Sea (3571).

Dorocidaris papillata, var.*

Off the coast of the Southern Atlantic States; U. S. Fish Comm., 1884, 1885:

Off Chesapeake Bay, 104 fath., S. M. G.; sta. 2420 (10714).

Off Cape Hatteras, North Carolina, 48–68 fath., M. S.; sta. 2268 (8318, 10061), sta. 2269 (8317, 10063), sta. 2301 (8316, 10062), sta. 2596 (12937).

Between Capes Hatteras and Lookout, 15–107 fath., gy. S. P.; sta. 2597 (12870), sta. 2601 (12945).

Off Cape Fear, North Carolina, 90 fath., S.; sta. 2418 (10053).

Gulf of Mexico. U. S. Fish Comm., 1885:

Off Key West, Fla., 45–50 fath., Cr.; sta. 2316, 2317, 2518 (10051, 10052, 10712).

Off Havana, Cuba, 67 fath., Cr.; sta. 2334 (10713).

Off the west end of Cuba, 426 fath.; sta. 2351 (10711).

Off Cape San Blas, Florida, 25–27 fath., G. Cr.; sta. 2372, 2373 (10715).

PHYLLACANTHUS Brandt.

7. Phyllacanthus annulifera A. Agassiz.

Port Lloyd, Bonin Islands; W. J. Fisher, coll. of W. H. Dall (14032).

8. Phyllacanthus dubia Brandt.

Port Lloyd, Bonin Islands; among the branches of corals, in one fathom of water; William Stimpson, North Pacific Expl. Exped., 1854 (2487).

9. Phyllacanthus gigantea A. Agassiz.

Sandwich Islands; J. K. Townsend (3554).

10. Phyllacanthus imperialis Brandt.

Gaspar Straits, Malay Archipelago; W. Stimpson, N. Pa. Expl. Exped. (3135).

POROCIDARIS Desor.

11. Porocidaris Sharreri A. Agassiz.

Atlantic Ocean, off North Carolina and Florida; U. S. Fish Comm., 1885:

Lat. 34° 39′ 15″ N., long. 75° 33′ 30″ W., 107 fath., gy. S. P.; sta. 2601 (12944).

Lat. 30° 44′ N., long. 79° 26′ W., 440 fath., S. F.; sta. 2415 (10704).

Off Havana, Cuba: U. S. Fish Comm., 1885:

Sta. 2337, 2338, 2341; 143–199 fath., Cr. (10716).

Sta. 2345, 184 fath., Cr. (10706).

Sta. 2348, 211 fath., Cr. (10705).

Off Havana, 1886 (14583).

Off Yucatan; U. S. Fish Comm., 1885:

Off Cape Catoche; lat. 22° 08′ 30″ N., long. 86° 49′ W., 26 fath., Cr.; sta., 2360 (10716).

Off Arrowsmith Bank: lat. 20° 59′ 30″ N., long. 86° 23′ 45″ W., 130 fath., Cr.; sta. 2354 (10717).

Off Nevis, Windward Islands, 356 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 151, 1878–'79 (6810).

* A. Agassiz, Revision of the Echini, 1872, p. 256.

This species has not been recorded hitherto from north of the latitude of Fernandina, Fla.

GONIOCIDARIS Desor.

12. Goniocidaris canaliculata A. Agassiz.

Rose Island, Navigator Group; U. S. Expl. Exped. (3569).

Subfamily SALENIDÆ Agassiz.

SALENIA Gray.

13. Salenia Pattersoni A. Agassiz.

Off Montserrat, West Indies, 148 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79 (6787).

Off Havana, Cuba, 242 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1877–'78 (6805).

Off Havana, Cuba, 67–279 fath.; U. S. Fish Comm., 1884–'85, 20 stations (7049, 7050, 7051, 7052, 8404, 8405, 10649, 10651, 10652); 1886 (14581).

14. Salenia varispina A. Agassiz.

Off the East Coast of Florida; U. S. Fish Comm., 1886:

Lat. 30° 53′ N., long. 79° 42′ 30″ W., 273 fath., gy. S.; sta. 2667 (14579).

Lat. 30° 47′ 30″ N., long. 79° 49′ W., 270 fath., gy. S.; sta. 2666 (14578).

Lat. 29° 41′ N., long. 79° 55′ W., 373 fath., Cr. S.; sta. 2664 (14580).

Lat. 29° 16′ 30″ N., long. 79° 36′ 30″ W., 438 fath., gy. S.; sta. 2661 (14576).

Mouth of Exuma Sound, Bahama Islands; lat. 23° 48′ 40″ N., long. 75° 10′ 40″ W., 1169 fath., Cr. S.; U. S. Fish Comm., sta. 2629, 1886 (14577).

Southeast of Cuba; lat. 19° 07′ N., long. 74° 52′ W., 1,200 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79 (6799).

Caribbean Sea; U. S. Fish Comm., 1884:

Lat. 15° 24′ 40″ N., long. 63° 31′ 30″ W., 683 fath., M. fne. S.; sta. 2117 (8402).

Lat. 13° 32′ 40″ N., long. 62° 54′ W., 690 fath., M. S.; sta. 2118 (8401).

Lat. 19° 45′ N., long. 75° 01′ W., 1,639 fath., M.; sta. 2127 (8403).

Off Barbados, West Indies, 399 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79 (6788).

Family ARBACIADÆ Gray.

ARBACIA Gray.

15. Arbacia nigra A. Agassiz.

Peru; Dr. W. H. Jones, U. S. N., 1884:

Pacasamayo; stones, 5 to 6 feet of water (8727).

San Lorenzo Island, Callão Bay side; low water, rocks and sand (8752).

Peru (8736).

Valparaiso, Chili (3244).

"Pacific Is." ? (3502).

Unknown localities (2666, 3452, 3453, 3454, 3619).

16. Arbacia punctulata Gray.

Southern New England:

Naushon Island, Mass.; Mus. Comp. Zool. (3430).

Near New Bedford, Mass. (3445).

16. Arbacia punctulata Gray—Continued.

Southern New England; U. S. Fish Comm.:
Vineyard Sound, Mass. (many stations).
Newport, R. I., shore (5085).
Narragansett Bay, R. I., 4-14½ fathoms (7037, 9617, 9618).
Noank, Conn. (3701, 5077, 13702).
Off Noank, Conn. (6957).
Middle Atlantic coast, United States; U. S. Fish Comm., 1883–'85:
Off Chesapeake Bay, 19 fath., fne. S. Sh.; sta. 2016 (8386).
Off Cape Hatteras, N. C., 13–27 fath., S. G. (5 stations).
Off Cape Lookout, N. C., 22-168 fath., S.; sta. 2608, 2609, 2614 (12873, 12875, 14028).
Middle Sound, near Wilmington, N. C.; R. E. Earll, 1880 (3795).
Blackfish Bank, off Charleston, S. C.; R. E. Earll, 1880 (8666).
South Carolina; William Stimpson (3522).
Florida:
Mouth of Saint Mary's River; U. S. Fish Comm., 1884 (8722).
Fernandina (3586).
Saint Augustine; Postell (3556).
Georgiana; William Wittfield (12868).
Indian River; G. Wurdemann (3518).
East Coast; General Spinner (10064).
Eastern Dry Rocks, near Key West; Dr. E. Palmer, 1884 (8729).
Charlotte Harbor; G. W. Mastin (2458).
Little Sarasota Bay; Meek (8616); Henry Hemphill, 1884 (8676).
Pine Key, outer shore; Henry Hemphill, 1884 (8617).
Marco (8657).
Gulf of Mexico; U. S. Fish Comm., 1885:
Off Charlotte Harbor, Fla., 24–27 fath., S.; sta. 2412, 2413 (10658).
Off Tampa Bay, Fla., 26 fath., crs. S.; sta. 2409 (10657).
Off Apalachicola, Fla., 21–30 fath., S. G.; sta. 2369–2373 (10656); sta. 2405–2408 (10657).
Off Cape Catoche, Yucatan, 21–25 fath., S. Cr.; sta. 2362–2365 (10655).

17. Arbacia pustulosa Gray.

Madeira; William Stimpson, N. Pac. Expl. Exped. (1777, 2496, 3500).
Unknown locality (3498).

18. Arbacia spatuligera A. Agassiz.

Peru; Dr. W. H. Jones, U. S. N., 1884 (8713).
San Lorenzo Island (8751).
Unknown localities (3434, 3444, 3448).

19. Arbacia stellata Gray.

Lower California:
William Stimpson ? (3588).
La Paz; W. J. Fisher, Stearns's Coll. (8991).
Gulf of California (?); Stearns's Coll. (10003).
Guaymas, Mexico; Captain Stone (2399, 2400).
Panama; Edwards (2461).
West Coast of North America; Lieut. Comdr. H. E. Nichols, U. S. N., 1881 (6742).

PODOCIDARIS A. Agassiz.

20. Podocidaris sculpta A. Agassiz.

Off Fernandina, Florida; U. S. Fish Comm., 1886:
Lat. 30° 58′ 30″ N., long. 79° 38′ 30″ W., 294 fath., gy. S. brk. Cr.; sta. 2668 (14542).
Lat. 30° 47′ 30″ N., long. 79° 49′ W., 270 fath., gy. S.; sta. 2666 (14543).

CŒLOPLEURUS Agassiz.

21. Cœlopleurus floridanus A. Agassiz.

Off Cape Hatteras, N. C.; lat. 35° 08′ 50″ N., long. 75° 07′ 20″ W., 68 fath., M. S.; U. S. Fish Comm., sta. 2267, 1884 (12345).

Off Cape Lookout, N. C.; lat. 34° 39′ 15″ N., long. 75° 33′ 30″ W., 107 fath., gy. S. P.; U. S. Fish Comm., sta. 2601, 1885 (14302).

Off Cape Fear, N. C.; lat. 33° 38′ N., long. 77° 36′ W., 15 fath., gy. S. brk. Cr.; U. S. Fish Comm., sta. 2622, 1885 (12943).

Off Key West, Florida; lat. 24° 25′ 30″ N., long. 81° 47′ 45″ W., 50 fath.; U. S. Fish Comm., sta. 2316, 1885 (10653).

Off Havana, Cuba; lat. 23° 09′ 30″ N., long. 82° 21′ 30″ W., 242 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 11, 1877–'78 (6798).

Off Havana, Cuba; U. S. Fish Comm., 1884–'85:

Sta. 2164, 192 fath., Cr. (7048).

Sta. 2166, 196 fath., Cr. (7047).

Sta. 2167, 201 fath., Cr. (8398).

Sta. 2319–2348, 67–216 fath., Cr. S. (10654).

Off Havana, 1886 (14582).

Off the Windward Islands; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79:

Off Barbados, 73–82 fath., sta. 290, 293 (6786, 6804).

Off Montserrat, 88 fath., sta. 155 (6794).

Lat. 23° 52′ N., long. 88° 05′ W., 95 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 32, 1877–'78 (6801).

The specimens of this species from station 2267 (12345), and station 2622 (12943) are all much larger than any described from the Gulf of Mexico, one of the largest measuring about 50^{mm} in diameter. The spines sometimes attain a length of over 130^{mm}. This species is here recorded for the first time from north of the Gulf of Mexico.

Family DIADEMATIDÆ Peters.

DIADEMA Schynvoet.

22. Diadema mexicanum A. Agassiz.

Lower California:

La Paz; L. Belding (5393).

Cape St. Lucas; John Xantus (3246, 3558).

St. Josef Island, Gulf of California; W. J. Fisher, Stearns's Coll. (10006).

Acapulco, Mexico; A. Agassiz (3467).

23. Diadema setosum Gray.

Nassau, New Providence, Bahamas; U. S. Fish Comm., 1886 (14533).

Florida:

Cape Florida; E. Palmer, 1884 (8761).

Indian Key; E. Palmer, 1884 (8732, 8763); H. Hemphill, 1885 (12934).

Big Pine Key; H. Hemphill, 1885 (12922).

Key West; E. Palmer, 1884 (7497).

Dry Tortugas; L. Agassiz (2485); E. Palmer, 1884 (8762).

Gulf of Mexico; U. S. Fish Comm., 1885:

Off Havana, Cuba, 169 fath., Cr.; sta. 2333 (10667).

Lat. 28° 45′ N., long. 85° 02′ W., 30 fath., Cr.; sta. 2405 (10666).

Off Cape Catoche, Yucatan, 21 fath., Cr.; sta. 2363 (10059).

23. Diadema setosum Gray—Continued.

West Indies; U. S. Fish Comm., 1884:
St. Thomas (7493, 7494, 7495, 8431).
Off Jamaica; lat. 17° 52′ N., long. 76° 45′ 30″ W., 215 fath., M.; sta. 2139 (8429).
Caribbean Sea; U. S. Fish Comm., 1884:
Old Providence Island (7492, 7496).
Curaçao Island (8430).
Lat. 17° 44′ 05″ N., long. 75° 39′ W., 23 fath., Cr. Sh.; sta. 2138 (8433).
Madeira; Wm. Stimpson, N. Pac. Expl. Exped. (3529).
Hilo, Sandwich Islands; Wm. Stimpson, N. Pac. Expl. Exped., 1856 (3495).
Hong Kong, China; Wm. Stimpson, N. Pac. Expl. Exped., 1854 (3545, 3557).
Unknown localities (2402, 3466, 3515, 3519).

ASPIDODIADEMA A. Agassiz.

24. Aspidodiadema antillarum A. Agassiz.

Mouth of Exuma Sound, Bahama Islands; lat. 23° 48′ 40″ N., long. 75° 10′ 40″ W., 1,169 fath., Cr. S.; U. S. Fish Comm., sta. 2629, 1886 (14548).
Gulf of Mexico; lat. 28° 38′ 30″ to 28° 51′ N., long. 87° 02′ to 88° 18′ W., 420–730 fath., M.; U. S. Fish Comm., sta. 2385, 2392, 2393, 2394, 1885 (10663, 14547).
Gulf of Mexico; lat. 24° 36′ N., long. 84° 05′ W., 955 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1877–'78 (6796).
Southeast of Cuba; lat. 19° 45′ N., long. 75° 04′ W., 1,639 fath., M.; U. S. Fish Comm., sta. 2127, 1884 (8396).

25. Aspidodiadema Jacobyi A. Agassiz.

North of Little Bahama Bank; lat. 27° 22′ N., long. 78° 07′ 30″ W., 338 fath., gy. S.; U. S. Fish. Comm., sta. 2655, 1886 (14550).
Off Havana, Cuba; U. S. Fish Comm.:
Sta. 2164, 192 fath., 1884 (8393).
Sta. 2346, 2347, 2350, 200–216 fath., 1885 (10664).
Off Havana, 1886 (14549).
Southeast of Cuba; U. S. Fish Comm., 1884:
Lat. 19° 56′ 44″ N., long. 75° 50′ 49″ W., 202 fath., Cr. S.; sta. 2131 (8392).
Lat. 19° 56′ 06″ N., long. 75° 47′ 32″ W., 254 fath.; sta. 2134 (8394).
Off Cayman Brac, south of Cuba, 297 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1880 (6802).
Off Cozumel Island, Yucatan; lat. 20° 19′ 10″ N., long. 87° 03′ 30″ W., 231 fath., Cr.; U. S. Fish Comm., sta. 2359, 1885 (10665).
Darien Bay; lat. 9° 30′ 45″ N., long. 76° 25′ 30″ W., 155 fath., M.; U. S. Fish Comm., sta. 2143, 1884 (8395).

ECHINOTHRIX Peters.

26. Echinothrix calamaris A. Agassiz.

Port Lloyd, Bonin Islands; W. J. Fisher (14034).
Tahiti, Society Islands; Dr. W. H. Jones, U. S. N., 1883 (7499).
Unknown locality (3536).

27. Echinothrix turcarum Peters.

Port Lloyd, Bonin Islands; Wm. Stimpson, N. Pac. Expl. Exped., 1854 (3547).
Hilo, Sandwich Islands; Wm. Stimpson, N. Pacific Expl. Exped., 1856 (3419).
Tahiti, Society Islands, and Marquesas Islands; Dr. W. H. Jones, U. S. N., 1883 (7498, 8824).
Unknown locality (3532).

ASTROPYGA Gray.

28. Astropyga pulvinata Agassiz.

Central America:
San Salvador (3062).
West Coast; Capt. J. M. Dow (3191).

Family ECHINOTHURIDÆ Wyv. Thomson.

ASTHENOSOMA Grube.

29. Asthenosoma hystrix A. Agassiz.

Atlantic Ocean, off Cape Romain, S. C.; U. S. Fish Comm., 1885:
Lat. 32° 36′ N., long. 77° 29′ 15″ W., 258 fath., gy. S.; sta. 2624 (12941).
Lat. 32° 35′ N., long. 77° 30′ W., 247 fath., gy. S.; sta. 2625 (12942).
Atlantic Ocean, off Georgia; lat. 30° 44′ N., long. 79° 26′ W., 440 fath., S. Sh. Cr.; U. S. Fish. Comm., sta. 2415, 1885 (10674).
Off the east coast of Florida; lat. 28° 21′ N. to lat. 31° 09′ N., long. 78° 33′ W. to long. 80° 05′ 45″ W., 263 to 514 fath., S. F. Cr.; U. S. Fish Comm., sta. 2658–2669 (14600, 14736–14741).
Off Havana, Cuba, 213 fath., Cr.; U. S. Fish Comm., sta. 2350, 1885 (10673).
Off Cozumel Island, Yucatan; lat. 20° 19′ N., long. 87° 03′ 30″ W., 222 fath., Cr.; U. S. Fish Comm., sta. 2358, 1885 (10668).
Off Barbados, Windward Islands; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79:
Sta. 274, 209 fath. (6823).
Sta. 291, 200 fath. (6829).
Sta. 297, 123 fath. (6821).

PHORMOSOMA Wyv. Thomson.

30. Phormosoma placenta Wyv. Thomson.

Off Nova Scotia, between Halifax and Le Have Bank; lat. 43° 34′ N., long. 63° 56′ 30″ W., 134 fath., gy. O.; U. S. Fish Comm., sta. 2513, 1885 (11712).
Atlantic Ocean, East and South of George's Bank; lat. 41° 53′ N. to lat. 40° 09′ 30″ N., long. 65° 21′ 50″ W. to long. 67° 26′ 15″ W.; 499–1,356 fath., M. S. O.; U. S. Fish Comm., sta. 2072 (8671), 2074 (9050), 2075 (9045), 2077 (9051), 2078 (8673), 2083 (8650), 2530 (11707), 2533 (11711), 2571 (11713).
Atlantic Ocean, off George's Bank; lat. 41° 33′ 15″ N., long. 65° 51′ 25″ W., 810 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 305, 1880 (6817).
Atlantic Ocean, off the Coast of Southern New England; lat. 39° 47′ 20″ N. to lat. 39° 33′ N., long. 69° 21′ 25″ W. to long. 71° 31′ 30″ W.; 924 to 1,178 fath., M. S. O. F.; U. S. Fish Comm., sta. 2052 (9048), 2094 (6206, 8672), 2205 (7811), 2208 (7813), 2209 (7814), 2210 (7936), 2217 (7816), 2220 (7817).
Atlantic Ocean, east of Delaware and North Carolina; lat. 38° 47′ 20″ N. to lat. 35° 45′ 23″ N.; 843–1,091 fath., M. fne. S. O.; U. S. Fish Comm., sta. 2103 (6648), 2115 (6636), 2116 (6641), 2231 (8101).
Off Cape Fear, N. C.; lat. 32° 40′ N., long. 76° 40′ 30″ W., 731 fath., gy. O.; U. S. Fish Comm., sta. 2678, 1886 (14596).
Off Saint Augustine, Fla.; lat. 29° 41′ N., long. 79° 55′ W., 373 fath., Cr. S.; U. S. Fish Comm., sta. 2664, 1886 (14599).
North of Little Bahama Bank; lat. 27° 57′ 30″ N., long. 77° 27′ 30″ W., 660 fath., yl. O.; U. S. Fish Comm., sta. 2654 (14595).

30. Phormosoma placenta Wyv. Thompson—Continued.

Gulf of Mexico; U. S. Fish Comm., 1885:
Lat. 28° 36′ 15″ N., long. 86° 50′ W., 347 fath., M.; sta. 2395 (10672).
Lat. 28° 32′ N., long. 88° 06′ W., 1,181 fath., M.; sta. 2383 (10671).
Lat. 29° 03′ 15″ N., long. 88° 16′ W., 324 fath., M.; sta. 2376 (10670).
Caribbean Sea, U. S. Fish Comm., 1884:
Lat. 15° 24′ 40″ N., long. 63° 31′ 30″ W., 683 fath., M. fne. S.; sta. 2117 (8424).
Lat. 9° 30′ 45″ N., long. 76° 25′ 30″ W., 155 fath., M.; sta. 2143 (8425).
Off the Windward Islands; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79:
Off St. Kitts, 250 fath.; sta. 147 (6811).
Off Montserrat, 303 fath.; sta. 153 (6814).
Off Grenada, 291 fath.; sta. 260 (6806).

31. Phormosoma uranus Wyv. Thomson.

Atlantic Ocean, off the eastern coast of the United States; U. S. Fish Comm., 1883–1886:—
Southeast of George's Bank:
Lat. 40° 34′ 30″ N., long. 66° 48′ W., 705 fath., gy. M.; sta. 2532 (11400).
Lat. 40° 34′ 18″ N., long. 66° 09′ W., 1,742 fath., gy. M. S.; sta. 2573 (11810).
Lat. 40° 16′ 30″ N., long. 67° 26′ 15″ W., 828 fath., bn. O.; sta. 2533 (11302).
South of Martha's Vineyard:
Lat. 39° 47′ 07″ N., long. 70° 35′ W., 721 fath., gy. O.; sta. 2552 (11310).
South of Block Island:
Lat. 39° 35′ N., long. 71° 18′ W., 1,064 fath., gy. O.; sta. 2211 (10854).
Lat. 39° 34′ 45″ N., long. 71° 31′ 30″ W., 1,080 fath., M. S.; sta. 2209 (7824).
Lat. 39° 34′ 15″ N., long. 71° 41′ 15″ W., 705 fath., M. S.; sta. 2203 (8128).
Lat. 39° 30′ 30″ N., long. 71° 44′ 30″ W., 728 fath., M.; sta. 2204 (8127).
Lat. 39° 29′ N., long. 71° 46′ W., 693 fath., gy. M. fne. S.; sta. 2181 (8131).
South of Long Island:
Lat. 39° 12′ N., long. 72° 03′ 30″ W., 707 fath., gn. M.; sta. 2235 (8093).
Lat. 39° 09′ N., long. 72° 03′ 15″ W., 810 fath., gn. M.; sta. 2234 (8092).
East of Maryland:
Lat. 38° 01′ 15″ N., long. 73° 44′ W., 568 fath., gn. M.; sta. 2172 (8130).
East of North Carolina:
Lat. 35° 49′ 30″ N., long. 74° 34′ 35″ W., 843 fath., M. fne. S.; sta. 2115 (8674, 10853).
Lat. 35° 45′ 23″ N., long. 74° 31′ 25″ W., 888 fath., M. fne. S.; sta. 2116 (10855).
Lat. 32° 40′ N., long. 76° 40′ 30″ W., 731 fath., gy. O.; sta. 2678 (14597).
Off Grenada, Windward Islands, 1,058 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 245, 1878–'79 (6819).

Family ECHINOMETRADÆ Gray.

COLOBOCENTROTUS Brandt.

32. Colobocentrotus atratus Brandt.

Sandwich Islands:
Garrett, Mus. Comp. Zool. (3442).
Hilo; Wm. Stimpson, N. Pacific Expl. Exped. (3494).
Unknown localities (2569, 2572, 2664, 2992).

33. Colobocentrotus Mertensii Brandt.

Bonin Islands:
Wm. Stimpson, N. Pacific Expl. Exped. (2490).
Port Lloyd; Wm. Stimpson, N. Pacific Expl. Exped. (3437); W. J. Fisher, (14039).

HETEROCENTROTUS Brandt.

34. Heterocentrotus mammillatus Brandt.

Sandwich Islands:
Garrett, Mus. Comp. Zool. (3527).
Hilo; Wm. Stimpson, N. Pacific Expl. Exped. (3573).
Palmyra Island; Dr. W. H. Jones, U. S. N. (8654).
Johnson's Island (5949).
Feejee Islands; U. S. Expl. Exped. (3572).
Loo Choo Islands; Wm. Stimpson, N. Pacific Expl. Exped. (3463).
Bonin Islands:
Wm. Stimpson, N. Pacific Expl. Exped. (2486); W. J. Fisher (14033).
Port Lloyd; Wm. Stimpson, N. Pacific Expl. Exped. (3526, 3552).
Manila ? (3464).

35. Heterocentrotus trigonarius Brandt.

Palmyra Island; Dr. W. H. Jones, U. S. N. (8733).
Kingsmill Islands; Garrett, Mus. Comp. Zool. (3443).
Panmotu Islands ? (3564).
Tahiti, Society Islands; Dr. W. H. Jones, U. S. N., 1883 (8758).
Friendly Islands; U. S. Expl. Exped. (2593).
Feejee Islands or Tongatabu; U. S. Expl. Exped. (3612).
South Pacific Ocean; Capt. Wm. Herrendean, 1876 (14031).
Unknown localities (2576, 2577, 3461, 3535, 3634, 3646, 4018).

ECHINOMETRA Rondelet.

36. Echinometra lucunter Blainville.

Japan:
Hakodadi; U. S. S. Tuscarora (3248, 3249).
Onsima; Wm. Stimpson, N. Pacific Expl. Exped. (2504, 3456, 3457).
Loo Choo Islands; Wm. Stimpson, N. Pacific Expl. Exped. (3583, 3613).
Bonin Islands; Wm. Stimpson, N. Pacific Expl. Exped. (3591, 3617).
Sooloo Sea (3603).
Sandwich Islands:
Wm. Stimpson, N. Pacific Expl. Exped. (3548).
Oahu; Dr. T. H. Streets, U. S. N. (5942).
Palmyra Island; Dr. W. H. Jones, U. S. N. (8651).
Panmotu Islands; U. S. Expl. Exped. (3587).
Society Islands:
Mus. Comp. Zool. (3533).
Tahiti; Wm. Stimpson, N. Pacific Expl. Exped. (3575); Dr. W. H. Jones, U. S. N., 1884 (7231, 7379).
Apia, Samoan Islands; Dr. W. H. Jones, U. S. N., 1883 (8754).
Zanzibar, Africa; Mus. Comp. Zool. (3580).

37. Echinometra oblonga Blainville.

Sandwich Islands; Garrett (3559).
Rose Island, Pacific Ocean; U. S. Expl. Exped. (3582).
Unknown locality (3065).

38. Echinometra subangularis Desml.

Bermuda; Dr. F. V. Hamlin (5102).
Bahamas, U. S. Fish Comm., 1886: Abaco (14529), Nassau (14530), Cat Island (14532), Watling's Island (14531), Rum Cay (14540).

38. Echinometra subangularis Desml.—Continued.

Florida:
(2435, 3090, 3429); Wurdemann (2431, 2432, 2433).
Cape Florida; E. Palmer, 1884 (8759).
Indian Key; H. Hemphill, 1885 (14307).
Big Pine Key; H. Hemphill, 1885 (12921).
Key West; U. S. Fish Comm., 1884 (7226); H. Hemphill, 1884 (8753, 8795); reefs, low tide, H. Hemphill, 1885 (10047); among stones, low tide, H. Hemphill, 1885 (10048).
West Indies (3247):
Nassau, New Providence; W. Whetten, 1859 (8755).
San Domingo; Wm. Gabb, 1878 (5158, 5172).
St. Thomas; U. S. Fish Comm., 1884 (7227, 7374).
Tortola, Virgin Islands (3469).
Caribbean Sea:
Curaçao Island; U. S. Fish Comm., 1884 (7376).
Sabanilla, U. S. of Colombia; U. S. Fish Comm., 1884 (7230, 7377).
Old Providence Island; U. S. Fish Comm., 1884 (7228, 7375).
Aspinwall; T. R. Gilliss (3455).
Vera Cruz, Mexico; Mexican Geogr. Comm. (12575).
Brazil:
U. S. Expl. Exped. (3563).
Pernambuco; C. F. Hartt, 1875 (6993).

39. Echinometra Van Brunti A. Agassiz.

Lower California:
La Paz; L. Belding (5390); A. Forrer (10012, 10015).
Cape St. Lucas; John Xantus (2463, 2465, 2467, 3050, 3052, 3241, 3610).
Mexico:
West Coast: Prof. A. Dugès (4306, 12579); Lieut. Comdr. H. E. Nichols, U. S. N., 1881 (6743).
Mazatlan (3079); Mexican Geogr. Comm. (12527).
Manzanillo; John Xantus (3487).
Acapulco; Mus. Comp. Zool. (3565).
San Salvador; Capt. J. M. Dow (6994).
Panama; Mus. Comp. Zool. (3562).
Manta, Ecuador; Dr. W. H. Jones, U. S. N., 1884 (8704).
Chatham Island, Galapagos Islands; Dr. W. H. Jones, U. S. N., 1884 (8734, 8749).

40. Echinometra viridis A. Agassiz.

Florida:
Key West; H. Hemphill, 1884 (8703).
Key Biscayne; Mus. Comp. Zool. (3570).
West Indies; U. S. Fish Comm., 1884 (var. *plana*):
Jamaica (7225, 7378).
St. Thomas (7229).
Unknown localities (2353); var. *plana* (3620).

PARASALENIA A. Agassiz.

41. Parasalenia gratiosa A. Agassiz.

Port Lloyd, Bonin Islands, among corals in one fathom; Wm. Stimpson, North Pacific Expl. Exped., 1854; type (3125).
China (?); Dale and Jouy, U. S. S. Palos.

STOMOPNEUSTES Agassiz.

42. Stomopneustes variolaris Agassiz.

Mauritius Islands, Indian Ocean; Mus. Comp. Zool. (3417).
Unknown locality (3460).

STRONGYLOCENTROTUS Brandt.

43. Strongylocentrotus albus A. Agassiz.

Valparaiso, Chili; Dr. W. H. Jones, U. S. N., 1883 (8735).

44. Strongylocentrotus depressus A. Agassiz.

Simoda, Japan; Wm. Stimpson, North Pacific Expl. Exped. (3602).

45. Strongylocentrotus Dröbachiensis A. Agassiz.

European Coasts.

Spitzbergen:
Spitzbergen Sea; U. S. S. Alliance, 1881 (5903).
Bjonen's Bay, 7–10 fath.; U. S. S. Alliance, 1881 (5223).
South Gatt, 7 fath.; Ensign E. Wilkinson, U. S. N. (8635).
Norway:
Kors Fjord; Rev. A. M. Norman, 1884 (8624).
Bergen; Bergen's Museum, 1884 (8575).
Kielerbücht, Germany; C. Möbius (3850).
England; J. Alder (3441).

Eastern North America.

Greenland (3599):
West coast of Greenland; Ensign H. G. Dresel, U. S. N., 1883 (8701).
Upernavik; Ensign H. G. Dresel, U. S. N., 1883 (8699, 8700).
Godthaab; L. Kumlien (7133).
Cumberland Gulf: Niantulik Harbor; Lieut. W. A. Mintzer, U. S. N., 1876 (3239).
Hudson's Bay:
South end; C. Drexler (3420).
James Bay; C. Drexler (3421).
Labrador: L'anse au Loup, 15 fath.; Allen and Barrows, 1882 (3933).
Newfoundland; Theodore Gill (3566).
Grand Bank of Newfoundland, 40–50 fath.; Gloucester sch. Gussie Blaisdell (4796); Gloucester sch. Victor (4793).
Banquerean, 50 fath.; Gloucester sch. Mystic (4899).
Nova Scotia; J. R. Willis (2418).
New Brunswick: Grand Manan; Wm. Stimpson (3438).
Maine:
Eastport; A. E. Verrill (4102).
Castine; Crittenden (3240).
Massachusetts Bay; Wm. Stimpson (2420, 2421).
Saybrook, Conn. (2422).
New Jersey (3064); Gedney (2334).
Off the Atlantic coast of the British Provinces of North America; U. S. Fish Comm.:
Off SE. edge of the Grand Bank of Newfoundland, 129–179 fath., S. G. (2 stations).
SE. corner of the Grand Bank, 33–64 fath., S. (3 stations).
NE. part of the Grand Bank, 36–44 fath., S. brk. Sh. (6 stations).
Off SE. coast of Newfoundland, 86 fath., G.; sta. 2456 (11047).

45. Strongylocentrotus Dröbachiensis A. Agassiz—Continued.

Off the Atlantic Coast of the British Provinces, &c.—Continued.

Saint John's, Newfoundland (11078).
Green Bank, 45 fath., brk. Sh.; sta. 2463 (11057).
S. end Bank of Saint Pierre, 42–67 fath., fne. bk. S. (2 stations).
Between Bank of Saint Pierre and Banquereau, 190–204 fath., fne. ers. S. G. (2 stations).
Off E. edge Banquereau, 129–219 fath., S. G. brk. Sh. (5 stations).
E. edge Banquereau, 39 fath., gy. S. G.; sta. 2487 (11061).
Misaine Bank, 44–75 fath., S. P. brk. Sh. hrd. (6 stations).
Le Have Bank, 55–62 fath., rocky, stony, S. (3 stations).
SW. of Le Have Bank, 104 fath., S. G.; sta. 2522 (11079).
Between Middle Ground and Halifax, N. S., 43 fath., ers. S.; sta. 2509 (11087).
Off Nova Scotia, 47–190 fath., S. G. P. R. (9 stations).
Halifax Harbor and Bedford Basin, 16–41 fath., M. S. O. (11 stations).

Eastern coast of the United States; U. S. Fish Comm.:

Bay of Fundy, 1872 (13395).
Eastport, Me., 1872 (5067, 5084).
Gulf of Maine, 1878 (5068).
Off Cape Ann, Mass., 47–90 fath., M. (13148, 13413).
Gloucester Harbor, Mass. (13412).
Massachusetts Bay, 16–22 fath., S. G. (13146, 13587).
Cape Cod Bay, 7–31 fath., S. M. (many stations).
Off Cape Cod, 10–106 fath., S. G. St. M. (many stations).
Georges Bank region, 17–131 fath., S. G. M. (23 stations).
Off Nantucket Shoals, 18–33 fath., S. (4 stations).
Off Martha's Vineyard, Mass., 67 fath., M. S. (10043).
Vineyard Sound, Mass. (5 stations).
Off Newport, R. I. (6 stations).
Off Noank, Conn. (3699, 7134, 13703).
Patchogue, Long Island (8542).

Western North America.

Alaska:

Cape Smyth; Pt. Barrow Ex., 1882 (8618).
Lat. 71° 02′ N., long. 157° 46′ W., 19 fath.; U. S. S. Corwin, 1884 (10880).
Off Pt. Franklin, 13½ fath.; Pt. Barrow Ex., 1883 (8684).
Off Hotham Inlet, 4 fath.; U. S. S. Corwin, 1884 (10881).
Off Pt. Hope, 25 fath.; U. S. S. Corwin, 1884 (10882).
Lat. 66° 12′ N., long. 168° 54′ W., 30 fath., Sh. P.; Lieut. G. M. Stoney, U. S. N., 1884 (10886).
Off Port Clarence, 7½ fath.; Pt. Barrow Ex., 1883 (8669).
Lat. 65° 55′ 15″ N., long. 168° 09′ 30″ W., 30 fath.; U. S. S. Corwin, 1884 (10884).
Lat. 65° (25′ to 28′) N., long. 171° (11′ to 26′) W., 6¼–11 fath.; U. S. S. Corwin, 1885 (12858).
Norton Sound; E. W. Nelson, 1879–'80 (5937); Pt. Barrow Ex., 1883 (8668).
Saint Paul Island; H. W. Elliott, 1874 (8812).
Saint Michaels; L. M. Turner, 1875 (5934, 14038).
Mouth of Yukon River, 3½ fath.: E. W. Nelson, 1877 (5243).
Kodiak; W. G. W. Harford (3230); W. J. Fisher (4245).
Near Sitka: Comdr. L. A. Beardslee, U. S. N. (6879).
Security Bay; Dr. W. H. Jones, U. S. N., 1883 (8633).
Wrangell; Dr. W. H. Jones, U. S. N., 1882 (8627, 8779).
Ward Cove, Revilla Regida Island; Dr. T. H. Streets, U. S. N. (14030).
Southern Alaska; Dr. W. H. Jones, U. S. N., 1883 (7126, 8631, 8778).

45. Strongylocentrotus Dröbachiensis A. Agassiz—Continued.

Alaska; W. H. Dall, 1865–1880:
- Bering Sea (12332).
- Kyska Harbor, 9–12 fath. (8625).
- Captain's Harbor, Unalashka, 9–80 fath., S. G. (4 stations).
- Iliulink Harbor, Unalashka (7032, 8623, 8737).
- Unalashka (7020).
- Belkoffska Bay, 15–25 fath. (8634).
- Coal Harbor, Unga (8622).
- Popoff Straits, 6 fath. (8780).
- Big Koninsha Island, Shumagins, 6–20 fath., S. R. (14040).
- Chiachi Islands, 20 fath., M. (8708, 14047).
- Semidi Islands, 15–25 fath. (8619).
- Kodiak, 16–25 fath. (7027).
- Saint Paul, Kodiak, 13 fath., M. (12341).
- Chugachik Bay, Cook's Inlet, 20–60 fath. (7033, 8629).
- Middleton Island, 10–12 fath. (8621).

British Columbia:
- Parry Passage; J. G. Swan, 1883 (7132, 8636).
- Kioveta Village, Parry Passage; J. G. Swan, 1883 (12333).
- Menzies Bay, Discovery Passage, 6 fath.; Lieut. Comdr. H. E. Nichols, U. S. N., 1881 (5939).
- Departure and Alert Bays; Dr. W. H. Jones, U. S. N., 1882 (7030).
- Gulf of Georgia; Mus. Comp. Zool. (2423).
- Straits of Fuca (3568).

Washington Territory: Neah Bay; J. G. Swan (5935).

Siberia.

Siberian Coast:
- "Arctic" (3431).
- Bering Strait (3601).
- Seniavine Strait; N. Pacific Expl. Exped. (3595).
- Port Providence, Plover Bay; W. H. Dall, 1880 (8630).
- Avatcha Bay, Kamtchatka; Wm. Stimpson, N. Pacific Expl. Exped. (2501).
- Bering Island; L. Stejneger, 1882–'83 (8782).
- Gulf of Penjinsk, Okhotsk Sea; N. Pacific Expl. Exped. (3510, 3511).
- Okhotsk Sea; N. Pacific Expl. Exped. (3512).

See notes under *Strongylocentrotus purpuratus*, respecting the occurrence of this species in Puget Sound and the Straits of Fuca.

46. Strongylocentrotus eurythrogrammus A. Agassiz.

Port Jackson, Australia; Wm. Stimpson, North Pacific Expl. Exped. (3040, 3520).

47. Strongylocentrotus franciscanus A. Agassiz.

Alaska:
- Granite Cove, Port Althorp; W. H. Dall (8816).
- Saint Paul, Kodiak Island; W. J. Fisher.
- Sitka; Bischoff (4028).

Puget Sound (2481).

48. Strongylocentrotus gibbosus A. Agassiz.

Peru:
- C. H. Raymond (3605).
- Pacasmayo: Dr. W. H. Jones, U. S. N., with *Fabia chilensis* Dana (8709).

Unknown locality (3256).

49. **Strongylocentrotus globulosus** A. Agassiz.

Hakodadi, Japan; W. J. Fisher, U. S. S. Tuscarora (3618).
Keelung Harbor, Formosa, China; William Stimpson, N. Pac. Expl. Exped. (2493).

The specimen above recorded from Formosa was described by Mr. A. Agassiz in 1863* as *Toxocidaris globulosa*, a species which he afterwards† united with *Strongylocentrotus franciscanus*, of the west coast of North America. Mr. Agassiz apparently had only large specimens of the *franciscanus*, which often bear a close resemblance to the specimens of *globulosus*, the largest of which, however, measures only about $2\frac{2}{5}$ inches in diameter. In the collection of the National Museum there are now several specimens of *S. franciscanus* of small to medium size, which permit of a more exact comparison being made, and indicate that considerable differences exist between these two species. In the *franciscanus* the coronal plates are broader and fewer in number, the primary tubercles much larger with a much wider scrobicular circle, and the poriferous zone narrower. In two specimens measuring about $1\frac{4}{5}$ inches in diameter there are 12 coronal plates in the interambulacral area of *franciscanus*, and 17 in that of *globulosus*. Unfortunately neither the actinal nor abactinal systems are present in any of the specimens of *globulosus*, but the differences exhibited by the remainder of the test are sufficient to show that the species are probably distinct.

50. **Strongylocentrotus intermedius** A. Agassiz.

Hakodadi Bay, Japan; Wm. Stimpson, North Pacific Expl. Exped. (3432).

51. **Strongylocentrotus lividus** Brandt.

England; J. Alder (2397).
Ireland: Roundstone, County Galway; W. W. Walpole (8725); A. M. Norman, 1884 (7019).
France:
Baie de Donarnenez, Finistère; F. Cailliaud (8614).
Nice; Bourkhardt (3524).

52. **Strongylocentrotus mexicanus** A. Agassiz.

Cape Saint Lucas, Lower California; J. Xantus (2637).

53. **Strongylocentrotus nudus** A. Agassiz. (?)

Locality unknown, probably Japan or the Sandwich Islands (3594).

This single specimen was originally labeled by Mr. A. Agassiz "*Toxocidaris nuda??*", and it agrees tolerably well with his description of that species, although it bears some resemblance, both as regards its general appearance and a few details, to certain specimens of *S. franciscanus* in the Museum collection from Sitka, Alaska. The arcs of pores are, however, straighter, and contain only from five to six pairs of pores each; the actinostome is also proportionally larger. The label of locality is missing, but the specimen probably belonged to the collection of the North Pacific Exploring Expedition.

* Proc. Acad. Nat. Sci. Phila. 1863, p. 356.
† Revision of the Echini, 1873, p. 442.

54. Strongylocentrotus purpuratus A. Agassiz.

Alaska: Sitka; Bischoff (8810).
British Columbia: Kioosta Village, Parry Passage; **James G. Swan, 1883 (8814).**
Washington Territory:
Straits of Fuca; D. S. Jordan, 1880 (3775).
Puget Sound; D. S. Jordan, 1880 (3760).
California:
William Stimpson (2495). **One of Stimpson's types of the species.**
San Francisco; H. Hemphill (3231).
Farallone Islands; Charles H. Townsend, **1884 (8811).**
Santa Cruz; A. Forrer, 1885 (10014).
Monterey; D. S. Jordan, 1880 (3766); **W. H. Dall (3337).**
San Miguel Island; W. H. Dall (8808).
Santa Cruz Island; H. Henshaw (3251).
Catalina Harbor, Santa Catalina Island; **W. H. Dall (8813).**
San Diego; W. J. Fisher (3236).
La Paz, Lower California; L. Belding, 1882 (8815).
Unknown localities (3590, 8809).

Number 2495 is one of Stimpson's original types, described in 1857, and probably came from San Francisco. The single specimen from Sitka, Alaska (8810), agrees quite closely with specimens from San Francisco and other parts of California, and was received about ten years ago, in connection with numerous specimens of *S. franciscanus* from the same place. As *S. purpuratus* had not been recorded previously from north of Puget Sound, I was inclined to believe that this specimen had been accidentally mixed in with the others, and in reality belonged to some more southern locality. The receipt since then of a specimen from Parry Passage, British Columbia (8814), which apparently represents the same species, makes the extended northern range of *S. purpuratus* seem more probable.

The specimens above recorded from the Straits of Fuca (3775) and Puget Sound (3760) exhibit a considerable range of variation in the direction of *S. Dröbachiensis*, which also occurs at the same place, making it very difficult, and, in fact, impossible, to always separate the two species with certainty. The variation is manifested both in the test and spines, the former differing much in shape, and in the size and arrangement of the tubercles; the specimens are mostly small. Quite typical specimens of *S. purpuratus* are not uncommon, with the characteristic stout spines, often purplish, as farther south, but frequently greenish. Specimens from Departure and Alert Bays, recorded under *S. Dröbachiensis*, present some of the same modifications; but in the small collection from that place I have found nothing that could be safely referred to *S. purpuratus*.

55. Strongylocentrotus tuberculatus Brandt.

Japan:
W. J. Fisher, U. S. S. Tuscarora (6881).
North end of Niphon; Wm. Stimpson, N. Pacific Expl. Exped. (3593).
Hong Kong Harbor, China; Wm. Stimpson, N. Pacific Expl. Exped. (3043, 3136, 3235).

SPHÆRECHINUS Desor.

56. Sphærechinus granularis A. Agassiz.

Fayal, Azores; Dabney (3538).
Funchal Bay, Madeira; Wm. Stimpson, N. Pacific Expl. Exped. (1773, 2500).
Nice, France; Mus. Comp. Zool. (3544).

57. Sphærechinus pulcherrimus A. Agassiz.

Japan:
W. J. Fisher, U. S. S. Tuscarora (3608).
N. E. shore of Niphon; Brook and Kern, N. Pacific Expl. Exped. (3449).
China (?); Dale and Jouy, U. S. S. Palos (8656).
Unknown locality (3446).

PSEUDOBOLETIA Troschel.

58. Pseudoboletia indiana A. Agassiz.

Unknown locality; U. S. Expl. Exped., 1839 (2591).

Family ECHINIDÆ Agassiz.

Subfamily TEMNOPLEURIDÆ Desor.

TEMNOPLEURUS Agassiz.

59. Temnopleurus Hardwickii A. Agassiz.

Japan:
Hakodadi; W. J. Fisher, U. S. S. Tuscarora (3250).
East coast of Niphon; Wm. Stimpson, N. Pacific Expl. Exped. (3592).
Kagosima; Wm. Stimpson, N. Pacific Expl. Exped. (3470).
Unknown locality (8692).

60. Temnopleurus Reynaudi Agassiz.

China (?); Dale and Jouy, U. S. S. Palos (8767, 8768).
Unknown localities (3600, 8774).

61. Temnopleurus toreumaticus Agassiz.

East India; Mus. Comp. Zoology (3459).
China (?); Dale and Jouy, U. S. S. Palos (8766, 8769).
Unknown locality (3447).

TEMNECHINUS Forbes.

62. Temnechinus maculatus A. Agassiz.

Atlantic Ocean, off Cape Hatteras, N. C., 43–49 fath., S.; U. S. Fish Comm., sta. 2307 (12953), sta. 2596 (12954).
Straits of Florida; lat. 25° 04′ 50″ N., long. 80° 15′ 10″ W., 56 fath., Cr. S.; U. S. Fish Comm., sta. 2639, 1886 (14546).
Gulf of Mexico; U. S. Fish Comm., 1885:
Lat. 29° 18′ 15″ N., long. 85° 32′ W., 25 fath., crs. S. brk. Sh.; sta. 2370 (10689).
Lat. 29° 15′ 30″ N., long. 85° 29′ 30″ W., 27 fath., G.; sta. 2372 (10690).
Lat. 28° 45′ N., long. 85° 02′ W., 30 fath., S. brk. Cr.; sta. 2405 (10691).
Windward Islands; U. S. Coast Survey str. Blake, A. Agassiz, 1878–79:
Off Grenada, 170 fath. (6839).
Off Barbados, 96 fath. (6789).

MICROCYPHUS Agassiz.

63. Microcyphus maculatus Agassiz.

Japan; Wm. Stimpson, N. Pac. Expl. Exped. (3134).

TRIGONOCIDARIS A. Agassiz.

64. Trigonocidaris albida A. Agassiz.

Off St. Vincent, West Indies, 88 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79 (6797).

Off Havana, Cuba; lat. 23° 09′ 15″ N., long. 82° 21′ W., 177 fath.; U. S. Coast Survey str. Blake, A. Agassiz. 1877–'78 (6831).

Off Havana, Cuba, 98–216 fath.; U. S. Fish Comm., 1884–'85 (11 stations).

Off Cozumel Island, Yucatan; lat. 20° 19′ N., long. 87° 03′ 10″ W., 178 fath., Cr.; U. S. Fish Comm., sta. 2357, 1885 (10692).

SALMACIS Agassiz.

65. Salmacis globator Agassiz.

Sydney, Australia; Australian Museum (5936).

66. Salmacis rarispina Agassiz.

Unknown locality; Mus. Comp. Zool. (3578).

MESPILIA Desor.

67. Mespilia globulus Agassiz.

Ousima, Japan; Wm. Stimpson, N. Pac. Expl. Exped. (3621).

Unknown localities (2586, 2587, 3458, 3468, 3567).

Subfamily TRIPLECHINIDÆ A. Agassiz.

PHYMOSOMA Haime.

68. Phymosoma crenulare A. Agassiz.

Hakodadi, Japan; Wm. Stimpson, N. Pacific Expl. Exped. (3137).

ECHINUS Rondelet.

69. Echinus acutus Lamarck.

Bergen, Norway; Bergen's Museum, 1884 (8573, 8613).

Milford Haven, Wales; Wm. Stimpson (8772).

70. Echinus angulosus A. Agassiz.

South Africa:

Cape of Good Hope; Wm. Stimpson, N. Pacific Expl. Exped. (3472).

Table Bay; I. Russell, U. S. Transit-of-Venus Exped., 1874–'75 (3648).

71. Echinus elegans Düb. & Kor. (?)

Atlantic Coast, United States, off Nantucket, Mass.; U. S. Fish Comm., 1884:

Lat. 39° 47′ 20″ N., long. 69° 34′ 15″ W., 924 fath., M.; sta. 2217 (7939).

Lat. 39° 46′ 22″ N., long. 69° 29′ W., 948 fath., M.; sta. 2218 (7940).

Off Cape Hatteras, N. C.; lat. 35° 45′ 23″ N., long. 74° 31′ 25″ W., 888 fath., M. fne. S.; sta. 2116, 1883 (8659).

72. Echinus esculentus Linné.

Bergen, Norway; Bergen's Museum (3108).

Oban, Scotland; Wm. Stimpson (3433).

Milford Haven, Wales; Wm. Stimpson (3542).

Finistère, France; Thomas Wilson (8771).

73. Echinus gracilis A. Agassiz.

Atlantic Coast, United States; U. S. Fish Comm.:
Off Martha's Vineyard, Mass., 1882, 89–134 fath., S. (5732, 5950, 9504, 13371).
Lat. 39° 58′ N., long. 69° 42′ W., 202 fath., S.; sta. 1092, 1882 (5654).
Lat. 39° 29′ N., long. 72° 19′ 40″ W., 74 fath., M. S.; sta. 2032, 1883 (6376).
Lat. 38° 39′ N., long. 73° 11′ W., 130 fath., S.; sta. 1043, 1881 (5056, 8693).
Lat. 32° 35′ N., long. 77° 30′ W. (off Cape Romain, S. C.), 247 fath., gy. S.; sta. 2625, 1885 (12953).

74. Echinus magellanicus Philippi.

Ancon, Peru; George Keifer, 1884 (8819).
Port Gallant, Patagonia; Mus. Comp. Zool. (6808).

75. Echinus margaritaceus Lamarck.

Unknown localities (2589, 2590).

76. Echinus miliaris Müller.

Bergen, Norway; Bergen's Museum (3114, 8578).
England:
Salcombe, Devonshire; Rev. A. M. Norman, 1884 (7014).
Hastings; Rev. A. M. Norman, 1884 (7013).
Ireland; J. Alder (3503).

77. Echinus norvegicus Düben & Koren.

Hardangerfjord, Norway; Bergen's Museum, 1884 (8581).
Shetland Islands; Rev. A. M. Norman, 1884 (7012).
Kielerbücht, Germany; C. Möbius (3830).
Northeastern part of the Grand Bank; lat. 47° 16′ N., long. 51° 16′ W., 74 fath., fne. gy. S.; U. S. Fish Comm., sta. 2454, 1885 (11306).
Southern edge of Middle Ground; lat. 44° 19′ N., long. 60° 39′ 15″ W., 69 fath., fne. yl. S.; U. S. Fish Comm., sta. 2502, 1885 (11721).
Atlantic Ocean, off George's Bank, and the southern coast of New England; lat. 41° 09′ 40″ N. to lat. 39° 26′ 16″ N., long. 66° 02′ 20″ W. to long. 71° 24′ 30″ W.; 948–1,742 fath., M. fne. S. F. O.; U. S. Fish. Comm., 1883–'85 (14 stations).
Atlantic Ocean, south of Martha's Vineyard, Mass.; lat. 39° 38′ 20″ N., long. 70° 56′ W., 1,241 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1880 (6809).
Atlantic Ocean, east of Maryland, Virginia, and North Carolina; lat. 38° 47′ 20″ N. to lat. 35° 09′ 50″ N., long. 72° 37′ W. to long. 74° 57′ 40″ W.; 888–1,497 fath., M. fne. S. O.; U. S. Fish. Comm., 1883–'84 (8 stations).

TOXOPNEUSTES Agassiz.

78. Toxopneustes maculatus A. Agassiz.

Christmas Island, Pacific Ocean; Dr. W. H. Jones, U. S. N. (8712).
Unknown localities (3632, 3633).

79. Toxopneustes pileolus Agassiz.

Ousima, Japan (2503).
Between Acapulco and Mazatlan, west coast of Mexico; Mexican Geogr. Comm. (12528).
Unknown locality (2408).

80. Toxopneustes semituberculatus Agassiz.

San Quentin Bay, Lower California; L. Belding (8817).
Chatham Island, Galapagos Islands, rocky beach; Dr. W. H. Jones, U. S. N., 1884 (8757).
Unknown locality (3604).

81. Toxopneustes variegatus A. Agassiz.

Bermuda; Mus. Comp. Zool. (3499).
Off Cape Lookout, N. C., 22 fath., S.; U. S. Fish Comm., 1885 (12874, 12876).
South Carolina (3579).
Florida (2405, 3088):
Southern Florida; H. Hemphill, 1884 (8679).
Key Vaccas; Hemphill, 1885 (14306).
Key West; D. S. Jordan, 1883 (8688); H. Hemphill, (8726, 10046); U. S. Fish Comm., 1884 (8410).
Eastern Dry Rocks, near Key West; E. Palmer, 1884 (8721).
Off Key West, 45–50 fath., Cr.; U. S. Fish Comm., sta. 2316–2318, 1885 (10681, 10685, 10687.)
Punta Rassa; H. Hemphill, 1884 (7517, 8687).
Charlotte Harbor; G. W. Mastin (2410, 2412).
Sarasota Bay; H. Hemphill, 1884 (8680).
Little Sarasota Bay; F. B. Meek (8694); H. Hemphill, 1884 (8677, 8678).
Tampa Bay; H. Hemphill, 1884 (8681).
Anclote Keys; E. Ingersoll, 1881 (12337).
Boca Ceiga Bay; H. Hemphill, 1884 (7519, 8686).
Cedar Keys; H. Hemphill, 1883 (8756).
West Florida; Kaiser and Martin (3018).
Marco; H. Hemphill (12856).
Garden Key, Tortugas; Lieut. H. G. Wright, U. S. N. (3543).
Tortugas; Wurdemann (3423); Col. Farquhar, 1880 (4472, 4473).
Gulf of Mexico; U. S. Fish Comm., 1885:
Off Apalachicola, Fla., 24 fath.; sta. 2407 (10683).
Off Cape Catoche, Yucatan, 25 fath.; sta. 2362 (10682).
West Indies; U. S. Fish Comm., 1884–'85:
Off Havana, Cuba, 98–216 fath. (14 stations).
San Antonio, Cuba (8411).
Jamaica (8409).
Saint Thomas (7516, 8407, 8408).
Yucatan; A. Schott (3234).
Caribbean Sea; U. S. Fish Comm., 1884:
Lat. 17° 44′ 05″ N., long. 75° 39′ W., 23 fath., Cr., brk. Sh.; sta. 2138 (8415).
Curaçao Island (8826).
Sabanilla, U. S. of Colombia (8826).

HIPPONOË Gray.

82. Hipponoë depressa A. Agassiz.

Between Acapulco and Mazatlan, west coast of Mexico, Mexican Geogr. Comm. (12530).

83. Hipponoë esculenta A. Agassiz.

Bermuda; Bermuda Centennial Commissioners, 1876 (4477, 4478); Dr. F. V. Hamlin (5101).
Bahamas, U. S. Fish Comm., 1886: Nassau (14535, 14536), Abaco (14534).
Florida:
Indian Key; H. Hemphill (12935).
No Name Key; H. Hemphill, 1885 (14308).
Key West; U. S. Fish Comm., 1884 (8426).
Tortugas; Dr. J. B. Holder (3525).
Dry Tortugas Keys; E. Palmer, 1884 (8731, 8760).
Saint Thomas, West Indies; U. S. Fish Comm., 1884 (8828).

83. Hipponoë esculenta A. Agassiz—Continued.

Cozumel Island, Yucatan; U. S. Fish Comm., 1885 (10669).
Caribbean Sea: U. S. Fish Comm., 1884:
Old Providence Island (8830).
Curaçao Island (8427).
Sabanilla, U. S. of Colombia; U. S. Fish Comm., 1884 (8829).

84. Hipponoë variegata A. Agassiz.

Pacific Ocean:
Sandwich Islands; Wm. Stimpson, N. Pac. Expl. Exped. (3489).
Johnson's Island; D. S. Jordan (5948).
Palmyra Island; Dr. W. H. Jones, U. S. N. (8652, 8710).
Gilbert Islands (6990).
Tahiti; Dr. W. H. Jones, U. S. N., 1884 (12343).
Ousima, Japan: Wm. Stimpson, N. Pac. Expl. Exped. (2502).

EVECHINUS Verrill.

85. Evechinus chloroticus Verrill.

New Zealand:
I. Russell, U. S. Transit-of-Venus Exped., 1874–'75 (3647).
Bluff Harbor (3631, 3638).

Suborder CLYPEASTRIDÆ Agassiz.

Family EUCLYPEASTRIDÆ Hæckel.

Subfamily FIBULARINA Gray.

ECHINOCYAMUS Van Phelsum.

86. Echinocyamus pusillus Gray.

Norway (3622); Bukken, Rev. A. M. Norman (7046).
Keilerbücht, Germany: C. Möbius (5181).
Off Fernandina, Fla., 270–294 fath., gy. S. brk. Cr.; U. S. Fish Comm., sta. 2666 (14544), 2668 (14545).
Off the Dry Tortugas, Florida; lat. 24° 15′ N., long. 82° 13′ W., 229 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1877–'78 (6838).
Off Cuba; U. S. Fish Comm., 1885:
Off Havana, 201 fath., Cr.: sta. 2342 (10631).
Lat. 22° 35′ N., long. 84° 23′ W., 463 fath., Cr.; sta. 2352 (10632).
Off Yucatan; U. S. Fish Comm., 1885:
Off Arrowsmith Bank, 130 fath., Cr.; sta. 2354 (10623).
Off Cozumel Island, 231 fath., Cr.: sta. 2359 (10623).
Caribbean Sea, near Old Providence Island: lat. 13° 34′ 45″ N., long. 81° 21′ 10″ W., 382 fath., Cr. S.; U. S. Fish Comm., sta. 2150, 1884 (7117).
Off Grenadines, Windward Islands, 338 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79 (6800).

FIBULARIA Lamarck.

87. Fibularia volva Agassiz.

North China Sea, 25 fath., shelly sand; Wm. Stimpson, N. Pac. Expl. Exped. (3581).

Subfamily ECHINANTHIDÆ A. Agassiz.

CLYPEASTER Lamarck.

88. Clypeaster humilis A. Agassiz.

Mindanão, Philippine Islands; Drayton (3436).

89. Clypeaster latissimus A. Agassiz.

Off St. Vincent, Windward Islands, 95 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 231, 1878–'79 (6825).

90. Clypeaster Ravenellii A. Agassiz.

Atlantic Ocean, off South Carolina; U. S. Fish. Comm., 1885:
Lat. 33° 18′ 30″ N., long. 77° 07′ W., 95 fath., S.; sta. 2417 (10058).
Lat. 32° 54′ N., long. 77° 53′ 30″ W., 88 fath., crs. S.; sta. 2312 (10055).
Lat. 32° 53′ N., long. 77° 53′ W., 99 fath., crs. S.; sta. 2313 (10056).
Off Key West, Fla.; U. S. Fish Comm., 1885:
Lat. 24° 25′ 45″ N., long. 81° 46′ 45″ W., 45 fath., Cr.; sta. 2317 (10675).
Lat. 24° 25′ 45″ N., long. 81° 46′ W., 45 fath., Cr.; sta. 2318 (10643).
Gulf of Mexico; U. S. Fish Comm., 1885:
Lat. 29° 24′ 30″ N., long. 88° 01′ W., 35 fath., S.; sta. 2388 (10054).
Lat. 28° 44′ N., long. 85° 16′ W., 60 fath., S.; sta. 2404 (10626, 10644).
Lat. 28° 42′ 30″ N., long. 85° 29′ W., 88 fath., M.; sta. 2403 (10057).
Gulf of Mexico; lat. 23° 20′ N., long. 89° 16′ W., 84 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 36, 1877–'78 (6830).

91. Clypeaster rotundus A. Agassiz.

Lower California; Commander Dewey, U. S. N. (3614).
Las Animas Bay, Gulf of California; R. E. C. Stearns (10005).
Unknown locality; flat variety (2631).

92. Clypeaster scutiformis Lamarck.

Unknown locality (2552).

93. Clypeaster subdepressus Agassiz.

Off the southern and western coasts of Florida; U. S. Fish Comm., 1885:
Lat. 24° 25′ 45″ N., long. 81° 46′ 45″ W., 45 fath., Cr.; sta. 2317 (10676).
Lat. 25° 04′ 30″ N., long. 82° 59′ 15″ W., 26 fath., S.; sta. 2414 (8993).
Lat. 26° 33′ 30″ N., long. 83° 15′ 30″ W., 27 fath., S.; sta. 2411 (8994).
Gulf of Mexico; U. S. Fish Comm., 1885:
Lat. 29° 10′ N., long. 85° 31′ W., 30 fath., S.; sta. 2375 (8995).
Lat. 29° 24′ 30″ N., long. 88° 01′ W., 35 fath., S.; sta. 2388 (8992).
Off Cape Catoche, Yucatan; lat. 22° 08′ 30″ N., long. 86° 53′ 30″ W., 25 fath., Cr. S.; U. S. Fish Comm., sta. 2362, 1885 (10625).

ECHINANTHUS Breyn.

94. Echinanthus rosaceus Gray.

Bahamas, U. S. Fish Comm., 1886: Nassau (14527), Abaco (14526).
Florida:
(3091); L. F. Pourtalès (4101).
Key Biscayne; Wurdemann (2480).
Indian Key; H. Hemphill (12936).
Key Vaccas; H. Hemphill, 1885 (14311).
Key West; U. S. Fish Comm., 1884 (8417).
West Indies; U. S. Fish Comm., 1884:
San Antonio, Cuba (8418).
St. Thomas (8419, 8420).
West Indies; Dr. John Gibson, U. S. N. (12340).

95. Echinanthus testudinarius Gray.

Hakodadi, Japan; W. J. Fisher (3435, 3577, 8977).
Kanada Bay, Niphon, Japan; W. J. Fisher (14037).
La Paz, Lower California; A. Forrer (10018); L. Belding, 1882 (5395).

Subfamily LAGANIDÆ Desor.

LAGANUM Klein.

96. Laganum Bonani Klein.

Sooloo Sea; U. S. Expl. Exped. (2551).
Mangsi Island, Pacific Ocean; U. S. Expl. Exped. (2549).

97. Laganum depressum Lesson.

Sandwich Islands; Pease (2387).
Tongatabu, Friendly Islands; U. S. Expl. Exped. (2526).
New Zealand (3606).
Unknown localities (2531, 2537, 2538, 2540, 2546, 3537, 8773).

98. Laganum Putnami Barnard.

Ousima, Japan; Wm. Stimpson, N. Pac. Expl. Exped. (3485).
Unknown locality (3476, 3486).

PERONELLA Gray.

99. Peronella decagonalis A. Agassiz.

Hong Kong, China; Wm. Stimpson, N. Pac. Expl. Exped. (1772).
Loo Choo Islands; Wm. Stimpson, N. Pac. Expl. Exped. (3482).
Unknown locality (2395).

Family SCUTELLIDÆ Agassiz.

ECHINARACHNIUS Leske.

100. Echinarachnius excentricus Valenciennes.

Straits of Fuca; "C. P.," U. S. Expl. Exped., 1838–'42 (2553).
Washington Territory:
Fort Steilacoom, Puget Sound; Dr. George Suckley, U. S. A. (2321).
Neeah Bay; J. G. Swan (6958).
California:
Crescent City; A. Agassiz (3576).
San Francisco; A. Agassiz (3546).
Monterey; D. S. Jordan, U. S. Fish Comm., 1880 (3773).
Monterey, 8–10 fath., M.; W. H. Dall (6884).
Monterey, 8–12 fath.; W. H. Dall (8781).
San Fernando Mountains, Santa Barbara Co., 15 miles from the sea, altitude 1,700 feet (fossil); W. H. Dall (14035).
San Miguel Island; W. H. Dall (6883).
Santa Catalina Island; W. H. Dall (5941).
New Anaheim Landing; W. H. Dall (14036).
San Diego; D. S. Jordan, U. S. Fish Comm., 1880 (3752); Orcutt (12338).
Off San Diego; Mus. Comp. Zool. (6807).
Mulege Bay, Gulf of California; W. J. Fisher (8989).

Mr. Alexander Agassiz* records *Echinarachnius excentricus* from Sitka and Unalach, Alaska, and Kamtchatka, on the authority of Eschscholtz. The very large collection of Echini in the National Museum from Alaska and Eastern Siberia does not contain any representatives of this species, and Eschscholtz's observations were probably based upon some other form. There is no positive evidence that *E. excentricus* extends north of Puget Sound and the Straits of Fuca, although *E. parma* is very common throughout Alaska, and in some places attains a very large size.

101. Echinarachnius mirabilis A. Agassiz.

Hakodadi, Japan; U. S. S. Tuscarora (3252).

102. Echinarachnius parma Gray.

Labrador: L'anse au Loup, 15 fath.; W. A. Stearns, 1882 (5932).
Nova Scotia; Willis (2383).
New Brunswick: Grand Manan; W. Stimpson (2378, 2379, 2380).
Maine: Eastport (4112).
Massachusetts:
Off Cape Ann, 30 fath. (3483).
Lynn; Dr. Prescott (3479).
Cape Cod; William Stimpson (3585).
Massachusetts Bay; General J. G. Totten (3477, 8776).
Off Newport, 24 fath.; U. S. Coast Survey str. Blake, A. Agassiz (6822).
Off the eastern coast of North America; U. S. Fish Comm.:
Off the southern edge of the Grand Bank of Newfoundland, 129–179 fath., S. P.; sta. 2430 (11036); sta. 2431 (11037).
NE. part of the Grand Bank, 35–39 fath., wh. S. brk. Sh. (3 stations).
Off the SE. coast of Newfoundland, 89 fath., S. gn. M.; sta. 2458 (11041).
Green Bank, 30–67 fath.. S. brk. Sh. (3 stations).
Between Bank of St. Pierre and Banquereau, 116 fath., G.; sta. 2481 (11045).
Banquereau, 75 fath. (4795).
Halifax Harbor, 16–37 fath., S., 1877 (13207, 13644, 13645).
Gulf of Maine, lat. 42° 44′ N., long. 66° 27′ W., 75 fath., S. M.; sta. 39, 1877 (13643).
Off Cape Ann, 21–26 fath., S. M. R. G., 1878 (several stations).
Gloucester Harbor, 8¼ fath., S., 1878 (13704).
Stellwagen's Bank, 13–17 fath., S., 1879 (13591).
Cape Cod Bay, 6–31 fath., S. G., 1879 (many stations).
Off Cape Cod, 10–34 fath., S. G., 1879, 1881 (many stations).
George's Bank region, 37–86 fath., S. G. (5 stations).
Off Nantucket Shoals, 18–25 fath., S. (2 stations).
Vineyard Sound, Mass., 1875 (3695, 4309).
Off Martha's Vineyard, Mass., 28–69 fath., S. M. (5086, 6197).
North of Block Island, 15 fath., S.; 1880 (13599).
Narragansett Bay, R. I., 8¼ fath., S. Sh., 1880 (9692).
Noank, Conn., 1874 (4978).
Off the coast of Maryland, 19 fath., S.; sta. 2015 (6365, 6572, 8653).
Off Chesapeake Bay, 70 fath., M. G.; sta. 2265 (8521).
Alaska; William H. Dall, 1871–1880:
Near Point Belcher, 9 fath., S. (14314).
Icy Cape, 7–15 fath., S. (8649, 8664).

* Revision of the Echini, p. 107.

102. Echinarachnius parma Gray—Continued.

Alaska: William H. Dall, 1871-1880—Continued.

Lat. 66° 45′ N., long. 166° 35′ W., 10 fath., S. (7127).

Point Spencer, Port Clarence (6954).

Off King's Island, Bering Strait, 17 fath., M. (8707, 8838).

Off Nunivak Island, 24 fath., S. (8660).

St. Paul's Island (6882).

St. George Island (6885).

Attu, 5–7 fath., S. G. (8706).

Atka, 10–16 fath., S. (8683).

Unalashka (6946, 8655, 8716, 8728, 10040); Iliuliuk Harbor, 3–6 fath., S. R. (8662, 8740, 12852); Captain's Harbor (8705, 8839); between Pinnacle and Ulakhla, 16 fath. (14042).

Unga (8723); Coal Harbor, 8–9 fath., M. S. St. (8663, 8836, 8837).

Unga Island and Popoff Straits (8717, 12851, 12853).

Chiachi Island, 20 fath., M. (14043).

Shumagins: Sanborn Harbor, 6–8 fath., S. (8665); Koninsha Island (14044).

Aliaska: Chignick Bay (6947).

Semidi Islands, 15–25 fath., G. (8661).

Chirikoff Island, 9–14 fath., S. (6948, 7028, 8738).

Kodiak: St. Paul (6949); Chajatlsa Cove, 13 fath., M. (8835).

Cook's Inlet: Chugachik Bay, 20–60 fath., S. M. (8640).

Bering Sea; between lat. 60° 16′ N. and lat. 63° 37′ N., long. 165° 19′ W. and long. 168° 45′ W., 12–25 fath., S. M.; Lieut. G. M. Stoney, U. S. N., June, 1884 (6 stations).

St. Paul Island, H. W. Elliott, 1874 (6950).

British Columbia (?); C. B. R. Kennerly, North Western Boundary Survey (3006).

Kamtchatka: Bering Island; L. Stejneger, 1882–'83 (6959, 8639).

Echinarachnius parma attains, in some parts of Alaska, a much larger size than has yet been noted from the Atlantic coast of North America. Mr. Dall's collection contains especially large specimens from Nazan Bay, Atka (8683); Chignick Bay, Aliaska (6947); and Unalashka (8716). One specimen from Nazan Bay measures, long. diameter 95^{mm}, trans. diameter 98^{mm}; another from Chignick Bay measures, long. diameter 89^{mm}, trans. diameter 96^{mm}.

ECHINODISCUS Breyn.

103. Echinodiscus auritus Leske.

Unknown locality (2392).

104. Echinodiscus lævis A. Agassiz.

Unknown locality (12336).

MELLITA Klein.

105. Mellita longifissa Michelin.

Angeles Bay, Gulf of California; W. J. Fisher, Stearns's Coll. (8988).

Mexico:

Mazatlan; A. Forrer (10016).

Acapulco; A. Agassiz (3474).

106. Mellita pacifica Verrill.

Cape St. Lucas, Lower California (?); John Xantus (2628).

Unknown localities (2626, 2627).

107. Mellita sexforis A. Agassiz.

West Indies: ? (4483); A. Agassiz (3584); St. Kitt's (7000).
Old Providence Island, Caribbean Sea; U. S. Fish Comm., 1884 (8423).
Rio de Janeiro, Brazil: R. Rathbun, 1876 (5388).

108. Mellita testudinata Klein.

Virginia:
Cherrystone; M. McDonald, U. S. Fish Comm., 1881 (4980, 5943).
Hog Island; Wm. Stimpson (3531).
North Carolina:
Off Cape Hatteras, 7–25 fath., S.; U. S. Fish Comm., 1884 (9 stations).
Beaufort; Wm. Stimpson (3025, 3530); W. K. Brooks (4302); H. C. Yarrow (4716).
Fort Macon; H. C. Yarrow (5083).
South Carolina: (3096, 3480); Hilton Head, F. V. Hayden (3513).
Florida (3505):
East coast; General Spinner, 1884 (10065).
Sarasota Bay, 1–2 fath.; H. Hemphill, 1884 (8741).
Sarasota Pass; H. Hemphill, 1884 (8818).
Tampa Bay, 8 fath.; H. Hemphill, 1884 (8675).
Tortugas; Col. Farquhar (4482).
Galveston, Texas: Dr. H. B. Butcher, U. S. A. (12339).
Vera Cruz, Mexico: Mexican Geogr. Comm. (12526).
Cumana, Venezuela: Couthouy (3509).
Bay of Bahia, Brazil: R. Rathbun, 1876 (5389).

ASTRICLYPEUS Verrill.

109. Astriclypeus Manni Verrill.

North China Sea; Wm. Stimpson, N. Pac. Expl. Exped. (3517).

ROTULA Klein.

110. Rotula Augusti Klein.

Unknown localities (2307, 6991).

ENCOPE Agassiz.

111. Encope californica Verrill.

La Paz, Lower California; A. Forrer (10010).
San Lucas Cove, Gulf of California; W. J. Fisher (8986).
Chatham Island, Galapagos Islands; Dr. W. H. Jones, U. S. N., 1884 (8720).
Unknown locality (2283).

The specimens from the Galapagos Islands (8720) are very large, the largest measuring $5\frac{3}{5}$ inches in longitudinal diameter.

112. Encope emarginata Agassiz.

Cumana, Venezuela; Couthouy (3607).
Sabanilla, U. S. of Colombia; U. S. Fish Comm. str. Albatross, 1884 (8421, 8422).
Unknown localities (2557, 3473).

113. Encope grandis Agassiz.

La Paz, Lower California; A. Forrer (10013).
Angeles Bay, Gulf of California; W. J. Fisher (8985).

114. Encope Michelini Agassiz.

Off Cape Lookout, N. C., 18–25 fath., S.; U. S. Fish Comm., 1885 (12940, 12949).
Off St. Augustine, Florida, 14 fath.; Postell (2285).
Rum Cay, Bahamas; U. S. Fish Comm., 1886 (14541).
Gulf of Mexico; U. S. Fish Comm., 1885:
Lat. 29° 10′ N., long. 85° 31′ W., 30 fath., S.; sta. 2375 (8954).
Lat. 26° 47′ 30″ N., long. 83° 25′ 15″ W., 28 fath., S.; sta. 2410 (8955).
Off Cape Catoche, Yucatan; U. S. Fish Comm., 1885:
Lat. 22° 08′ 30″ N., long. 86° 49′ W., 26 fath., Cr.; sta. 2360 (10621).
Lat. 22° 08′ 30″ N., long. 86° 53′ 30″ W., 25 fath., S. Cr.; sta. 2362 (10622).
Unknown localities (2289, 2295, 2296, 2298).

115. Encope micropora Agassiz.

Mazatlan, Mexico; A. Forrer, 1885 (10017).
Panama; Sternberg (3475).
Unknown localities (2279, 2284).

Suborder PETALOSTICHA Hæckel.

Family CASSIDULIDÆ Agassiz.

Subfamily ECHINONIDÆ Agassiz.

ECHINONĒUS Van Phelsum.

116. Echinonēus cyclostomus Leske.

Pacific Ocean:
Loo Choo Islands; Wm. Stimpson, N. Pac. Expl. Exped. (3450).
Gilbert Island (6995).
Unknown locality (2508).

Subfamily NUCLEOLIDÆ Agassiz.

NEOLAMPAS A. Agassiz.

117. Neolampas rostellata A. Agassiz.

Near Key West, Florida; lat. 24° 15′ N., long. 82° 13′ W., 229 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 5, 1877–'78 (6790).

ECHINOLAMPAS Gray.

118. Echinolampas depressa Gray.

Straits of Florida; lat. 25° 04′ 50″ N., long. 80° 15′ 10″ W., 56 fath., Cr. S.; U. S. Fish Comm., sta. 2639, 1886 (14592).
Off Grenada, Windward Islands, 92 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 253, 1878–'79 (6815).

CONOLAMPAS A. Agassiz.

119. Conolampas Sigsbei A. Agassiz.

Off Havana, Cuba, U. S. Fish Comm., 1885; sta. 2350, 213 fath., Cr. (10645, 10766); sta. 2342, 201 fath., Cr. (10762).
Gulf of Mexico; lat. 25° 52′ N., long. 88° 05′ W., 95 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 32, 1877–'78 (6820).

RHYNCHOPYGUS D'Orbigny.

120. Rhynchopygus pacificus A. Agassiz.

Mexico:

Cape St. Lucas, Lower California; John Xantus (6988).
Acapulco; Mus. Comp. Zool. (3561).
Chatham Island, Galapagos Islands; Dr. W. H. Jones, U. S. N., 1884 (8750).

Family SPATANGIDÆ Agassiz.

Subfamily POURTALESIÆ A. Agassiz.

POURTALESIA A. Agassiz.

121. Pourtalesia Jeffreysi Wyv. Thomson.

Atlantic Ocean, off George's Bank; lat. 40° 16′ 50″ N., long. 67° 05′ 15″ W., 1,290 fath., M. S.; U. S. Fish Comm., sta. 2084, 1884 (6255).

URECHINUS A. Agassiz.

122. Urechinus Naresianus A. Agassiz.

Off George's Bank; lat. 41° 43′ N., long. 65° 21′ 50″ W., 1,309 fath., M.; U. S. Fish Comm., sta. 2074, 1883 (7114).
Off George's Bank; lat. 41° 24′ 45″ N., long. 65° 35′ 30″ W., 1,242 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 308, 1880 (6803).

Subfamily ANANCHYTIDÆ Alb. Gras.

PALÆOTROPUS Lovén.

123. Palæotropus Josephinæ Lovén.

Off Havana, Cuba, 143-182 fath., S. Cr.; U. S. Fish Comm., sta. 2327, 2341, 1885 (10634, 10635).
Off Barbados, Windward Islands, 140 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 299, 1878–'79 (6791).

PALÆOBRISSUS A. Agassiz.

124. Palæobrissus Hilgardi A. Agassiz.

Off Barbados, Windward Islands, 82 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 300, 1878–'79 (6812).

HOMOLAMPAS A. Agassiz.

125. Homolampas fragilis A. Agassiz.

Caribbean Sea, near Aves Island; lat. 15° 24′ 40″ N., long. 63° 31′ 30″ W., 683 fath., M. fne. S.; U. S. Fish Comm., sta. 2117, 1884 (8397).

PALEOPNEUSTES A. Agassiz.

126. Paleopneustes cristatus A. Agassiz.

Off Havana, Cuba, 156 fath., Cr.; U. S. Fish Comm., sta. 2332, 2336, 1885 (10759, 10761).
Off Barbados, Windward Islands, 180 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 295, 1878–'79 (6828).

127. Paleopneustes hystrix A. Agassiz.

Off Havana, Cuba, 279 fath., Cr.; U. S. Fish Comm., sta. 2343, 1885 (10648).
Off Montserrat, Windward Islands, 120 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 157, 1878–'79 (6826).

LINOPNEUSTES A. Agassiz.

128. Linopneustes longispinus A. Agassiz.

North of Little Bahama Bank; lat. 27° 22′ N., long. 78° 07′ 30″ W., 338 fath., gy. S.; U. S. Fish Comm., sta. 2655, 1886 (14537).
Off Havana, Cuba, U. S. Fish Comm.; sta. 2157, 1884, 29 fath. (8428); sta. 2343, 1885, 279 fath., Cr. (10646).
Off St. Kitts, West Indies, 208 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 148, 1878–'79 (6818).

Subfamily SPATANGINA Gray.

SPATANGUS Klein.

129. Spatangus purpureus Leske.

Shetland Islands; A. M. Norman, 1884 (7017).
Kielerbücht, Germany; C. Möbius (3837).
Atlantic Ocean, off Martha's Vineyard; lat. 39° 53′ N., long. 69° 43′ W., 156 fath., fne. S.; U. S. Fish Comm., sta. 1098, 1882 (5564).
North of Little Bahama Bank; lat. 27° 22′ N., long. 78° 07′ 30″ W., 338 fath., gy. S.; U. S. Fish Comm., sta. 2655, 1886 (14594).

130. Spatangus Raschi Lovén.

Shetland Islands; A. M. Norman, 1884 (7018).

MACROPNEUSTES Agassiz.

131. Macropneustes spatangoides A. Agassiz.

Off St. Kitts, West Indies, 250 fath.; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79 (6837).

MARETIA Gray.

132. Maretia planulata Gray.

Gilbert Islands, Pacific Ocean (8715).
Unknown locality (2564).

LOVENIA Desor.

133. Lovenia cordiformis Lütken.

California; W. H. Dall:
Catalina Island, 40 fath. (3238).
Catalina Harbor (12957).
South of Catalina Island, 50 fath. (5938).
Gulf of California; Lieut. Comdr. H. E. Nichols, U. S. N., 1881 (8719).

BREYNIA Desor.

134. Breynia australasiæ Gray.

Australia (2560).

ECHINOCARDIUM Gray.

135. Echinocardium cordatum Gray.

Scotland; Anderson (3551).
Dublin Bay, Ireland; W. W. Walpole (8711).
Salcombe, Devonshire, England; Rev. A. M. Norman, 1884 (7011).
Kielerbücht, Germany; C. Möbius (3847).
Cape Fear, North Carolina (3549).

136. Echinocardium flavescens A. Agassiz.

Bergen, Norway; Bergen's Museum, 1884 (8580).
Sweden; Mus. Comp. Zool. (3504).
Shetland Islands; Rev. A. M. Norman, 1884 (7016).
Kielerbücht, Germany; C. Möbius (3846).

Subfamily BRISSINA Gray.

HEMIASTER Desor.

137. Hemiaster cavernosus A. Agassiz.

Tierra del Fuego, West Coast; Dr. M. H. Crawford, U. S. N., 1884 (8718).
Kerguelen Island; Dr. J. H. Kidder, U. S. N., U. S. Transit-of-Venus Expedition, 1874–'75 (3144, 3232); types of *Hemiaster cordatus* Verrill.

138. Hemiaster Mentzi A. Agassiz.

Gulf of Mexico; lat. 28° 45′ N., long. 88° 15′ 30″ W., 940 fath., M.; U. S. Fish Comm., sta. 2384, 1885 (10647).

BRISSOPSIS Agassiz.

139. Brissopsis lyrifera Agassiz.

Shetland Islands; Rev. A. M. Norman (7015).
Bergen, Norway; Bergen's Museum (8582).
Kielerbücht, Germany; C. Möbius (3838).
Atlantic Ocean, off the coast of the United States; U. S. Fish Comm., 1883–'85:
Lat. 41° 09′ 40″ N., long. 66° 02′ 20″ W., 1,255 fath., M.; sta. 2077 (6996, 7118).
Lat. 40° 09′ 30″ N., long. 67° 09′ W., 1,356 fath., gy. glb. O.; sta. 2571 (12143).
Lat. 39° 49′ N., long. 68° 28′ 30″ W., 1,467 fath., glb. O.; sta. 2043 (8667).
Lat. 39° 47′ 20″ N., long. 69° 34′ 15″ W., 924 fath., gy. M.; sta. 2217 (7934).
Lat. 39° 46′ 22″ N., long. 69° 29′ W., 948 fath., gy. M.; sta. 2218 (7935).
Lat. 39° 34′ 45″ N., long. 71° 31′ 30″ W., 1,080 fath., M. S.; sta. 2209 (7823).
Lat. 39° 33′ N., long. 71° 16′ 15″ W., 1,178 fath., M.; sta. 2208 (7822).
Lat. 39° 22′ N., long. 71° 23′ 30″ W., 1,396 fath., gy. O.; sta 2564 (12144).
Lat. 39° 15′ 30″ N., long. 71° 25′ W., 1,434 fath., gy. O.; sta. 2562 (12142).
Lat. 38° 27′ N., long. 73° 02′ W., 1,168 fath., gy. O.; sta. 2230 (8102, 8148).
Lat. 37° 50′ N., long. 73° 03′ 50″ W., 1,395 fath., glb. O.; sta. 2105 (6604, 7113).
Lat, 37° 38′ 40″ N., long. 73° 16′ 30″ W., 1,423 fath., glb. O.; sta. 2229 (8197).
Lat. 37° 25′ N., long. 73° 06′ W., 1,582 fath., M.; sta. 2228 (8147, 10049).
Between Capes Hatteras and Lookout, N. C., 87–124 fath., S. P., 1885 (12947)

139. Brissopsis lyrifera Agassiz—Continued.

Gulf of Mexico; U. S. Fish Comm., 1885:
Off Havana, Cuba, 279 fath., Cr.: sta. 2343 (10636).
Lat. 28° 44′ N., long. 85° 16′ W., 60 fath., S.; sta. 2404 (10633).
Lat. 28° 36′ N., long. 85° 33′ 30″ W., 111 fath., M.; sta. 2402 (10627).
Lat. 28° 38′ 30″ N., long. 85° 52′ 30″ W., 142 fath., M.; sta. 2401 (10640).
Lat. 28° 41′ N., long. 86° 07′ W., 169 fath., M.; sta. 2400 (10639).
Lat. 28° 05′ N., long. 87° 56′ 15″ W., 1,330 fath., M.; sta. 2381 (10638).
Lat. 29° 14′ 30″ N., long. 88° 09′ 30″ W., 68 fath., M.; sta. 2378 (10637).

Gulf of Mexico, off the mouth of the Mississippi River; lat. 28° 51′ 30″ N., long. 89° 01′ 30″ W., 118 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 49, 1877–'78 (6813, 6827).

Caribbean Sea, off Jamaica; lat. 17° 55′ N., long. 76° 41′ 20″ W., 150 fath.; U. S. Coast Survey str. Blake, A. Agassiz, sta. 116, 1878–'79 (6816).

Off Aspinwall, Panama, 25 fath., M.; U. S. Fish Comm., sta. 2145, 1884 (7117).

ACESTE Wyv. Thomson.

140. Aceste bellidifera Wyv. Thomson.

Atlantic Ocean, off Maryland; lat. 37° 41′ 20″ N., long. 73° 03′ 20″ W., 1,497 fath., glb. O.; U. S. Fish Comm., sta. 2106, 1883 (6700).

Caribbean Sea, off Aves Island; lat. 15° 24′ 40″ N., long. 63° 31′ 30″ W., 683 fath., M. fne. S.; U. S. Fish Comm., sta. 2117, 1884 (7115).

AGASSIZIA Valenciennes.

141. Agassizia excentrica A. Agassiz.

Straits of Florida; lat. 25° 05′ N., long. 80° 15′ W., 56 fath., Cr. S.; U. S. Fish Comm., sta. 2640, 1886 (14593).

Off Havana, Cuba; U. S. Fish Comm.:
Sta. 2159, 1884, 98 fath. (8400).
Sta. 2341, 1885, 143 fath. (10629).
Sta. 2345, 1885, 184 fath. (10630).

Off the Windward Islands; U. S. Coast Survey str. Blake, A. Agassiz, 1878–'79:
Off Barbados, 76 fath. (6792).
Off Dominica, 118 fath. (6793).

142. Agassizia scrobiculata Valenciennes.

La Paz, Lower California; L. Belding (5394).
San Lucas Cove, Gulf of California; W. J. Fisher (10008).
Mazatlan, Mexico; A. Forrer (10019).
Panama; A. Agassiz (3550).

BRISSUS Klein.

143. Brissus carinatus Gray.

Pacific Ocean:
Sandwich Islands (?); U. S. Expl. Exped. (2562).
Marquesas Islands; Dr. W. H. Jones, U. S. N., 1884 (8702).
Paumotu Islands (8691).
Tahiti, Society Islands (8690).

METALIA Gray.

144. Metalia pectoralis A. Agassiz.

Bahamas: B. H. Van Vleck (10852); Nassau, U. S. Fish Comm., 1886, one fine large living specimen (14539).

Off Cape Catoche, Yucatan, 25 fath., S. Cr.; U. S. Fish Comm., sta. 2362, 1885 (10624).

Unknown locality (2596).

145. Metalia sternalis Gray.

Sandwich Islands; Mus. Comp. Zoology (3060).
Unknown locality (2524).

MEOMA Gray.

146. Meoma grandis Gray.

La Paz, Lower California; L. Belding, 1882 (5392).
Unknown localities (2514, 2518, 3615).

147. Meoma ventricosa Lütken.

Nassau, Bahamas; U. S. Fish. Comm., 1886 (14538).
Gulf of Mexico; U. S. Fish. Comm., 1885:
Off the Dry Tortugas, 26 fath., S.; sta. 2414 (8999).
Off Charlotte Harbor, Fla., 27 fath., S.; sta. 2411, 2412 (8998, 9000).
Off Apalachicola, Fla., 26–30 fath., S. Cr.; sta. 2405, 2406 (8996, 8997, 10620).
Off Cape Catoche, Yucatan, 25 fath., S.; sta. 2362 (10619).

SCHIZASTER Agassiz.

148. Schizaster canaliferus Agassiz.

Atlantic Ocean, off Martha's Vineyard; lat. 40° 02′ N., long. 70° 37′ 30″ W., 101 fath., M. fne. S.; U. S. Fish. Comm., sta. 1108, 1882 (5563).

149. Schizaster fragilis Agassiz.

Hardangerfjord, Norway; Bergen's Museum (8596).
Atlantic Ocean, off the eastern coast of North America; U. S. Fish Comm.:
Off the Grand Bank of Newfoundland, 150 fath. (4940).
Off the southern edge of the Grand Bank, 471 fath., gy. M., 1885 (12128).
Between Bank of St. Pierre and Banquereau, 116–224 fath., M. S. G., 1885 (6 stations).
Eastern edge of Banquereau, 39 fath., S. G., 1885 (12331).
South of Nova Scotia, 93–190 fath., M. G., 1877, 1885 (9680, 11305, 12126, 12136).
30 miles S. E. ½ S. of Cape Sable, N. S., 88–91 fath., fne. S. M., 1877 (5951, 7120, 13414).
Jeffrey's Bank, Gulf of Maine (4903).
33 miles E. by S. of Eastern Point Light, Cape Ann, Mass., 85–110 fath., M. G., 1878 (9867).
Off Cape Cod, Mass., 80–129 fath., M., 1879 (13417–13419).
Off the northern edge of George's Bank, 99–150 fath., M. S. G., 1883–1885 (7112, 7121–7124).
East of George's Bank; lat. 41° 49′ N., long. 65° 49′ 30″ W., 72 fath., S. G., 1885 (12132).
Southeast of George's Bank; lat. 39° 56′ 45″ N., long. 70° 50′ 30″ W., 156 fath., M. fne. S., 1885 (12133).
Off Martha's Vineyard, Mass.; between lat. 39° 49′ N. and 40° 03′ N., long. 68° 56′ W. and 71° 43′ W.; 120–321 fath., M. S. Sh., 1880–1885 (19 stations).
South of Long Island, N. Y.; between lat. 38° 53′ 30″ N. and 39° 33′ N., long. 72° 18′ 30″ W. and 72° 52′ W.; 188–452 fath., M. S., 1884, 1885 (7713, 7717, 12294, 12297).
Off Cape Lookout, N. C.; lat. 34° 39′ 15″ N., long. 75° 33′ 30″ W., 107 fath., gy. S. P., 1885 (12946).

150. Schizaster Orbignyanus A. Agassiz.

South of Martha's Vineyard, Mass.; lat. 40° 02′ 54″ N., long. 70° 23′ 40″ W., 115 fath., M. fne. S.; U. S. Fish Comm., sta. 871, 1880 (13312).

PERIASTER D'Orbigny.

151. Periaster limicola A. Agassiz.

Gulf of Mexico; U. S. Fish Comm., 1885:
Lat. 29° 14′ 30″ N., long. 88° 09′ 30″ W., 68 fath., M.; sta. 2378 (10641).
Lat. 28° 38′ 30″ N., long. 85° 52′ 30″ W., 142 fath., M.; sta. 2401 (10642).

MOIRA A. Agassiz.

152. Moira atropos A. Agassiz.

Eastern coast, United States:
North Carolina (1753).
Charleston, South Carolina; William Stimpson (3497).
Pine Key, Florida; Henry Hemphill (6989).
Unknown localities (2515, 2517, 2520, 2521, 6998).

Alphabetical index of the species of Echini enumerated in the preceding list.

Alphabetical index of the species of Echini, &c.—Continued.

NOTES ON SPECIES OF THE AUSTRALIAN GENUS PARDALOTUS.

By LEONHARD STEJNEGER.

In his "Catalogue of the Birds in the British Museum," vol. x (1885), p. 54, Mr. R. Bowdler Sharpe distinguishes three different forms of *Pardaloti* having the "head streaked with white on hinder crown and occiput," as follows:

a'. All the primaries edged with white, forming a large wing-patch; tips of primary-coverts scarlet ..... *ornatus.*

b'. Third and fourth primaries edged with white; tips of primary-coverts scarlet, or orange, or yellow ..... *assimilis.*

c'. Third primary only edged with white; tips of primary-coverts always yellow .... *affinis.*

The first and third of these he treats of as good species, but *assimilis* he regards as "subsp. *α*" of *P. ornatus* (p. 56).

In looking over the collection in the National Museum, I find that it possesses three specimens of true *P. ornatus* TEMM. (or *P. striatus* auctorum plurimorum nec GMEL.); three typical specimens of *P. affinis* GOULD (= *P. striatus* GMEL. nec auct.*); and besides, seven specimens which are identical with *P. affinis*, with the exception that they have the tips of the primary coverts colored *red and not yellow;* that is, they have the outer edge of *only the third primary* white, plus a red wing spot. These I take to be typical *P. assimilis* of RAMSAY, for the reason that this author gives no other character by which to distinguish *assimilis* from *affinis* than the color of the wing spot.† I may also mention that a specimen from New South Wales (U. S. Nat Mus., No. 88285), which the National Museum in 1882 received from the Linnean Society of that province is marked "*Pardalotus assimilis* ♂." The specimens under consideration consequently differ somewhat from Mr. Sharpe's six speci-

* Mr. Sharpe has already pointed out the fact that *P. striatus* GM. is *not ornatus* TEMM., and he has also hinted at the probability of the former being Gould's *affinis*. Latham in his description mentioned the black head with the white stripes, the yellow supraloral spot and the *yellow* tips to the outer wing-coverts, "making an oblique mark near the outer edge of the wing." If, therefore, his bird is a *Pardalotus* at all, its characters fit very well the species in question. Latham does not give any locality, and Gmelin's assertion of its habitat being South America is, therefore, evidently an invention of his.

† His definition is as follows (Proc. Linn. Soc. New South Wales, II, 1878, p. 180, footnote): "Tips of spurious wings *always orange-red* never *yellow* as in *P. affinis.*" Gould also uses the term "spurious wing," both, of course, meaning the *primary-coverts.*

mens which have the "third *and fourth* primaries edged with white." He says: "I find, moreover, that all the birds for which I propose to adopt Ramsay's name of *P. assimilis* have, as a rule, the *third* and *fourth* primaries edged with white, the third for two-thirds of its length, the fourth only near the base, but varying in extent and sometimes extending a good way up the edge of the feather." Except two, none of my specimens show the slightest trace of white on the fourth primary (except at the tip, of course), not even at the extreme base. The only specimens (U. S. Nat. Mus., Nos. 33048 and 99432) showing features similar to those described by Mr. Sharpe have the middle portion of the outer web very narrowly edged with white, while the base is left black; but one of these specimens (No. 99432) also differs in having a similar, though still narrower, white edge to the *second* primary (the first one is narrowly edged in all of them). The tips of the primary coverts in this specimen are orange red (they ranging in the series from scarlet vermillion to orange red) and altogether the birds look to me as only presenting a slight individual variation. The next question arises as to the similarly colored specimens of the British Museum, but I hardly think that they can come under any other category.

Mr. Sharpe furthermore states that his *assimilis* have the primary coverts all the way from pure yellow to crimson. Those with *yellow* tips and white-edged fourth primary I should refer to *affinis* proper, to which they apparently take the same position as does my aberrant specimen to true and typical *assimilis*.

We have, then, two forms, *affinis* and *assimilis*, the only distinguishing character of which is the color of the tips of the primary coverts. But, if we have to take Mr. Sharpe's word for it—and my series seems to corroborate his statement—this color "varies from yellow and orange to scarlet and even crimson." It seems to me unquestionable that we have here proven to us "*intergradation*" between these two forms, and, according to the code of nomenclature of the American Ornithologists' Union, the names of these two forms should therefore stand as *Pardalotus affinis* (or *striatus*) and *Pardalotus affinis* (or *striatus*) *assimilis*.

Toward *P. ornatus*, which has all the primaries (except the second) edged with white, I can see no intergradation, and hence the reference of *assimilis* to this species is quite incomprehensible to me.

If *P. ornatus* must necessarily have a subspecies, such a one may probably be found in *P. melanocephalus*. The only specimen of the latter in the possession of the National Museum (No. 107515) shows considerable tendency towards the former, and may indeed be regarded as somewhat intermediate, for it has two distinct white stripes on the occiput and a few white spots on the black ear-patch. At any rate, *P. melanocephalus* and its yellow-rumped counterpart, *P. xanthopygius*, are very closely allied to *P. ornatus*, and should not be separated in any synopsis by the interposition of *P. punctatus* and its allies. Accord-

ingly I should arrange the species somewhat differently from what Mr. Sharpe has done, and propose the following amended

KEY TO THE SPECIES.

a^1. Cap and back uniform olive, the feathers slightly margined with dusky. *P. quadragintus.*

a^2. Cap and back colored differently, the ground-color of the former being black.

b^1. Cap dotted with white or yellow round spots.

c^1. Forehead concolorous with the rest of the cap; supraloral spot white; under tail-coverts yellow.

d^1. Rump chestnut ..... *P. punctatus.*

d^2. Rump yellow ..... *P. xanthopygius.*

c^2. Forehead pale fawn, differing from the rest of the cap; supraloral spot scarlet; under tail-coverts yellow ..... *P. rubricatus.*

b^2. Cap without rounded spots.

c^1. Third (and often fourth) primaries only edged with white.

d^1. Tips of primary coverts yellow ..... *P. affinis.*

d^2. Tips of primary coverts red ..... *P. affinis assimilis.*

c^2. All the primaries edged with white, forming a large wing-patch.

d^1. Cap streaked with white on occiput, and ear-coverts densely spotted with white ..... *P. ornatus.*

d^2. Cap and ear coverts uniform black.

e^1. Rump dull tawny ..... *P. melanocephalus.*

e^2. Rump bright yellow ..... *P. uropygialis.*

P. quadragintus has been made No. 1, as probably the most generalized form, and next to it is placed *P. punctatus*, which in its young plumage shows considerable general resemblance to the green-headed species, and which also in the white round spots on the smaller wing-coverts shows its near relationship.

The National Museum possesses specimens of the following species:

P. quadragintus, 2 specimens.
P. punctatus, 15 specimens.
P. xanthopygius, 1 specimen.
P. affinis, 3 specimens.
P. affinis assimilis, 7 specimens.
P. ornatus, 3 specimens.
P. melanocephalus, 2 specimens.

Specimens of *P. rubricatus* and *uropygialis* are, therefore, very desirable.

Among the six specimens of *P. assimilis* is the one brought home by Mr. Peale (U. S. Explor. Exped.) and recorded as *P. striatus.*

SMITHSONIAN INSTITUTION, *March* 16, 1886.

SUPPLEMENTARY NOTES ON SOME SPECIES OF MOLLUSKS OF THE BERING SEA AND VICINITY.

By W. H. DALL.

(With two plates.)

In the American Journal of Conchology for 1871 (pp. 93–160, pl. 13–16) the writer described a number of species from Bering Sea and the adjacent Arctic region, a part of which were figured; and from 1871 to 1873 a number of additional species were characterized, and some of them figured, in the Proceedings of the California Academy of Sciences. The working up of the whole northern collections obtained by the writer from 1865 to 1874, with additions made by himself in 1880, and by many others between 1874 and 1886,* has been an immense task, as yet only partially accomplished. Meanwhile the briefly characterized species have been referred to by several authors and not always definitely understood. For this reason it has seemed well to add some additional notes and figures, without waiting for the complete presentation of the final report.

In 1878 a series of the more critical species was taken by me to Europe and compared with typical specimens in the public museums of Bergen, Christiania, Stockholm, Göteborg, Copenhagen, Berlin, and London, together with specimens in the hands of Messrs. Friele, G. O. Sars, von Maltzan, Hanley, Jeffreys, Boog-Watson, Marshall, and other gentlemen interested in the Arctic fauna, to all of whom and to the gentlemen in charge of the official collections in the cities above mentioned, especially Professors Lovén, von Martens, Lütken, E. A. Smith, and Steenstrup, my sincere and hearty thanks are due. Careful notes were made at the time of comparison, so it is evident that these specimens have a peculiarly typical and standard character after having been submitted to such expert criticism. The figures herewith are taken from those specimens; the specimens themselves, with many others, form part of the collection of the U. S. National Museum. The present article may be regarded as a first instalment, related to the two which precede it, but also having probable successors, as time permits the discussion of the material.

Cancellaria (Admete?) middendorffiana Dall.

Admete middendorffiana Dall. Proc. U. S. Nat. Mus., 1884, p. 524, Sept., 1884.

In the above-mentioned proceedings reference was made to a figure of Middendorff (Mal. Ross., ii, pl. ix, figs. 13–14) of a shell from the Arctic part of Bering Sea, which I took to be intended to represent a species

*Including the annual expeditions of the revenue cutters Corwin and Rush, the collections of Messrs. Fisher, of the U. S. Coast Survey; Turner, Stejneger, Murdoch, and others, of the Signal Service; and of Stoney, Nichols, and other naval officers.

obtained in the same region by myself and by the Point Barrow expedition, and which I regard as distinct from *Admete viridula* of authors. My friend, Dr. Krause, in his paper on the mollusks of Bering Sea (Arch. f. Naturg., 1885, p. 273), regards this figure as intended to represent *A. viridula* var. *lævior* Leche. In the light of this criticism, and with the aid of specimens of that variety submitted by Dr. Krause, I have reviewed my material, consisting of some hundreds of specimens of all varieties of the *Admete* from all parts of the coasts of Alaska and Bering Sea, as well as various parts of the Arctic Ocean. I conclude that, whatever Middendorff's figure may be intended to represent, the species I referred to it is distinct from *Admete* and perhaps a typical *Cancellaria*. Its external appearance is certainly very similar to the variety *lævior*, from which, however, it differs in the following particulars: The shell is stout and heavy, not thin, as *Admete* invariably is; the proportions and sculpture in a large series are extremely uniform, while the *Admete* is very variable; the columella has a distinct siphonal fasciole, wanting in *Admete;* the interior of the aperture is periodically thickened and furnished with eighteen or twenty strong liræ which do not reach, but are separated by a smooth space from, the outer lip and have no connection with the external grooved sculpture; the sculpture is stronger and more uniform, the revolving ribs flatter than in *Admete*, and there is an absence of the tendency in the latter to intercalary finer threads. Its claim to specific rank was not disputed by any of the experts to whom it was submitted.

An examination of several hundred Admetes does not show a single specimen with the raised liræ. The *Cancellaria* is a strictly Arctic shell, and has not been found south of the northern end of Nunivak Island by any one, while the *Admete* is common everywhere among the Aleutian Islands, and in all its varieties, *lævior* included.

Cancellaria middendorffiana is of a chalky or porcelanous white, with a pale yellow epidermis. An average specimen has five whorls with a length of shell of 17.5, of aperture of 10.0, and a greatest total breadth of 10.5^{mm}. It has a general resemblance (such as an arctic shell may have to a tropical one) to *C. sinensis*, as figured by Reeve, except that the spiral ridges on the columella, generally two or three, are obscure and not sharp.

In this connection it may be observed that the original type of *Tritonium viridulum*, O. Fabr., as well as the *Defrancia viridula* of Möller, founded on the same specimen, is a *Bela*, like *B. exarata*, and not an *Admete* at all. This has already been mentioned by Mörch, and was confirmed by an examination of the shell at Copenhagen. The earliest identifiable name of the *Admete viridula* of authors is *Cancellaria buccinoides* of Couthouy (Feb., 1838); but there being already a *Cancellaria* of that name, Dr. Jay in 1839 named it *Admete couthouyi*. This specific name was adopted by Gould in 1841 and has several years priority over Möller's *Admete crispa* (1842). In accordance with

the rules of nomenclature we should not return to Couthouy's original specific name, but adopt the specific name which was rightfully in use when the genus *Admete* was erected upon it. Hence the name will be *Admete couthouyi* Jay, sp.

Mangilia levidensis Carpenter.

M. levidensis Cpr. Suppl. Rep., 1863, p. 658.
M. funebrale Dall. Am. Journ. Conch., *l. c.*, p. 100, 1871.

The types of Carpenter's species in the National Museum are so rough, worn, and dilapidated that it was only by the accident of having a badly worn specimen of *funebrale* to identify that I was enabled to discover their identity. A fresh specimen which Dr. Carpenter examined was returned by him to the geological survey of California, to whom it belonged. The name *funebrale* should be cancelled.

Mangilia? aleutica Dall. (Pl. III, fig. 6.)

M. aleutica Dall, *l. c.*, p. 99, 1871.

This form was regarded as nearest to *Bela angulosa* (G. O. Sars, 1878), which differs from it by being shorter and yet having one more whorl. *B. angulosa* is also generally more uniformly and sharply sculptured.

Bela sculpturata Dall. (Pl. IV, fig. 7.)

Shell seven-whorled, turreted, white, with strong waxen yellow epidermis; thin, with strong sculpture; transverse sculpture of, on the last whorl, ten strong squarish ribs and numerous fine and occasionally impressed lines of growth; longitudinal sculpture of a distinct angulation of the whorl, in front of the anal fasciole, which on the transverse ribs develops into stout swellings, which in the earlier whorls are connected by an obscure rib; the whole surface of the whorl is covered with rather wide and shallow grooves and their even wider interspaces; the grooves are closest and finest on the canal and behind the angulation, and faintest or nearly absent on the periphery; anal notch very shallow, fasciole nearly obsolete. Operculum short, triangular, yellowish brown. Greatest length of shell 12.3, of aperture 5.5; greatest width of shell 4.5mm. Habitat: Aleutian region, Chiachi Islands, etc., to the Queen Charlotte Islands and Vancouver district.

This shell can only among European species be compared with Sars's *angulosa*, than which it is more coarsely and rudely sculptured (the figure does not show this feature with sufficient emphasis), the transverse ribs less or not at all flexuous, the longitudinal sculpture less fine and much less uniformly distributed. The Alaskan shell is also somewhat stouter in the same length than the Norwegian one.

Bela alaskensis Dall. (Pl. IV, fig. 3.)

Mangilia? alaskensis Dall, *l. c.*, p. 98, 1871.
Bela alaskensis Krause, Wiegm. Arch., *l. c.*, p. 279, pl. xviii, figs. 5, 17, 1885.

Dr. Krause has figured a particularly smooth and white specimen, but I have found since my original description was published that the

shell varies much in strength of sculpture, and in color from dark red-brown to white. I therefore figure one of the original types to show the range of variation.

I would note that the second part of Vol. VII of the Am. Journal of Conchology, in which my descriptions were published, was issued November 2, 1871, though the fourth part did not appear until 1872; therefore the quotation of the species should take the date of their effective publication and not of the subsequent completion of the volume.

Bela lævigata Dall. (Pl. III, fig. 7).

B. lævigata Dall, *l. c.*, p. 98, pl. 16, fig. 7, 1871.

This species has been identified by Prof. Sars with *B. gigas* Verkruzen (= *arctica* A. Ad. = *simplex* Midd. and perhaps = *Defrancia Beckii* Möller,* from an inspection of his type). Though the conclusions of so eminent a naturalist are not to be treated lightly, I cannot, after study of abundant material, feel entirely satisfied that the Norton Sound shell is the same as the very much larger form to which it has been referred. The specimens were found abundantly, were uniform in size, and present every aspect of adult shells. The length of the type specimen, which agrees with the others, is 7.0^{mm}. The average length of specimens of *B. simplex* or *gigas*, of the same number of whorls, is 9.0^{mm}, and adult specimens are from 18–20.0^{mm} in length. Both forms have a microscopic striation, stronger in the young shells. If the two are identical, *lævigata* is rather a dwarf variety than a merely young stage of the species. Between *B. simplex*, *arctica*, and *gigas*, allowing for the ordinary individual variation, there is no difference whatever, and the impression left on my mind, after examining the type specimen of *B. Beckii* of Möller, was that it was rather an immature specimen of the same species, which I noted at the time. To assist in clearing up the question I give an enlarged figure of the type specimen of *B. lævigata*.

Bela albrechti Krause. (Pl. IV, fig. 1).

B. albrechti Krause, *l. c.*, p. 276, pl. xviii, figs. 3, 11.

I add a figure taken from a fine specimen taken at Port Clarence, Bering Strait, in 1866, having a length of 11.2^{mm}. This is a strictly arctic species. It is quite distinct from any other species. Mine are pure white, with a gray-green thick epidermis.

Bela harpa Dall. (Pl. IV, fig. 2.)

B. harpa Dall. Proc. U. S. Nat. Mus., 1884, p. 523.

I add a figure of this remarkably clearly cut species, taken from the type specimen 17.0 millimeters in length. The longitudinal sculpture, on the whole, is more pervasive than shown in the figure, where only the stronger grooves are represented. The shell has a reddish tinge,

*Mörch (Moll. Grönl., 1875, p. 128) regards this as a variety, *ventricosa* Mörch, of *B. violacea* Mighels. But it seems to me that the *violacea* series is entirely distinct from the *lævigata* series.

with the color fading into white toward the apex. This shell is rare, and also strictly arctic. Professor Sars and Mr. Friele, to whom it was submitted, in 1878, considered it a good species. Its nearest relative would seem to be *B. plicifera* S. Wood, which differs, being larger, with fewer ribs, and without the sharp spiral grooves which are the most salient character of *B. harpa*. It is also differently proportioned, with a relatively longer spire and smaller aperture.

Bela krausei Dall. (Pl. IV, fig. 4.)

I have a third species to add to the group to which the two previously mentioned forms belong, and which is characterized by a fine, sharp, but peculiarly appressed, sculpture. The present shell is the smallest of the three.

Shell small, elongate, ovate, compressed, with about six whorls and a rather large smooth nucleus; tranverse sculpture of, on the last whorl, about twenty-six broad flattened waves, strongly flexed, most elevated over the fasciole, and becoming narrower and less prominent anteriorly; the outer angle of the anal notch is rather prominent and makes an angulation especially of the earlier whorls, which fall away in a peculiarly flattened manner to the suture; longitudinal sculpture of fine sharp grooves, which pass uniformly over the ribs and interspaces, are somewhat stronger on the earlier whorls and very uniform, only a little coarser on the canal. The notch is more marked than usual in *Bela;* the shell is pure white and the epidermis grayish yellow and quite strong; length of shell 9.0, of aperture 4.7, width of shell 3.2^{mm}.

I am pleased to name this species, which has been in my hands some twelve years, under a manuscript name which is now otherwise occupied, to Dr. Arthur Krause, whose excellent work on the Bering Sea mollusca is well known. This species is extremely rare; the specimen figured came from Port Etches, Alaska, where it was dredged on a muddy bottom in fifteen fathoms, in 1874.

Bela solida Dall. (Pl. III, fig. 4).

Shell solid, short, stout, with five strongly sculptured whorls and a small smooth nucleus; color a faint blush of salmon covering the white; epidermis very thin, smooth, and adherent; transverse sculpture of, on the last whorl, thirteen stout, shouldered, prominent, rather sharply rounded ribs, which pass over the periphery and disappear at the anterior third of the whorl; they cross the anal fasciole with but little flexure, but curve forward from the angulation (generally more decidedly than the figure indicates), at which they are somewhat swollen, with about equal interspaces; longitudinal sculpture of numerous equal uniform grooves, with convexly rounded subequal interspaces, faint on the anal fasciole, but covering the rest of the shell with remarkable uniformity, averaging five or six to the space of a millimeter; one or two stronger ones follow the angulation of the whorl, but not prominently; pillar stout, white; anal notch obsolete; operculum short, broad, thin, yellow-

ish. Greatest length of shell 13.0, of aperture 8.0; greatest breadth of shell 7.0mm.

This very characteristic species seems to have no analogue in European seas. It is found abundantly in the western Aleutians, generally in about ten fathoms, and especially on a sandy bottom. It does not go into truly arctic waters and varies less than most of the genus. The type figured came from the harbor of Kyska.

There are a large number of undetermined species of *Bela* from Bering Sea in the collection, some of which will probably prove new, but I have thought best to refer only to those about whose novelty there seemed to be no question. The group is one of the most difficult to determine on account of the variability of some of the species, many of which have also well-defined large and small races, otherwise similar in all respects.

Sipho martensi Krause.

S. martensi Krause, l. c., p. 287, pl. xviii, fig. 18, 1885. Dall, l. c., p. 525, 1884.
Fusus (Euthria) conulus Aurivillius, Vega Exp. vet. arb., iv, p. 354, pl. 13, fig. 6, 1885.

This fine species has received two names, almost simultaneously. I am not aware which has precedence, but the species was referred to, under the name of *martensi*, by me before either description was published, as above mentioned. It seems to be a strictly Arctic species, and was obtained by the Vega off Cape Shelagskoi in twelve fathoms, and southwest of St. Lawrence Island, in Bering Sea, in fifty-five fathoms. I obtained it in the Arctic Ocean, north of Bering Strait, in twenty fathoms, mud, in 1880. Notwithstanding the shape of the shell I doubt its being a typical *Euthria*, none of which are known from northern seas.

Trophon muriciformis Dall. (Pl. IV, fig. 6.)

Trophon Dalli Kobelt, Mon. *Trophon*, Mart. & Chemn. Neueste ausg., q. v.

This fine shell has been renamed by my friend Dr. Kobelt on account of the existence of a shell, which he refers to *Trophon*, but which American conchologists refer to Stimpson's genus *Eupleura*, namely, the *Buccinum muriciforme* of King and Broderip (Zool. Journ., v, p. 348). The *T. muriciformis* has not been well figured, the only specimen I had to spare Dr. Kobelt being worn and discolored by a growth of *Halisarca*, while that figured by Aurivillius is evidently somewhat worn.

In the colored copies of Tryon's Manual I find it figured of a dull green, perhaps copied from Kobelt's figure, but when in good condition the shell itself is of a creamy translucent white, with a chalky superficial stratum. In some specimens the triangular spines are continuous, with hardly raised lamellæ; but in the original type the lamellæ are hardly visible, and the spines, showing somewhat translucent, project from the opaque white surface as if they had been stuck on artificially. It is a native of the Arctic coast of Alaska, and very rare. The Vega

dredged two somewhat worn specimens in Bering Sea, southwest from St. Lawrence Island, in fifty-five fathoms.

A similarly coronated species, but of very much smaller size, is in the British Museum from New Zealand, acquired with the Cumingian Collection, and was the type of *Trophon coronatus* Adams (P. Z. S., 1862, p. 429). Similar specimens were obtained by the Challenger in those seas in very deep water. In the British Museum I found a specimen labelled *Trophon goodridgii* Forbes, 1852, from the Herald voyage, which appears to be identical with an adolescent stage of *T. muriciformis*. It would seem, however, that this name was never published, and I have not found any reference to it in any publication I have been able to consult. From a remark of Forbes in the Annals and Magazine of Natural History, 1852 (vol. x, pp. 305–6), it is probable that this specimen came from Cape Kruzenstern, Kotzebue Sound.

The death of Forbes occurred in 1854, when only the vertebrates of the zoology of the Herald voyage, which he edited, together with two short papers in the Proceedings of the Zoological Society, with preliminary descriptions of a few mollusks, had been published. This probably accounts for the absence of the report on the invertebrates which he was so well qualified to prepare.

In this connection it may be noted that *Trophon stuarti* Smith (P. Z. S., 1880, pl. xlviii, fig. 6, p. 481), from Vancouver Island, is a fine pale specimen of the Alaskan and Oregonian *T. orpheus* Gould, and the *T. maltzani* of Kobelt seems very likely to prove one of the numerous varieties of *T. tenuisculptus* Cpr., itself close to *craticulatus* Fabr.

Genus STROMBELLA Gray.

It is generally acknowledged that, as between a generic name properly characterized and one which is a mere naked interjection into literature, that which is characterized should stand, and especially when it is anterior in date, though it has the right to stand apart from the question of date. Of course a naturalist having the benefit of science at heart would not intentionally duplicate names, but would adopt and characterize the one already given if determinable. But most naturalists are content to go by habit or custom, and in doubtful points accept without verification very doubtful or inadequate determinations. In the case of the present genus such an instance exists. There is, in a catalogue by Schleuter, the name *Strombella* without any means of identification whatever, and were it correctly identified with a type which has been assigned to it, it would still be a synonym. For us, therefore, the name *Strombella* Schleuter is an echo of vacancy, a nothing. Gray characterized briefly, but sufficiently, his genus *Strombella* at a later day, and shortly after this Mörch injected a "catalogue name," *Volutopsius*, into his list of Greenland mollusca, which was only characterized by him much later, and amended to *Volutopsis* by

others. Yet this name has attained general currency, because (probably) of an attempt of the brothers Adams in their "Genera" to treat *Strombella* Schleuter as having entered into nomenclature.

In the Annales de la Société malacologique de Belgique (iv, 1869, p. 20) Mörch cites "*Fusus* (*Pyrolofusus* Beck) *deformis*" from Spitzbergen. But Beck's name does not appear in any publication previously, and is not defined or characterized here or elsewhere by himself or by Mörch. In April, 1873, the writer characterized the subgeneric group, which includes *Neptunea harpa* Mörch and *Fusus deforme* Gray, under the name of *Heliotropis*, with the first-mentioned species as type. If he had known of Mörch's citation of Beck's manuscript name, he would have adopted it, not because it had any right to stand, but to save a synonym.

Against this case is a similar one, which should meet with the same treatment whatever may be the decision. In 1879 there were distributed to all persons known to be interested in northern mollusks a set of plates belonging to my report (unavoidably delayed in MSS.) on the *Buccinidæ* of the Alaskan fauna, some fifty copies in all, properly lettered with the names of the species by the engraver. I had found on dissection that the rhachidian tooth of the radula in *Chrysodomus crebricostatus* Dall (1877) was smooth and flat (as in *Liomesus*), and intercalated in the legend of the plate the subgeneric name *Beringius* for this species, in recognition of this feature, which was fully characterized and figured in my manuscript. Subsequently my friend, Mr. Friele, in his researches on the mollusca of the Norwegian North Atlantic Expedition, discovered the same peculiarity in *Fusus turtoni*, which he accordingly separated under the name of *Jumala*.

Now, I am far from claiming that if the other characters coincide *Beringius* should take precedence of *Jumala;* on the contrary, I believe it should not, and that Mr. Friele's name should stand; but it would seem as if one rule should apply to all cases of the kind, and that the unrecognizable names of Schleuter and the undefined catalogue entries of later writers, such as *Pyrolofusus* and *Volutopsius*, should not be quoted to the discomfiture of more conscientious or more thorough workers, or gain, by their mere existence, any standing in nomenclature.

Cerithiopsis (stejnegeri, var. ?) truncatum, n. s. (Pl. IV, fig. 5).

Among the small shells inhabiting the canals of *Cliona* and other "bread-sponges," and not found elsewhere, was detected at Unalashka a small *Cerithiopsis* very similar in sculpture to *C. stejnegeri*, but distinguished by a remarkable peculiarity not noticed in any other species of the genus known to me. The nuclear whorls, amounting to one and a half, were of a (for the species) very large size and of a soft, almost fleshy, consistency; in drying, this broke up spontaneously and disappeared. The first shelly whorl is about the size of the fourth whorl in

C. stejnegeri, and from this point the shell is subcylindrical, strongly decussately sculptured, with the same number of revolving and transverse threads as in *C. stejnegeri;* but the sculpture is less flattened and at the intersections forms a node; the base is faintly or not at all sculptured; the specimens, none of which seemed quite mature, had about four whorls after the truncation; the color, a pinkish, very light brown, differs from that of *C. stejnegeri*, which is deep wine color, and has a glassy gloss, while *C. truncatum* is dull-surfaced. I have had a doubt as to whether the peculiarity might not be pathological, but the number of similar specimens observed seems too great. Lon. of shell, 3.3; lat., 2.0mm. Habitat, Unalashka and Chica Islands, in sponges at low-water mark, 1874.

The *C. stejnegeri* has been collected from the Shumagins to Bering Island. The only other species of the group yet found in Alaska, so far as I know, are dead specimens of a large form resembling *C. emersonii* or *tuberculata*, which have been found very rarely at Sitka, and once at Unalashka, from low-water mark to 12 fathoms.

Velutina conica, n. s. (Pl. III, fig. 10).

Shell solid, strong, white, with an imperceptible or extremely thin epidermis; finely striate in each direction, four-whorled, the last much the largest; suture narrow, but channeled; aperture oblique; axis within the columella not pervious to the eye; columella narrow, strong, with a light wash of callus, and no umbilical chink; alt. of shell, 10.0; of aperture (parallel to the axis), 7.5; max. lat. of shell, 7.6mm.

Found at Unalashka, Kadiak, and other places in the Aleutian region; not uncommon at depths of 5–15 fathoms. Specimen figured, from Unalashka.

This species differs from its relatives in the same region by its want of a perceptible epidermis, its solidity, its conical shape, in wholly containing the soft parts without any exceptional contraction by the animal, and in its narrow columella. There is no closely analogous European species, nor is this one yet reported from the Oregonian region. The fine wavy longitudinal striæ are not perceptible without a glass; to the eye, except for lines of growth, it appears smooth.

Family RISSOIDÆ.

This group is very sparsely represented in these seas—a fact which may be contrasted with the abundance of individuals and even of species on either side of the North Atlantic in the same latitude. The only form which was found anywhere abundantly was the *Cingula robusta*, and even in that case the abundance was but relative. A résumé of the principal forms collected, with figures, may be of use. Several of them appear closely related or identical with forms of north European waters.

Cingula robusta Dall.

C. robusta (Dall MS.) Krause, *l. c.*, p. 270, t. xvii, fig. 1, *a-b*.

This species has been well figured by Dr. Krause, who kindly adopted the manuscript name under which I have sent out numerous specimens during the twelve years it has been in my collection. Since his paper was received I have been informed that the name *robusta* has been used for another species of the same group. Not having the means of verifying this statement at the present moment, I propose to figure the two extreme forms under which I have found this species at Kyska Harbor, Aleutian Islands, and to apply varietal names to them; the name referring to the stout variety to be adopted for the species in case it be found necessary to drop the name of *robusta*.

Cingula robusta var. **martyni** Dall (Pl. III, fig. 9).

This is the most common and apparently the normal form, collected by me in the Aleutians and by Krause at Plover Bay, Eastern Siberia. The specimen figured is 5.0^{mm} long. It is dedicated to the naturalist Martyn, whose beautiful figures in the Universal Conchologist gave the first adequate representation of some of our best known species from Northwest America.

Cingula robusta var. **scipio** Dall (Pl. IV, fig. 10).

This form is much rarer than the preceding, about 1 per cent. of those collected being of this sort, but with a certain number of intermediate grades. Should the differences be sexual, as in some *Hydrobiinæ*, these slender ones would be males. There seems to be no other difference than that of form, faint revolving lines being occasionally present in both; both are of the same reddish grape-color with whitish bloom, and whitish border to the aperture. The figures are on the same scale and show the proper relative proportions.

Onoba saxatilis Möller (Pl. III, fig. 8).

Rissoa (*Paludinella*) *saxatilis* Möller, Ind., p. 9, 1842. (f. Friele.)
Rissoa arctica Loven (f. G. O. Sars, Friele).
? *Cingula leptalea* Verrill, Tr. Conn. Acad. VI, p. 182, pl. 32, fig. 10, 1884.

The specimens identified by both Sars and Friele with *saxatilis* of Möller have from four to five whorls and vary between 2.25 to 2.75^{mm} in total length. The Alaskan specimen above figured is full-sized, being 2.75^{mm} in length. The fine spiral sculpture is only feebly developed, and varies with different specimens of *saxatilis*. The outline, &c., agreeing so closely with Professor Verrill's figure, and the other characters being very much the same, I cannot help suspecting that his *leptalea* may prove to be only a finely developed *saxatilis*. The identification of the Norwegian form with *C. aculeus* Gould and both with *R. saxatilis* or *arctica*, as made by Prof. G. O. Sars, seems more than doubtful and requires confirmation, though both may be found on the Norwegian coast. The New England *aculeus* is certainly not the same as the arctic specimens from

Alaska or Greenland, which are not over one-half the size of *aculeus*, which is about 4.00 to 4.25^{mm} long. It is much nearer to *R. proxima* than to *R. striata;* indeed, it does not seem from my specimens especially close to *O. striata* as has been claimed.

The species is extremely rare in the Aleutian Islands, where a few specimens were obtained at Nazan Bay, Atka Island, from the ripple-marks on the sandy beaches.

Onoba cerinella Dall (Pl. IV, fig. 12).

This species is quite close in form to *O. proxima* Alder, as figured by Jeffreys and G. O. Sars. It differs from that species in the total absence of spiral striation, in having a less truncated apex and one less whorl in the same length, 3.0^{mm}. There is a slight chink behind the reflexed inner lip, the surface is smooth but not polished, the sutures distinct but not deep. A few specimens collected at Atka Island with the last specimens were regarded as distinct from *O. proxima* and other related European forms by those who examined them, in 1874.

Onoba aleutica Dall (Pl. III, fig. 11).

Shell resembling *C. minuta* Totten, but more slender and smaller; less slender and drawn out than *O. aculeus* Gould, and having no spiral lines like the latter; color light warm brown; surface smooth, with faint growth lines, no spiral sculpture; loosely coiled; the aperture simple, peritreme continuous, slightly reflexed, its edge black, inside whitish, hardly touching the body whorl and with a chink, or umbilical space extending far behind it, but not into the axis. Shell often eroded in spots, thin, with distinct sutures and neatly rounded whorls. Extreme length of specimen figured 3.5^{mm}. Very rare in ulvæ at Unalashka, Aleutian Islands, 1874.

Alvanea castanea Möller, var. **alaskana** Dall (Pl. IV, fig. 9).

? *Rissoa castanea* Möller, Index, p. 9, 1842. Sars, Moll. Reg. arct. Norv., p. 174, pl. 10, figs. 1*a–b*.

A shell found at Nunivak Island in 1874, and figured above, was referred to Möller's species by both Friele and Professor Sars. It differs from the typical form in having the same number of whorls in five-eighths the length of the former, in the greater prominence of the wrinkles extending forward from the sutures, and in being much thinner than the *castanea* generally is. I am informed that the *castanea* is a very variable form, and notwithstanding the typical *castanea* has not yet been found in Alaska, I prefer until the receipt of more information to refer this shell to it as a variety. The specimen figured is 2.5^{mm}, in length, and of a pink color, fading into white toward the apex, with traces of a pale thin smooth yellowish epidermis.

Alvania castanella Dall. (Pl. III, fig. 5.)

The verdict on this species, after comparison with all those of North Europe and Greenland, was that it was nearest to but distinct from

castanea. It has about five whorls, spirally sculptured; the nucleus smooth and white, the rest waxen, with a pinkish or brownish flush; the surface when denuded of the thin epidermis appears vitreous. The sculpture is not of flattened threads, as in *castanea*, but of up to as many as twelve sharp ridges, separated by shallow channels or grooves, excavated as if made with a carpenter's gouge; there are sometimes as few as six or seven ridges on the body whorl, the others becoming obsolete. The peritreme is continuous, slightly thickened, with a chink in the umbilical region; the total length of the specimen figured is 2.7mm. There is no transverse sculpture, except the faint markings due to lines of growth. The spiral sculpture grows stronger toward the shoulder of the whorl, as is generally the case, and this tends to give the shell a slightly turreted aspect.

Alvania aurivillii Dall. (Pl. IV, fig. 8.)

Shell waxen or yellowish, with five and a half or six whorls; nucleus, two whorls, white smooth and polished; remainder strongly sculptured with (on the last whorl) about eight strong revolving ridges, narrow but flat-topped, except in the very young shell, where they are sometimes almost sharp-edged; the anterior and posterior threads are generally the faintest, the others, except in the completely adult, angulate the outer lip at their intersection with it; the one just in front of the suture is sometimes a little nodulous in the early whorls. In the adult the peritreme is simple, continuous, and slightly thickened; there is a distinct though very small umbilicus; the total length of the specimen figured is 4.3mm.

I have dedicated this species, the finest of the group in Alaska, to Mr. Carl Aurivillius, whose work on the gastropods of the Vega expedition has recently appeared. Its distinctness from other described northern species has been admitted by all those who have examined it. It seems to have no analogue in European or East American waters.

The *A. aurivillii* inhabits the Western Aleutians, where it seems rare. A few specimens were obtained at Adakh Island and one at Constantine Harbor, Amchitka Island, 1874. They were dredged in shoal water near low-water mark.

Macoma edentula Brod. and Sby. var. **middendorffii** Dall. (Pl. IV, fig. 11.)

M. var. middendorffii Dall, *l. c.*, p. 347, 1884.

Since calling attention to the probable varietal distinctness of this singular form, I have made a more thorough examination of all the available material, leaving no doubt in my mind of its distinctness from the common *T. calcarea* Chemn. or *lata* Midd., a short broad form of which was described by Broderip and Sowerby as *T. edentula* and well figured in the zoology of the voyage of the Blossom (plate 41, fig. 5, and plate 44, fig. 7). *T. calcarea* is found all over the Alaskan region, and its variety *edentula* differs from the *middendorffii* in being of a dull calcareous or earthy gray or brown with a dark, fugacious epidermis, instead

of porcelanous white and almost polished, with no visible epidermis as in fresh and living specimens of the latter shell; the variety *middendorffii* is shorter and higher and somewhat more inflated. In the alcoholic specimens the siphons of *middendorffii* are much longer than those of the ordinary form. The inner margin of the pallial sinus in the right valve is, in the specimen figured, nine millimeters distant from the anterior adductor scar; in the left valve they are only one and a half millimeters apart. This specimen is 40.0^{mm} high, 45.0^{mm} long, and 20.0^{mm} in greatest diameter. The figure is somewhat less than natural size. This variety is rare and probably a race due to some peculiar environmental conditions, such as, perhaps, a habitation in pure, clean, fine sand or other circumstance peculiarly favorable to fine growth, compactness of form, and hardness of shell. I have had it only from the southern part of Bering Sea, St. Paul Island, Bering Island, Hagmeister Island, and Nunivak Island, all localities where deep water and a clean sandy bottom are the rule. It may be that in muddier localities it develops into the *calcarea* or *lata*.

WASHINGTON, *February* 4, 1886.

DESCRIPTIONS OF PARASITIC COPEPODA BELONGING TO THE GENERA PANDARUS AND CHONDRACANTHUS (WITH SEVEN PLATES).

By RICHARD RATHBUN.

Genus PANDARUS Leach.

Pandarus sinuatus Say, Journ. Phila. Acad., i, pp. 436–437, 1817.
Pandarus, sp., Smith, Rept. U. S. Comm. Fish and Fisheries, part 1, p. 576 (282), pl. vii, fig. 31, 1873 (1874).

(Plate V, fig. 2; plate VI, figs. 1–8; plate VII, figs. 1–8.)

In 1817, Say described, under the above name, a species of parasitic copepod, which he stated to be of common occurrence on the dog-fish, *Squalis canis ?* Mitchell. His description, though brief and unsatisfactory, evidently applies to a species of *Pandarus* which has frequently been taken from specimens of the dog-fish (*Mustelus canis*), sand-shark (*Carcharias americanus*), and Atwood's shark (*Carcharodon Atwoodi*), collected in the vicinity of Wood's Holl, Mass., by the U. S. Fish Commission. The specimens from these several species of sharks differ slightly from one another in certain minor details, but they all undoubtedly belong to a single species. A specimen from Atwood's shark has been figured in general outline by Prof. S. I. Smith (*loc. cit.*).

Following is Say's description:

"*P. sinuatus.* Body dilated, thorax emarginate before, abdomen sinuate behind.

"Inhabits dog fish (*Squalis canis ?* Mitchell). Cabinet of the Academy [of Philadelphia]. Length, one-fifth of an inch.

"Body longitudinally oblong quadrate; thorax transverse quadrate, somewhat narrowed before, emarginate between the antennæ, middle of the base rectilinear and fuscous, angles projected backwards and rounded at tips; antennæ very short; anterior feet formed for suction, at tip oval or subreniform, and placed obliquely; scales, four subequal ones in a transverse line at the base of the abdomen, each transverse and rounded at tip, and two larger ones originating beneath the preceding, slightly dentate at tip, and not concealing half of the abdomen; abdomen quadrate, as wide as the thorax but rather longer, posterior edge with a central sinus and lateral one each side, posterior angles acute; oviducts filiform.

"Very commonly occur on this species of Squalis, attaching themselves more particularly about the bases of the fins. They are by no means so active as the *Caligus piscinus*, which also occurs in plenty, on the codfish of our coast."

The following description is drawn up mainly from specimens obtained from the sand-shark, but the principal differences exhibited by specimens from the dog-fish and Atwood's shark are also noted.

This species is rather below the average size for the genus, and in shape and general appearance more closely resembles *Pandarus bicolor*, of Europe, than any other described species. It may readily be distinguished from *P. bicolor*, however, by its smaller size, narrower frontal plates, the much smaller dorsal lobe of the third cephalo-thoracic segment, and the smaller terminal caudal plate. The swimming feet, and especially those of the fourth pair, also present considerable differences.

In dorsal view, the body is elongate-oval in outline, with the length equal to about twice the greatest width, which is near the hinder end of the anterior segment, or across the dorsal appendages of the second segment. The anterior segment is moderately convex, quite regularly semi-elliptical in outline, and about three-sevenths as long as the entire body; length to width about as 3 to 4, or 5 to 6; anterior margin regularly rounded; postero-lateral angles more or less acute or slightly rounded, moderately produced and frequently directed slightly inward. The posterior margin, when perfect, bears three or four short, broad, and sharply pointed teeth-like projections on each side of, and near to, a rounded median one. More often all the projections are blunt and rounded, and frequently the margin is more or less irregular and jagged, with a slight irregular notch near the middle, and has but few small, ill-defined teeth, which are seldom regularly placed, there being often but one or two on each side of the center. The frontal shields are of medium width, with the anterior margin generally but slightly curved along the middle, and the median notch of moderate size. They broaden gradually to the point where they become free, beyond which they retain a nearly uniform width, the outer extremities being more or less regularly rounded. Sometimes they are broader and more curved on the outer side, but in no case do they attain so great a width as in *Pandarus bicolor*.

The lateral dorsal lobes of the second segment are oval in dorsal view, and placed somewhat obliquely. The inner posterior margin generally presents an outward curve, but is sometimes nearly straight or slightly concave; the posterior extremity is well rounded. These lobes are rather widely separated and overlap the appendage of the succeeding segment but slightly, though projecting a short distance back of it, and reaching about half way from the posterior margin of the first segment to the posterior margin of the fourth segment.

Dorsal appendage of the third segment comparatively small, about twice as wide as long, and with a deep sinus in the middle, which reaches about one-half its length, and partly separates it into two equal and very regular lobes. At the margin the sinus opens broadly with concave sides, but farther in its edges approach more or less closely together, and are nearly parallel. In advance of the sinus there is a circular translucent area, which, under a low-power lens, appears to be an extension of it, and to greatly increase its length and width as shown on plate VI, fig. 1.

Dorsal appendage of the fourth segment very large in proportion to the preceding, and equalling or slightly exceeding the fifth segment in width. It is broadly emarginate posteriorly, or with a short, wide sinus, which partly divides it into two well-rounded lobes. The exposed portion of the fifth segment is between one-fourth and one-third the length of the entire body, and about one-third broader than long; its greatest width is just back of the appendage of the preceding segment, which is but slightly, if any, wider. It narrows gradually backward, the posterior extremities on each side being rather broad and rounded, or in some cases obtusely subangular. The posterior median sinus is large, and regularly rounded at the inner end.

The caudal plate is small, its free margin forming an arc, equal to about four-fifths the circumference of a comparatively perfect circle, and from one-half to two-thirds its entire length projects back of the posterior lateral extremities of the fifth segment. The caudal stylets are of medium size, and very thick vertically, being thickest toward the outer margin; they narrow gradually, the outer margin being nearly straight and the inner margin slightly curved, or more or less irregular. The width of the stylets near the tip varies somewhat in different specimens; in some cases the stylets taper regularly to a sharp point; in others, the width near the tip is fully half the width at the inner end. They terminate in three stout, pointed spines, arranged vertically and serially, as shown on pl. VI, fig. 2, the lower spine being also the outermost. A smaller spine projects backward from the lower inner margin, about one-third or two-fifths the length of the stylet from the tip, and slightly in advance of this spine there is usually a single small seta. The antero-lateral angles of the stylets are obtuse, and not produced as in most species. In alcoholic preparations, two-thirds or more in length of the stylets are visible from above. The ovigerous tubes are nearly twice the length of the entire body.

Specimens from the dog-fish and Atwood's shark do not differ much from those above described in the characters of the dorsal surface. The frontal plates are often broader, with a more strongly curved outer margin, in specimens from the dog-fish, while in those from Atwood's shark they are, if anything, a trifle narrower. The posterior margin of the first segment is generally more regular and the spines more constant. In the specimens from Atwood's shark the lobes of the second segment are proportionally longer, and that of the third segment is shorter, with a broader median sinus.

Few of the appendages of the ventral surface present features that are distinctively characteristic of the species, and as they are all figured on plates VI and VII, but brief mention will be made of them.

The so-called "sucking disks" of the two anterior pairs, at the bases of the two pairs of antennæ, are rather large, placed near together and in parallel positions; the inner ones are somewhat smaller than the outer, the former being oval, the latter more elliptical, in outline. The

inner joint of the anterior antennæ is nearly three times as long as broad, broadest near the outer end, and strongly and regularly curved from the outer edge of the anterior emargination to the postero-lateral angle, this entire curved margin bearing numerous long and rather stout papillæ. The outer joint is a little more than one-third the length of the basal, and about twice as long as broad, its distal end with a cluster of small setæ; two similar setæ project from the posterior margin near the outer end. The terminal joint of the second antennæ bears two small, slender spines on the basal portion, the distal portion being stout and slightly curved.

The swimming feet of the first pair vary somewhat in shape in different specimens, but the long flexible spines are the same in number and similarly placed in all the specimens that have been examined. In the specimen represented on plate VII, fig. 1, there is on the middle portion of the outer side of the outer ramus a prominent raised area projecting laterally, and with convex surface, not existing in the other specimen figured (fig. 2). The same character occurs, however, on specimens from all three species of sharks. The two rami of the second pair of feet are of subequal length, the outer being slightly shorter than the inner. The terminal joint of the outer ramus is about two-thirds as long as that of the inner, quite regularly oval in outline and with nine marginal spines, arranged mainly along the end and the inner margin, the four outermost being much the largest. The terminal joint of the inner ramus is about twice as long as broad, and broadens gradually from the base to near the end; it bears five slender spines on the inner margin at the tip, and immediately in advance of them, on the inner margin, there is occasionally an additional minute spine. The four outermost spines are subequal in size and curve outwards; the fifth is smaller and curves inward.

Of the third pair of feet, both rami are about equal in length, the terminal joint of the outer ramus being but slightly shorter than that of the inner. The spines of the terminal joint of the outer ramus, in specimens from the sand-shark, are eight in number and vary somewhat in size, as shown in the drawing, and all but one curve outward; on the corresponding joint of the inner ramus, the two outermost spines only curve in the same way. In specimens from the dog-fish and Atwood's shark, both rami are somewhat smaller than in those from the sand-shark, and the innermost terminal spine of the inner ramus is wanting, leaving only the two curved spines; on the terminal joint of the outer ramus, the innermost spine is lacking in the dog-fish specimens and occasionally in those from the sand-shark, and this and the next succeeding one are not found in the specimens from Atwood's shark. Inside of the rami there is a large, well-rounded, lobe-like extension of the basal joint, which is often much larger than represented in the figure.

The fourth pair of feet vary considerably in size and shape, but are

essentially alike in all the specimens examined. Four figures are given, two from sand-shark specimens, and one each from the dog-fish and Atwood's shark; these serve to represent the principal differences observed. The basal joint is very large, with a notch of variable size on the outer margin. The rami are larger in the sand-shark specimens than in those from the other species, and there is considerable variation in their outline; the outer ramus has four spines at the outer end, with sometimes a smaller one on the outer margin, slightly in advance of the latter; a small curved spine also projects from the same margin near the middle. The inner ramus is without spines. In *Pandarus bicolor*, the fourth pair of feet are quite unlike those of this species, the rami being much longer, more slender, and of an entirely different shape.

The ventral caudal plate is shorter than the dorsal, and slightly concave along the middle of the posterior margin.

There is considerable variation in the color of this species. In alcoholic specimens the prevailing color of the dorsal surface of the first four segments is a dull yellow, or yellowish white; the fifth segment is sometimes of the same color, but generally darker, and with a grayish or brownish tinge; the caudal plate is nearly white, or slightly yellowish. In most specimens there are two bright-brown or brownish-black spots close to the front margin, one on each side. These often extend backward a variable distance, and sometimes unite in front to form a horseshoe-shaped figure, which may cover a greater or less extent of surface. The dorsal lobe of the fourth segment is generally marked with the same color, which may form a central dot, nearer the posterior than the anterior margin, or a broad blotch covering the greater part of the lobe. Specimens from the dog-fish are usually darker than those from the sand-shark or Atwood's shark, and the brown or blackish marking often covers most of the first segment, leaving only an elongate median light space of variable width. The same markings frequently extend to the lobes of the second and third segments, and that of the fourth segment is generally entirely dark.

The length of the body, exclusive of the ovigerous tubes, is between 7^{mm} and 8^{mm}, nearly all the specimens collected coming within those dimensions. The drawings of appendages representing this species on plates VI and VII have been made from alcoholic preparations, mostly treated with a dilute solution of caustic potash, and examined under very slight pressure.

This species is found attached to the surface of the body and to the fins. It has been most commonly taken from the sand shark, which is abundant in Vineyard Sound, Massachusetts, but is frequently found on the dog-fish in the same region. It has been collected only once from Atwood's shark, but this species of shark has not been observed since 1875. The specimens recorded in the following list were all obtained by the U. S. Fish Commission.

RECORD OF SPECIMENS EXAMINED.

From the Sand-shark, *Carcharias americanus*:

Vineyard Sound, Mass., 1875, 10 specimens, ♀ (6202, 6208*); 1880, 30 ♀ (6021); 1882, 14 ♀ (6028, 6030); 1883, 25 ♀ (6034, 6041); 1884, 10 ♀ (8121); 1885, 20 ♀ (10744).

From Atwood's Shark, *Carcharodon Atwoodi*:

Vineyard Sound, Mass., 1871, 25 ♀ (6172).

From the Dog-Fish, *Mustelus canis*:

Vineyard Sound, Mass., 1875, 14 ♀ (6199, 6203); 1883, 7 ♀ (6046); 1884, 3 ♀ (8124, 8126); 1885, 3 ♀ (10745).
Long Island Sound, off Noank, Conn., 1874, 1 ♀ (6207).

Pandarus Smithii, sp. nov.

(Plate V, fig. 3; plate VII, fig. 9.)

This is a large species, differing considerably from both *P. Cranchii* and *P. sinuatus*, though resembling the former more closely than the latter in general appearance. From *P. Cranchii* it may be readily distinguished by the shape of the frontal plates and of the anterior body segment. The median dorsal portion of the second segment, between the lateral lobes, is extended some distance backward, in the shape of a transverse, chitinous plate, and the appendage of the third segment is divided into two separate lobes. The fourth segment is exceedingly large, while comparatively little of the fifth segment is visible from above. In the characters of the second and third segments this species bears some resemblance to *P. lugubris* Heller,† but otherwise the two are very unlike.

Frontal plates broad, with the anterior margins strongly and regularly curved, increasing rapidly in width from the median line of the body to the point where they become free; posterior free margin entirely adjacent to the margin of the first segment; outer extremities broadly and regularly rounded. In alcoholic specimens but a very small portion of the basal joint of the first antennæ is usually exposed in dorsal view.

First body segment large, slightly broader than long; front margin well rounded; lateral margins convex, diverging somewhat rapidly for about three-fourths the length of the segment, thence bending inward toward the postero-lateral angles, which are rounded, and extend a moderate distance back of the median portion of the posterior margin; posterior margin with four sharply-pointed, spine-like teeth on each side of a median one, which is shorter than those adjoining it. Lateral

* The numbers inclosed in parentheses refer to the Crustacean record-books of the U. S. National Museum, in which the specimens are catalogued.

† Reise der Œsterr. Fregatte Novara; Zool. Theil, Band II, p. 205, pl. XX, figs. 1, 2, 1868.

dorsal lobes of the second segment elongate-oval, about twice as long as broad; median portion with a transverse, subtriangular, lobed plate, as shown in the figure. Dorsal appendage of the third segment divided into two small, equal, and regularly curved lobes, the margins of which meet, but do not coalesce, at the posterior extremity of the preceding segment. Dorsal appendage of the fourth segment very large and concealing the greater part of the fifth segment; width slightly greater than twice the length; median sinus subtriangular in outline, the lateral lobes formed by it semicircular in outline. Fifth segment very short, as seen from above, and much narrower than the preceding segment; sides strongly and regularly curved, and terminating posteriorly in a small but prominent knob on each side of the median sinus, which is broad, rounded, and of moderate depth.

Caudal plate rather large, subcircular in outline, narrowing abruptly anteriorly, about two-thirds in length projecting back of the fifth segment. Caudal stylets mostly uncovered from above, moderately long and narrow, thick vertically, and terminating in three spines arranged vertically and serially, as in *P. sinuatus*. A wing-like projection extends inward from the anterior half of each stylet, and overlaps the ventral caudal plate on the lower side.

The sucking disks of the two anterior pairs, on the ventral side of the first segment, are of about the same width and parallel; outer ones elongate-suboval in outline, inner about half as long as the outer, and cut off squarely at the front end. Rami of the posterior pair of feet much longer and more slender than in *P. Cranchii*, and also somewhat more elongate than in even extreme cases of *P. sinuatus;* outer ramus with five terminal spines and one median spine on the outer margin, situated in the middle of a rounded notch.

The dorsal surface of the body is smooth and almost entirely of a rich brownish black, the margins of the segments and the frontal plates being lighter and of an amber or horn color. On the anterior portion of the first segment there is also a transverse curved area of the same light color. The fifth segment is blackish about the posterior knobs and lighter anteriorly; the caudal plate is a deep rich brown, almost black.

The above description is made up from two specimens taken from a dusky shark, *Carcharinus obscurus* (Lesueur) Jor. & Gilb., caught off Noank, Conn., in 1874, by the U. S. Fish Commission (6198), and the drawings are from one of the same. The same species has also been found on a specimen of sand-shark, *Odontaspis littoralis* (Mitch.) Jor. & Gilb., taken in Vineyard Sound, Mass., by the Fish Commission, in 1880 (6022), and on an undetermined species of shark from about the same region (8119). There is only a single specimen in the lot numbered 8119. It measures 8^{mm} in length, and differs but slightly from the types described above. The terminal knobs of the fifth segment are each armed with a minute spine; the caudal plate is more elongate, being oval in outline; and the shaft of the caudal stylets is relatively broader,

with the three terminal spines arranged in an oblique series, trending inward from the tip.

There are four specimens from the sand-shark, and they resemble No. 8119 more than they do the types, though differing somewhat from the former. They are lighter in color, and the transverse light area on the front part of the first segment is larger and less well-defined; the five median spines of the posterior margin of the same segment are carried on a slight backward projection of the margin, and the two additional spines on each side are very small. The dorsal lobes of the third segment are widely separated throughout, and the appendage of the fourth segment is smaller than in the types, leaving much more of the fifth segment exposed above. The caudal plate and stylets are similar to those of 8119; the ovigerous tubes are slightly longer than the body. The largest of the specimens measures 9^{mm} in length of body, and the others are not much smaller.

Pandarus Cranchii Leach.

(Plate V, fig. 1.)

A number of specimens of this species were obtained from a large, undetermined species of shark, taken by the U. S. Fish Commission steamer Albatross off the Capes of Virginia, at station 2422, lat. 37° 08′ 30″ N., long. 74° 33′ 30″ W., June, 1885. Other American localities for the species have already been recorded by the writer.*

Genus CHONDRACANTHUS De la Roche.

Chondracanthus galeritus, sp. nov.

(Plate VIII, figs. 1–7; plate X, figs. 1–7.)

Rather below the medium size, elongate, but exceedingly variable shape, according to the amount of contraction or method of preservation. When most extended, the total length of the body is three or more times the greatest width, which is across the abdomen. In much contracted specimens, the width is sometimes nearly equal to the length. In the former case, with alcoholic specimens, the head is generally thrown back, the thorax and abdomen straight, smooth, and much inflated, as on plate VIII, figs. 1, 2; in the latter, the body is more or less compressed, and curved or twisted, the thoracic and abdominal portions with thickened margins and more or less pronounced foldings on the dorsal surface. Considering the former as the more normal shape, we have confined our description mainly to it.

The head is slightly elongate, broadest near the front, and narrows gradually backward. The dorsal portion is inflated and projects to a greater or less extent over the ventral and basal portions, like a hood or cap. The front margin is broad, approximately straight, the antero-

* Proc. U. S. Nat. Mus., vol. vii, 1884, p. 488.

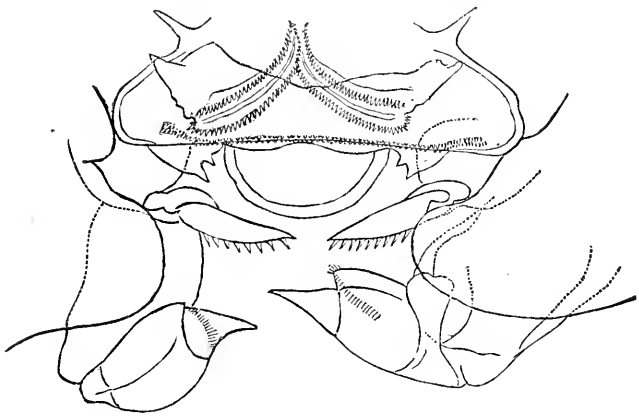
lateral corners well rounded, the front dorsal surface divided off as shown in fig. 1, and the dorsal groove reaching to near the hinder end of the hood. The thickness through the hood is nearly equal to its width, the region about the mouth being much exsert, and the base of the head somewhat constricted near where it joins the thorax.

In dorsal view, the thorax is rather narrow in front and bilobed on each side, the front lobes being very small, sometimes but faintly indicated, and the posterior, which immediately follow them, quite large and regularly rounded, the width of the thorax at this point being not very much less than that of the abdomen. The larger lobes give origin to the second pair of thoracic appendages. The abdomen is also divided near the middle into two segments by a rather broad and shallow constriction, deepest and best defined at the sides, and indicated on the dorsal surface by a very slight transverse depression. In contracted specimens this division is frequently more marked. The posterior segment is generally slightly longer and broader than the anterior, and its length is about equal to the thickness through the abdomen. The postero-lateral prolongations of the hinder segment are rather short (a little more than one-third the length of the segment), stout, and well rounded at the extremities. In some cases they taper rapidly, while in others they retain a more uniform width. The genital segment is small; the tail very small, elongate, rounded at the end, and with two minute appendages on the ventral side near the front, each tipped with a single stout seta.

The anterior antennæ are large, broad, flattened, but not as conspicuous as in *Chondracanthus cottunculi*, and consist of only a single joint, although the setæ at the outer end are borne upon a small, overlapping and elongate fold or lobe, as shown on pl. X, figs. 2, 3. In specimens normally preserved they stand almost entirely in advance of the head, and reach nearly or quite to the lateral margins of the head; greatest length about twice the greatest width; the adjacent margins slightly overlapping. The front and inner margins are strongly convex; posterior margin straight or slightly concave, with a small, rounded prominence or lobe near the inner end; outer end abruptly narrowed, rounded, and with several small setæ. In contracted specimens these antennæ are often drawn down to a greater or less extent over the ventral surface of the head, thus appearing much less conspicuous dorsally. (See plate VIII, figs. 4 and 5.)

The second antennæ or prehensile hooks are rigid, of a light horn color, and arise from a rather complicated frame-work of the same consistency, imbedded in the soft ventral surface of the head, close to the front margin. They are strongly incurved near the end, and terminate in a sharp point, but the lower two-thirds to three-fourths is nearly straight. Their length, not including the incurved portion, is about equal to the greatest width of the anterior antennæ.

Of the three principal pairs of mouth organs, one pair is in advance of the mouth opening and two pairs back of it, while on each side there is a small palpus, terminating posteriorly in two sharp spines. The organs of the first pair are rather slender, curved, and serrated on both margins. Of the second pair, the terminal joint is slender, very slightly curved, and tapers gradually to a sharp point. The posterior margin is armed with about ten acute spines, arranged in a single regular series, extending from the tip to beyond the middle. The hinder pair are comparatively very large, and capable of considerable extension backward. The basal joint is very broad, the median joint of moderate size, the terminal joint small, broad at the base, and rapidly narrowing to a slender distal end, terminating in a rather acute point.



Arrangement of mouth parts in *Chondracanthus galeritus*.

The thoracic appendages are comparatively small and divided at the outer ends, for slightly more than half their length, into two subequal portions, which are stout at the base and taper rapidly to sharp or slightly rounded tips. The first pair originate just back of the head, and are much smaller than the second, when compressed against the ventral surface, scarcely reaching to the bases of the latter. The second pair, which arises from the posterior thoracic lobes, when compressed in the same manner, do not reach much, if any, beyond the middle of the first abdominal segment. In distended specimens the thoracic appendages project ventrally at an angle of more than 45 degrees, but in distorted ones they may lie more or less flat against the surface, the posterior pair often reaching to or slightly overlapping the second abdominal segment.

The ovigerous tubes are nearly as long as the body, sometimes longer, large, and slightly tapering; rounded at the ends.

By contraction, or by distortion in alcohol, this species assumes very odd and irregular shapes, which it is impossible to describe in detail; but it is always readily distinguished from the other species of the genus

described in this paper, by the shape of the anterior antennæ and of the thoracic appendages. By contraction the head often becomes nearly circular in dorsal view, with the antero-lateral corners extended forward beyond the median anterior margin, and with the thorax immediately following the hood-like dorsal expansion. In such cases, the thorax is also very short.

The average length of the body, in females, is about 6 or 7^{mm}. The color of living specimens is whitish, the head and most of the thorax with its appendages being translucent; remainder of the body mostly opaque; ovigerous tubes slightly yellowish. In alcohol the body becomes yellowish-white and the ovigerous tubes much darker. Just before hatching, the latter become pinkish, due to the color of the embryos in the eggs.

This species is of very frequent occurrence in the mouth of the common flounder, *Paralichthys dentatus* (L.) Jord. & Gilb., at Wood's Holl, Mass., and vicinity, many specimens having been collected by the U. S. Fish Commission in 1883 (6036, 6037, 6049, 6077, 6082). . It generally attaches itself in the front part of the mouth, holding on tightly by means of its hooked antennæ, its head often partly buried in the soft skin. Males are often found attached to the females, and a side view of a male is represented on plate VIII, fig. 7.

Chondracanthus galeritus appears to correspond more nearly, in its general shape and characters, with *Chondracanthus cornutus* of Europe, than with any other described species. I have not been able to examine specimens of the latter species, but a comparison with published figures indicates that the anterior antennæ and mouth parts, at least, furnish good distinguishing characters.

Chondracanthus phycidis, sp. nov.

(Plate IX, figs. 1-6; plate X, figs. 8-13.)

This species is of about the same length as *Chondracanthus galeritus*, but generally rather stouter, when most extended about twice as long as broad, when much contracted in alcohol fully two-thirds as broad as long; ovigerous tubes large, straight, or slightly curved, usually about three-fourths as long as the body, but sometimes of about the same length.

Head large, about one-third the length of the entire body, broadly suboval in outline, as viewed from above, the greatest width being nearly equal to or even slightly exceeding the length. It is more or less abruptly narrowed toward the front, generally more so than in the figure given, with the anterior margin straight or slightly convex in the middle. The lateral margins diverge rapidly from the front, and are at first slightly concave, but soon round outwardly, the posterior two-thirds of the head in length being quite broad and with strongly convex sides. In side view the dorsal contour is strongly arched, the

ventral concave anteriorly and strongly convex posteriorly, giving a much greater depth to the head in the region of the mouth than at the front, the greatest thickness being nearly equal to the greatest width.

The thorax is short and broad, not more than half as long as, and somewhat narrower than the head. Viewed from above it presents two rounded lobes on each side, produced by a constriction near the front; the anterior lobes merge into the head, the posterior are larger and better defined.

The abdomen enlarges abruptly from the thorax and is very broad, especially toward the front, its greatest width being nearly equal to its length, or even exceeding it in specimens that are much contracted. A slight, narrow constriction at the sides partly divides it into two segments, of which the anterior is slightly longer than the posterior in specimens in normal condition, but often very much larger in the young or contracted ones. The greatest width of the body is across the anterior segment, and its thickness at the same place is considerably more than half the width, the median ventral surface being more or less raised and the margins broadly thickened. The postero-lateral prolongations of the abdomen are large and stout, rounded at the ends, and generally extend obliquely downwards and backwards, though sometimes nearly at right angles to the rest of the abdomen.

The genital segment is relatively small, the tail nearly as large, globular, and reaching back nearly as far as the hinder prolongations of the abdomen; in young specimens it projects back of the latter. The ovigerous tubes are of nearly uniform size throughout, or taper slightly.

The anterior antennæ are very small, slender, rounded, two-jointed, and do not reach quite to the sides of the front margin; they originate at the extreme end of the ventral surface of the head, very near the median line. The basal joint is elongate, and slightly constricted at the inner end; the terminal joint is short, about one-third as long as, and narrower than, the basal, and is rounded at the outer end, where it is armed with several small elongate papillæ; there is also one similar papilla near the middle of the posterior margin. The posterior antennæ or prehensile hooks are rather large; the principal joint stout, strongly curved throughout, and sharply pointed; the basal short and broad. The mouth parts do not differ greatly from those of *C. galeritus*: the three principal pairs of organs are represented on plate X, figs. 10–12.

The thoracic appendages are of moderate size, relatively stout, and notched or slightly bilobed at the ends; those of the anterior pair are not much more than half as long as the posterior, the latter reaching to about the middle of the first abdominal segment. The anterior pair originate close to the head, and in side view appear subcircular or subovate in section, while the posterior are oblong or short clavate, and about twice as long as broad. The former are but slightly indented at the ends, each terminating in two rounded knobs, the outer somewhat larger than the inner, and often presenting, when viewed from the ends,

a subreniform shape, as represented on plate IX, fig. 2. The latter, in ventral view, are convex on the outer margin and concave on the inner, the outer terminal knob or lobe being the largest, and projecting further back than the inner.

The average length of adult specimens is about 5 or 5.5mm. The color in alcohol is a yellowish or dingy white, the ovigerous tubes being of a light yellow or yellowish buff.

This species is readily distinguished from the other species described in this paper by the shape of the head, the small size of the anterior antennæ, the stoutness of the thoracic appendages, and the shape of the posterior part of the body, including the genital segment and tail. It has been collected only once, about 15 specimens having been taken from nearly as many specimens of the common hake, *Phycis tenuis*, collected off Martha's Vineyard, Mass., in 1883, by the U. S. Fish Commission (6066). They were attached to the gills. Many of the specimens are immature females, and nearly all were accompanied by a single male each.

Chondracanthus cottunculi, sp. nov.

(Plate XI, figs. 1–7.)

Of about the same size as *Chondracanthus phycidis*, but readily distinguished from both that species and *C. galeritus* by the size and shape of the anterior antennæ, and by other prominent characters.

The greatest width of the body is equal to about one-half the length, or slightly less. The head is considerably shorter than broad, about one-fifth as long as the entire body, narrowed and rounded in front, the lateral margins diverging rapidly and very convex and well rounded posteriorly; the greatest width is just in advance of the hinder end. The front margin is extended laterally in the shape of two rather prominent rounded knobs; the dorsal surface arches strongly and terminates posteriorly in a raised margin or collar; on the ventral side, the lateral margins are bordered by two broad, convex, smooth patches or cheeks. The thorax is much constricted immediately back of the head, forming a very short neck, from which the margins diverge very rapidly again with a convex outline, producing a wing-like expansion on each side, cut off squarely behind or, in some cases, sharply pointed and directed more or less backward at the ends. This portion of the thorax is of about the same width as the abdomen, to which it appears to belong, but it gives origin to the second pair of thoracic appendages.

The abdomen composes about three-fifths of the body in length, its width being nearly three-fourths its length. It is moderately convex dorsally, and consists of two segments with slightly raised margins. The posterior segment is slightly longer than the anterior; the posterolateral prolongations of moderate size, sometimes of nearly uniform width with well-rounded ends, at others tapering and more pointed.

Four divisions of the body back of the head are plainly distinguishable on the dorsal side. These are separated by three shallow but well-defined transverse grooves, having a backward extension, as represented on plate XI, fig. 1. The first is just back of the short neck; the second originates at the hinder ends of the thoracic wings, and extends some distance backward, forming three sides of a rectangular figure; the third starts at the median indentations on the sides of the abdomen, and, though similar in its course to the preceding, is somewhat straighter. The above arrangement of the grooves is well marked on the specimen figured, which is more perfectly preserved than any of the others. In other specimens, they have the same relative position and shape, but from distortion in alcohol present numerous irregularities, and the intervening spaces are often inflated, appearing like large rounded knobs, while the margins may be much thickened.

The genital segment is small; the tail very small, globular, with two moderately long setose processes projecting from the ventral side, and stopping some distance in advance of the posterior extremities of the abdomen.

In lateral view the body presents a grotesque appearance, the dorsal contour being rather strongly and regularly arched, the head and prominent antennæ resembling somewhat a crested helmet, and the thoracic appendages held out rigidly in front.

The anterior antennæ are very large, prominent, flattened, irregularly subtriangular in outline, their lateral extension being somewhat greater than their longitudinal. Being soft and flexible, they exhibit considerable variation in their outline, but the inner margins are generally convex and closely adjacent or slightly overlapping, the posterior and the antero-lateral more or less concave, the former sometimes nearly straight. At the sides they project far beyond the antero-lateral corners of the head, their total spread being about equal to the greatest width of the head. The lateral portions are much narrowed, rounded at the ends, and armed with a few small setæ or papillæ; the anterior extension varies in width, being sometimes broadly rounded, at others more acute. The inner posterior corners are more or less extended. Each antenna appears to consist of only a single joint; in one specimen examined, however (plate XI, fig. 5), there were traces of a division near the middle; but this would probably have disappeared under compression.

The posterior antennæ are small compared with the anterior; they consist of a rather small basal joint, and a stout, moderately curved distal joint, but slightly tapering, though sharply pointed. The horny framework to which they are attached is comparatively large and strong, and continuous from side to side.

Figures are given of the second and third pairs of mouth organs. In the former the terminal joint is very slender, sharply pointed, the basal large; in the latter the terminal joint is curved and also slender, but

abruptly enlarges at the base; the second joint is closely margined with fine hairs along the inner margin.

The thoracic appendages are of moderate size, nearly as thick as wide, rather abruptly expanded and indented at the ends, as shown on plate XI, fig. 2, the terminal projections on each side being rounded. The first pair originate immediately back of the head, and are smaller than the second pair, though not very much shorter. When compressed against the ventral surface, the appendages of the second pair extend but a moderate distance back of the lateral thoracic wings, and those of the first pair overlap the second but slightly. Following these appendages, and in the same line, there is a pair of short, stout, simple abdominal appendages, belonging to the first segment; they are somewhat conical in shape, rounded at the ends, and sometimes more or less compressed vertically; they are located close to the margin.

The total length of the body, including the antennæ, is about 6mm. The ovigerous tubes are slightly shorter than the body, or of about the same length. They are comparatively large, taper but slightly, and are rounded at the ends. The color of the body in alcohol is a sort of yellowish white, or light flesh color; ovigerous tubes dull yellowish. This species has been found on two species of *Cottunculus*, living in the gill cavity. Males were attached to most of the females. The specimens were all collected by the U. S. Fish Commission steamer Albatross.

RECORD OF SPECIMENS EXAMINED.

From *Cottunculus torvus.*

Lat. 41° 11′ 30″ N., long. 66° 12′ 20″ W., 449 fath., sta. 2078; 3 specimens (6139).

From *Cottunculus microps.*

Lat. 39° 58′ 35″ N., long. 71° 00′ 30″ W., 197 fath., sta. 2092; 2 specimens (6166).

From *Cottunculus ?*, sp. ?

Lat. 39° 29′ N., long. 71° 46′ W., 693 fath., sta. 2181; 1 specimen (8454).

REFERENCE TO THE PLATES.

Fig. 1, of Plate V, was drawn by Mr. J. H. Emerton; all the other figures are by the author, and were drawn mainly from alcoholic specimens, with the aid of the camera lucida. Delicate opaque appendages were treated with a dilute solution of caustic potash, and were observed under as slight pressure as possible.

DESCRIPTION OF A RECENTLY NEW OYSTER-CATCHER (HÆMATOPUS GALAPAGENSIS) FROM THE GALAPAGOS ISLANDS.

By ROBERT RIDGWAY.

Hæmatopus galapagensis Ridgw.

? *Hæmatopus palliatus* Sund., P. Z. S., 1871, 125.—Scl. & Salv. P. Z. S., 1870, 323 (Indefatigable I).—Salv., Trans. Zool. Soc., ix, pt. ix., 1875, 502 (Indefatigable I).
Hæmatopus galapagensis Ridgw., Auk, iii, July, 1886, 331.

Sp. Char.—Somewhat similar to *H. palliatus* Temm., but differing as follows: Back, scapulars, and wings sooty black, instead of grayish brown; shorter upper tail-coverts entirely black, the longer ones white varied toward tips with blackish (the median coverts barred or transversely spotted); under primary coverts chiefly black; white of the wing much more restricted. Wing 10.00; tail, 3.80–3.90; culmen, 3.12–3.42; depth of bill at thickest portion in front of nostril, .50; tarsus, 2.12–2.20; middle toe, 1.65. (Type, No. 101,319, U. S. Nat. Mus., Chatham I., Galapagos; Dr. Wm. H. Jones, U. S. N.).

Hab.—Chatham Island, Galapagos group.

This very distinct species, although much more closely related to *H. palliatus*, bears in some respects a greater general resemblance to *H. leucopus* Garnot, from the Straits of Magellan district. Through the courtesy of the officers of the American Museum of Natural History, in New York City, and of the Boston Society of Natural History, I am able to make a direct comparison with the latter, and therefore express the diagnostic characters of the two species in a synoptical table, in which is included also the distinctive characters of *H. palliatus*.

a^1. Breast white, like abdomen, etc.; bill stout, its greatest depth forward of nostril exceeding .45 of an inch; middle toe, with claw, more than 1.75.

b^1. Back, scapulars, and wing-coverts grayish brown; upper tail-coverts entirely white; under primary coverts almost entirely white. Wing, 9.75–11.00, culmen 3.00–3.70, greatest depth of bill .48–55; tarsus, 2.05–2.55; middle toe (without claw), 1.20–1.55. *Hab.*, Atlantic coast of America, from Nova Scotia to Patagonia, and Pacific coast, from Lower California to Chili. *H. palliatus* Temm.

b^2. Back, scapulars, and wing-coverts sooty black; shorter upper tail-coverts entirely black, the larger ones white, varied at ends with blackish; under primary coverts chiefly black. Wing about 10.00;* culmen 3.12–3.42, greatest depth of bill, forward of nostril, .50; tarsus, 2.12–2.20; middle toe, 1.65. *Hab.*, Galapagos (Chatham Island) ..... *H. galapagensis* Ridgw.

a^2. Breast entirely black. Bill very slender, its greatest depth, forward of the nostril, not exceeding .40 of an inch; middle toe, with claw, much less than 1.75. Back, scapulars, and wing-coverts sooty black, with a slight greenish gloss; upper tail-coverts (except shorter median ones) entirely white; under primary coverts, also the most of the remaining portion of the under side of the wing, uniform black. Wing, 10.00–10.60; culmen, 3.00–3.05, greatest depth of bill, forward of nostril, .38–.40; tarsus, 1.75–1.95; middle toe, 1.20–1.30. *Hab.*, Tierra del Fuego ..... *H. leucopus* Garn.

* Two of the three specimens are moulting the primaries.

The three specimens upon which the new species is founded were collected on Chatham Island, Galapagos, August 16, 1884, by Dr. William H. Jones, U. S. N., of the U. S. S. Wachusett, whose memoranda relative to them are as follows:—

No. 101,319 (collector's No. 63), adult: Bill, red; iris, golden yellow; eyelids, red; feet, pale flesh-color. Length (before skinning), 18 inches; extent, 32.

No. 101,321 (collector's No. 63), adult: Bill, dark red; iris, bright golden yellow; eyelids, bright red; feet, pale flesh-color. Length, $17\frac{1}{4}$; extent, $32\frac{1}{2}$.

No. 101,320 (collector's No. 65), immature: Bill, red, barely black toward tip; iris, golden yellow; lids, reddish; feet, "slate or grayish." Length, $18\frac{1}{4}$; extent, 33.

A REVIEW OF THE SPECIES OF THE GENUS PRIONOTUS.

By DAVID S. JORDAN and ELIZABETH G. HUGHES.

In the present paper we have given the synonymy of the species of *Prionotus*, or Sea Robins, together with an analytical key by which they may be distinguished. The material examined by us is chiefly in the museum of the Indiana University, having been collected mostly by Professors Jordan and Gilbert and Mr. Silas Stearns.

Most of the characters in the following analysis have been taken from adult specimens. Young examples in most cases differ from the adults in the following respects, in addition to those characters which usually distinguish young fishes:

The spines on the head are sharper, more conspicuous, and more compressed in the young, and some spines, especially those on the side of the head, disappear entirely with age. The interorbital space is more concave in the young. The pectoral fins are also much shorter. The gill-rakers are longer in the young, and proportionately more slender, and some of the color markings—especially the dark cross-shades—are more conspicuous, while the spots on body and fins are less so.

The following is the synonymy of the genus.

PRIONOTUS.

PRIONOTUS Lacèpède, Hist. Nat. Poiss. III, 37, 1802 (*evolans*).
ORNICHTHYS Swainson, Nat. Hist. Classn. Fishes, II, 1839, 262 (*punctatus*).
CHRIOLAX Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 374 (*evolans*).
Type *Prionotus evolans* L.

The species of *Prionotus* so far as known are confined to the waters of America and Japan. They may be compared as follows:

ANALYSIS OF THE SPECIES OF PRIONOTUS.

a. Dorsal rays VIII to X—11 to 13. Anal rays 11 or 12.

b. Mouth comparatively small, the maxillary less than one-third the length of the head, the mandible not extending backward as far as the vertical from the front of the eye; a more or less distinct cross-groove* on top of head behind eye; black spot on spinous dorsal very distinct, ocellated, confined to the membrane between fourth and fifth spines.

c. [Pectoral fins very long, reaching base of caudal, the rays graduated, the ninth the longest; scales small, in 109 transverse series, 50 tubes in the lateral line; gill rakers shortish, 1+6 in number; body rather stout, the depth 4 in length; palatine teeth few, feeble; caudal subtruncate; second dorsal spine longest, half the length of head; first spine strongly serrated in front; pre-

* Not described in *P. alatus*, but probably present.

opercular spine with a smaller one at its base; head $2\frac{1}{2}$ in length. D. x–12, A. 11. Body with four faint cross-bands; caudal with black tip, and two paler cross-shades; spinous dorsal with small dark spots besides the large one, soft dorsal plain; pectorals clouded.] (*Goode & Bean*) ..... ALATUS, 1.

cc. Pectoral fins rather short, not reaching last ray of anal and not more than half the length of the body; one or two small spinules on lower edge of preopercle, below the preopercular spine.

d. Preopercular spine with a smaller one at its base; pectorals reaching past middle of anal, their length not quite half the body; gill-rakers rather long and slender, about 10 developed; maxillary, $2\frac{1}{2}$ in head; a bluntish spine on edge of snout behind the serræ; behind this, one or two smaller ones, at least in the young; no spine on cheek bone; groove behind the eye evident; interorbital area rather narrow, concave; preocular, supraocular, occipital and nuchal spines rather prominent. Dorsal spines high, the third $2\frac{1}{8}$ in head; first spine not serrate; caudal truncate. Head, $2\frac{4}{5}$ in length; depth, $2\frac{4}{5}$; D. x–12, A. 12. Pores about 50. Back obscurely spotted. Dorsal and caudal fins spotted with brown, the first dorsal with a black blotch besides; the pectoral with obscure dark spots, and margined with blue" ..... PUNCTATUS, 2.

dd. Preopercular spine with no smaller one at its base in front; pectoral fin short, reaching little past front of anal, its length less than half the body; gill-rakers of moderate length, about 10 developed; no spine on cheek bone or on sides of snout. D. x–13. A. 12.

e. Body not very slender, the depth 5 in length; head not very small, its length 3 in body; groove across top of head behind eye, very conspicuous; interorbital area moderately concave, rather broad, about equal to diameter of eye; bones of head comparatively smooth, the preocular, postocular, occipital and nuchal spines low, depressed; temporal ridge conspicuous, without spines. Dorsal spines low, the second $2\frac{1}{8}$ in head, the first moderately serrate; base of soft dorsal equal to distance from tip of snout to tip of humeral spine; caudal fin lunate, its outer rays $\frac{1}{3}$ to $\frac{1}{4}$ longer than inner; pectoral fin somewhat rounded, the longest ray about the fifth; free rays of pectoral expanded toward tip, with decurrent membrane; scales rather large; about 58 pores. Body and fins nearly plain, mottled with darker, but without well-defined spots except the dorsal ocellus; back with four obscure cross-blotches; two or three oblique pale streaks across spinous dorsal. Gill-membranes dusky. Young with head rougher, pectoral fins shorter, dark spots on body more distinct.... CAROLINUS, 3.

ee. Body very slender, the depth about $6\frac{1}{2}$ in length; head short, $3\frac{3}{8}$ in length; groove across top of head behind eye, little conspicuous; interorbital area narrow, deeply concave; its

width about $\frac{2}{3}$ the diameter of the eye; bones of head very smooth, the striations very weak; spines on top of head (preocular, supraocular, occipital and nuchal) short and sharp, not depressed; temporal ridge blunt, without spine. Dorsal spines very high, the second $1\frac{2}{3}$ in head, the first moderately serrate; soft dorsal high, its base about $\frac{1}{3}$ longer than head; caudal truncate; pectoral fin truncate; its third ray longest, the others, to the tenth little shorter; free rays of pectoral a little expanded at tip; scales rather small, about 52 pores. Body covered with roundish bronze spots of various sizes; smaller bronze spots on the head; both dorsals, caudal and pectoral fins with similar bronze spots, these especially numerous and distinct on soft dorsal.

SCITULUS, 4.

bb. **Mouth comparatively large**, the maxillary two to two and three-fourths in the length of head, the mandible extending backward to opposite of eye, or nearly so; no distinct cross-groove on top of head; free rays of pectoral tapering, not expanded at tip; black blotch on spinous dorsal diffuse, not ocellated, involving the membranes of more than two spines.

f. **Preopercular spine** without a distinct smaller spine at its base in front.

g. **Pectoral fins** very long, reaching at least to beyond the second third of the dorsal; serræ on preorbital, each ending in a conspicuous point or spine.

h. **Gill-rakers** long and slender, the longest nearly half the eye; body rather stout, the depth 4 in length; head large, nearly plane above, the interorbital space not concave, its width equal to eye; snout very short, $2\frac{1}{2}$ in head; maxillary $2\frac{1}{6}$ in head, reaching past front of orbit; bands of palatine teeth, very narrow; bones of head smoothish, little striate. First dorsal spine serrate in front, the third spine nearly half the length of the head; caudal slightly concave; pectoral reaching ninth anal ray, its outline rounded; ventrals not reaching vent. Scales about 55. Color pale olivaceous, back and sides with a few dark spots; second dorsal with three rows of black spots; caudal with three rows of dark blotches; pectorals with dark clouds. D. x-12, A. 11... STEPHANOPHRYS, 5.

hh. **Gill-rakers** very short, tubercle-like, 9 or 10 developed, little if any longer than the interspaces; first dorsal spine nearly smooth; mouth not very large, the maxillary $2\frac{1}{2}$ to $2\frac{2}{3}$ in head.

i. **Interorbital space** moderately concave; its width about four-fifths length of eye; no cirrus above the eye; distance from supraocular spine to nuchal scales about equal to eye; supraocular and nuchal spines low; occipital spines wanting; temporal ridge sharp, ending in a blunt spine; preorbital projecting, strongly serrate; a blunt spine on each side of snout, behind serræ of preorbital; a blunt spine behind this above angle of mouth; no spine on cheek-bone, in adult; upper

opercular spine almost obsolete; bones of head rather strongly striate, but not granulate; scales rather large; about 52 pores. D. x–11, A. 10. First dorsal spine not much shorter than second, which is $2\frac{1}{3}$ in head; caudal very slightly concave; pectorals longer than in any other species (except *alatus*), reaching entirely past bases of dorsal and anal; its tip subtruncate, the longest ray about the ninth; ventrals reaching a little past vent. Head 3; depth 5; color nearly plain brownish, with darker clouds; no distinct spots anywhere on body or fins; the pectorals marbled with paler ..... RUBIO, 6.

ii. Interorbital space very deeply concave, its width about $\frac{3}{5}$ length of eye; a fringed cirrus above the eye; distance from supraocular spine to nuchal scales about half the eye; occipital as well as nuchal spines distinct; temporal ridge with a small spine; no spine on cheek bone; bones of the head with fine, sharply defined striæ, but no granulations; upper opercular spine well developed; scales moderate (about 50 pores); D. viii-13, A. 11. First dorsal spine longest, $1\frac{1}{2}$ in head; caudal subtruncate; pectorals nearly twice as long as head, reaching nearly to last rays of dorsal; ventrals about reaching to vent; head 3 in length; depth $4\frac{1}{2}$. Color crimson red, nearly plain; caudal with two dark cross shades..... OPHRYAS, 7.

gg. Pectoral fins short, not reaching beyond middle of dorsal; head much smoother than in any other species, the bones of the head faintly striate, with small granulations; the cranial spines little developed; the supraocular, occipital and temporal spines wholly wanting, there being only 3 pairs of spines on the head; mouth large, the maxillary 2 in head. Gill-rakers short and thick in adult, slender in young, about 10 developed; interorbital space concave, rather broad, its width, in adult, rather more than length of eye; first dorsal spine granulated; caudal slightly lunate; pectoral subtruncate, the second ray the longest, as long as head in adult; scales large, 48 pores in the lateral line. Head large, $2\frac{2}{3}$ in length; depth $3\frac{2}{3}$; D. x–12, A 11. Color crimson, with darker clouds and small spots; both dorsals with dark cross-streaks; head and pectoral fins conspicuously reticulated with blackish (in adult); anal plain, whitish; free rays of pectoral unspotted ..... STEARNSI, 8.

ff. Preopercular spine with a distinct smaller one at the base; gill-rakers slender.

k. Scales moderate (50 to 60 pores); caudal fin very slightly lunate; pectoral fin subtruncate.

l. Cheek-bone without distinct spine at the center of radiation.

m. Edge of preorbital granular-serrate, without distinct spine, the serræ about 12 in number on each side; temporal ridges roughish but without spines; bones of the head with the striæ coarsely granular; mouth moderate, the maxillary about $2\frac{3}{5}$ in head; head not very broad,

the spines on its upper surface, except the nuchal spine, inconspicuous; head $2\frac{2}{3}$ in length; depth about 4: D. X—12. A. 11. Gill-rakers longer and slenderer than in other species; 15 to 20 developed. Coloration brownish: side with a very distinct dusky bronze band below the lateral line and parallel with it; this becoming broken posteriorly into a series of roundish dark spots; some dark streaks and clouds below this stripe; fins with dark clouds, the soft dorsal with two dark blotches, which extend as bars on the back; head with scattered dark spots; dusky area below eye.

n. Pectoral with its rays each crossed by fine black bars, these especially distinct towards the base of the fin; free rays spotted; scales comparatively small, 10+1+23 in a vertical line from last dorsal spine to vent; interorbital area broad and almost flat, its width a little more than length of eye; first dorsal spine granulated; second spine $2\frac{2}{3}$ in head; pectorals about half the length of the body..... STRIGATUS, 9

nn. Pectoral fin with its rays all plain blackish; free rays plain dusky: scales larger, 8+1+21 in a vertical line from last dorsal spine to vent; interorbital space more deeply concave, its width in adult not quite length of eye; first dorsal spine nearly smooth; second spine 3 in head; pectorals a little more than half of the body ..... EVOLANS, 10

mm. [Edge of preorbital with six spinous teeth on each side; cheeks and temples without spine; pectoral fin reaching fourth anal ray.]..... MILES, 11.

ll. Cheek-bone with a spine (small in the adult, larger in the young) at the center of radiation; temporal ridge with two bluntish spines; bones of the head very sharply striate; young with four sharp, knife-like spines on side of cheek and snout, in a line before the preocular spine; these nearly disappearing with age; maxillary about $2\frac{1}{3}$ in head; sides without dark longitudinal stripe.

o. Gill-rakers slender in the young, becoming shorter and thicker with age, about 10 developed on lower part of arch; head broad, the spines on its upper surface very prominent, all of them more or less compressed and knife-like, especially in the young. Second dorsal spine $2\frac{1}{2}$ in head; head $2\frac{1}{3}$; depth $4\frac{1}{3}$; D. X–12. A. 11. Pectorals moderate, 2 in body in the adult, $2\frac{1}{2}$ in the young. Body brownish, much mottled with grayish and dusky, and with three or four obscure dark cross-bands; head and dorsal fins with many dark spots; caudal with two dusky shades; free rays of pectoral spotted, dusky area below eye. TRIBULUS, 12.

oo. Gill-rakers (in young) long and slender, 5 developed; scales small; spines as in *P. tribulus*, but still larger and more knife-like; pectoral fins short, 3 in body (in young)..... HORRENS, 13.

kk. [Scales very small; preorbital produced into an obtuse process, projecting beyond the snout; spines on head well developed; pectoral fins truncated.]
BIROSTRATUS, 14.

aa. [Dorsal rays IX–14. A. 14. Scales 45 to 50; vertex and snout without spines; preorbital terminating in a flat, short, triangular, serrated disk; palatine teeth very minute, in a very narrow band; pectorals reaching to tenth anal ray and marked by a very large black blotch.]
JAPONICUS, 15.

1. Prionotus alatus.

Prionotus alatus Goode & Bean, Bull. Mus. Comp. Zoöl., xix, 210, 1883 (deep sea off Charleston, S. C.); Jordan, Cat. Fish N. Am., 114, 1885 (copied).

Habitat.—Gulf Stream.

This species is known only from the original type. It seems to be a very well marked species, distinguished especially by its very long pectoral fins.

2. Prionotus punctatus.

? *Trigla punctata* Bloch, Ichthyol., taf. 353, about 1790 (Martinique, on a drawing by Plumier); Bloch & Schneider, Syst. Ichth., 13, 1801 (copied), Cuvier, Règne Animal, 1829 (name only).

Prionotus punctatus Cuv. & Val., Hist. Nat. Poiss., iv, 93, 1829 (Antilles; Brazil; Martinique); Günther, Cat. Fish. Brit. Mus. 193 1860 (Brazil; Jamaica; Caribbean Sea; Patagonia).

Habitat.—West Indies and coast of South America; not known from the coasts of the United States.

This species is known to us from two small specimens collected (probably at Tuxpan) on the east coast of Mexico, by Mr. T. Salt. The characters given in our analysis are in part from these specimens, and in part from the specimens in the museum at Paris, the types of Cuvier and Valenciennes.

We feel absolutely certain that this species is the *Prionotus punctatus* of Cuvier and Valenciennes, but not that it is identical with the species figured by Plumier, to which Bloch has given the name of *Trigla punctata*.

The figure of Plumier shows a bright red body, with many small spots of a darker red, while red spots are scattered over all of the fins, except the spinous dorsal and the ventrals. In general form, and in the armature of the head, so far as this is shown in the plate, Plumier's figure most resembles the present species, but the red color suggests a possibility that some of the deep-water species may have been intended.

We know little of the life-coloration of the specimens referred by us to *P. punctatus*, as they are now faded. At present, but two species are positively known from the West Indian fauna, *P. rubio*, which could by no means have been the original of Plumier's figure, and the present one, which much resembles it.

Bloch's figure of "*Trigla carolina*," usually identified with *P. punctatus*, is almost certainly *P. tribulus*.

3. Prionotus carolinus.

Trigla carolina Linnæus, "Mantissa, 528" (Carolina) Gmelin, Syst. Nat., 1347, 1788 (copied); Cuvier, Règne Animal, 1829 (name only).

Prionotus carolinus Cuv. & Val., Hist. Nat. Poiss., iv, 90, 1829 (New York: Carolina); Storer, Report of Fishes Mass., 14, 1839 (Martha's Vineyard): Dekay, New York Fauna, Fishes, 46, 1842, plate v, fig. 15 (New York Harbor); Ayres, Bost. Journ. Nat. Hist., iv, 258, 1842 (Brookhaven, L. I.); Linsley, "Cat. Fish. of Conn., 1844"; Storer, "Synopsis, 51, 1846": Günther, Cat. Fish. Brit. Mus., ii, 192, 1860 (New York); Gill, Cat. Fish. East Coast N. Am., 21, 1873 (name only); Jordan & Gilbert, Proc. U. S. Nat. Mus., 373, 1878 (Beaufort Harbor); Bean, Proc. U. S. Nat. Mus., 84, 1880 (Noank, Conn.; Wood's Holl, Mass.); Goode & Bean, Bull. Essex Inst., 12, 1879 (Salem).

Trigla palmipes Mitchill, Trans. Lit. & Phil. Soc. New York, 431, 1814, plate iv, fig. 5 (New York Harbor).

Prionotus palmipes Storer, Hist. Fish Mass., 66, 1867, plate v, fig. 1 (Tisbury, Mass.); Jordan & Gilbert, Proc. U. S. Nat. Mus., 614, 1883; Jordan & Gilbert, Synopsis Fish. N. Am., 734, 1882; Jordan, Cat. Fish. N. A., 114, 1885 (name only); Goode, Nat. Hist. Aquatic Animals, 255, 1886, plate 71 (Beesley's Point, N. J.).

Prionotus pilatus Storer, "Proc. Bost. Soc. Nat. Hist., ii, 77, 1845" (Massachusetts Bay); Storer, "Synopsis, 270, 1846"; Storer, Hist. Fish. Mass., 68, 1867, plate vi, fig. 1 (Mass. Bay); Gill, Cat. Fish. East Coast N. Am., 21, 1873 (name only); Goode & Bean, Bull. Essex Inst., 12, 1879.

Habitat.—Cape Ann to South Carolina, chiefly northward.

This species is very abundant on the coasts of Southern New England and New York, but is rarely taken as far south as Charleston. Our specimens are from Menemsha Bight, Martha's Vineyard.

This is evidently the *Trigla palmipes* of Mitchill, and the *Prionotus carolinus* of Cuvier and Valenciennes and of most authors. The description of Linnæus of *Trigla carolina* is very brief, and Professors Jordan & Gilbert have recently rejected the name *carolina* as too uncertain for adoption. Of the species found in Carolina, the description of Linnæus best fits this species and *P. scitulus*, and the expression "cauda bifida" certainly points to the present species and excludes the other.

We are unable to see anything in the description or figure of *P. pilatus* that would show that it is a species distinct from *P. carolinus*. Goode and Bean say that it may be *P. punctatus*, and they intimate that its type may not have come from Massachusetts. The figure given by Storer is, however, much more like *P. carolinus* than like any other species known to us.

4. Prionotus scitulus.

Prionotus punctatus Jordan & Gilbert, Proc. U. S. Nat. Mus., 373, 1878 (Beaufort, N. C.); Goode, Proc. U. S. Nat. Mus., 111, (Saint Augustine); Goode & Bean, Proc. U. S. Nat. Mus., 358, 1879 (Clear Water Harbor, Fla.); Jordan & Gilbert, Synopsis Fish. N. Am., 734, 1883 (Beaufort), (not *Trigla punctata* Bloch).

Prionotus scitulus Jordan & Gilbert, Proc. U. S. Nat. Mus., 288, 1882 (West Florida: Beaufort);* Jordan & Gilbert, Proc. U. S. Nat. Mus., 614, 1882 (Charleston); Jordan, Cat. Fish. N. A., 114, 1885.

* The mutilated specimens from Pensacola heretofore referred to this species prove to belong to one as yet undescribed. An account of it will be given later.

Habitat.—South Atlantic Coasts of United States, Beaufort to Saint Augustine.

This well-marked species is rather common within the region from which it is known. The specimens before us are from Charleston and Beaufort.

It was for a time regarded by American authors as the original *punctatus* of Bloch; but the evidence at present indicates that such is not the case.

5. Prionotus stephanophrys.

Prionotus stephanophrys Jordan & Gilbert, Proc. U. S. Nat. Mus., 454, 1880 (San Francisco); Lockington, Proc. U. S. Nat. Mus., 529, 1880 (Point Reyes, near San Francisco); Jordan & Gilbert, Proc. U. S. Nat. Mus., 62, 1881 (Point Reyes); Jordan & Gilbert, Synopsis Fish. N. Am., 736, 1883 (San Francisco); Jordan, Cat. Fish. N. Am., 115, 1885 (name only).

This species is known only from the original type, obtained in the nets of the "parranzelle," in deep water, between San Francisco and Point Reyes. From this specimen (in the National Museum), the description of Jordan and Gilbert, as well as that of Lockington, was taken.

6. Prionotus rubio.

Rubio Volador Parra, Descr. Dif. Piezas de Hist. Nat., 1787., lam. 38 (Havana).

Prionotus punctatus Poey, Synopsis Pisc. Cubens., 1868, 304 (Havana); Poey. Enumeratio, 1875, 41; Jordan & Gilbert, Synopsis Fish. N. A., 1883, 956 (Descr. from Cuban specimens); ? Bean and Dresel, Proc. U. S. Nat. Mus., 1884, 151 (Jamaica).

Prionotus rubio Jordan, Proc. U. S. Nat. Mus., 1886, 50 (Havana).

Habitat.—West Indian fauna; not rare about Cuba.

We have two specimens from Cuba of this species, which Poey has considered the *Prionotus punctatus*. The only basis of this identification so far as we can see is the assumption that only this species of *Prionotus* inhabits the West Indian fauna. As we have examples of a different one from the Mexican coast, this supposition is not well founded. It is evident from a comparison of this species with Bloch's figure that it has little or nothing in common with the fish painted by Plumier.

From related species, *P. rubio* is well distinguished by its long pectorals, and by its very short gill-rakers, much shorter than in any other species, *P. ophryas* coming nearest it in this respect.

7. Prionotus ophryas.

Prionotus ophryas Jordan & Swain, Proc. U. S. Nat. Mus., 542, 1884 (Pensacola); Jordan, Cat. Fish. N. Am., 115, 1885.

Habitat.—Gulf of Mexico; in deep water. Known only from the Snapper Banks, near Pensacola.

Only the original type of this species is known. It was taken from the stomach of a Red Snapper (*Lutjanus aya*), near Pensacola, by Mr. Silas Stearns.

A second specimen, in very bad condition, has since been obtained by us from the same source. In this the undigested parts of the head and body are of a deep crimson. Probably all the deep-water species of this genus will be found to be red in life.

8. Prionotus stearnsi.

Prionotus stearnsi Jordan & Swain, Proc. U. S. Nat. Mus., 541, 1884 (Pensacola; young); Jordan, Cat. Fish. N. Am., 115, 1885; Jordan, Proc. U. S. Nat. Mus., 1886, (Pensacola; adult.)

Habitat.—Gulf of Mexico; in deep water. Known only from the Snapper Banks, off Pensacola.

This species is known only from two specimens, both taken on the Snapper Banks, at Pensacola, by Mr. Silas Stearns. The original type is a small specimen, not four inches long. The other is very large, about 13 inches long, larger than any other specimen of *Prionotus* which we have ever seen. Both specimens have been already described in detail in these Proceedings. In spite of the remarkable differences in appearance of the two specimens, there is little reason to doubt their specific identity, as very similar differences distinguish the young and old of *P. tribulus*. According to Mr. Stearns, the large specimen above referred to was in life of a bright crimson red. Of all the species of the genus the present one has the spines of the head least developed, its upper surface being almost smooth.

9. Prionotus strigatus.

Trigla lineata Mitchill, Trans. Lit. & Phil. Soc. New York, i, 430, 1814, plate iv, fig. 4 (New York Harbor); (not *Trigla lineata* Bloch).

Prionotus lineatus Dekay, New York Fauna, Fishes, 45, 1842, plate iv, fig. 12 (New York Harbor); Storer, Synopsis 50, 1846; Günther, Cat. Fish. Brit. Mus., ii, 192, 1860.

Prionotus evolans var. *lineatus* Jordan & Gilbert, Synopsis Fish. N. Am., 736, 1883.

Trigla strigata Cuvier, Règne Animal, Ed. 11, 1829 (after *evolans* Linnæus or *lineata* Mitchill).

Prionotus strigatus Cuv. & Val., Hist. Nat. Poiss., 86, 1829 (New York); Storer, Report Fish. Mass., 12, 1839 (Holmes' Hole); Ayres, Bost. Journ. Nat. Hist., iv, 25e, 1842 (Brookhaven, L. I.); Linsley, "Cat. Fish Conn., 1844"; Jordan & Gilbert, Synopsis Fish. N. Am., 974, 1882 (note); Jordan, Cat. Fish. N. Am., 115, 1885 (foot-note).

Prionotus pilatus Baird, Ninth Smithsonian Report, 13, 1855 (Beasley's Point, N. J.).

Prionotus evolans Goode & Bean, Bull. Essex Inst., 12, 1879; Bean, Proc. U. S. Nat. Mus., 84, 1880 (Wood's Holl, Mass.; Noank, Conn.; Newport, R. I.); Goode, Nat. Hist. Aquatic Animals, 255, 1886, plate 71 (Wood's Holl, Mass.).

Habitat.—Atlantic coast of the Northern States, Cape Cod to Virginia.

Our specimens of this species are from near Martha's Vineyard.

It is extremely close to *Prionotus evolans*, of which it should most likely be regarded as a geographical variety. We have, however, as yet

seen no intermediate examples. It is, however, true that we have seen no specimens of either, from near the point of meeting in their geographical range.

The name *lineatus* cannot be retained for this species, on account of the prior *Trigla lineata* of Bloch, a European species of *Trigla*, with which Mitchill erroneously identified his specimens.

10. Prionotus evolans.

Trigla evolans Linnæus, Systema Nat., 498, 1766 (Carolina); Bean, Proc. U. S. Nat. Mus., 1885, 204 (description of Linnæan type).

Prionotus evolans Gill, Cat. Fish. East Coast N. Am., 21, 1873 (name only); Jordan & Gilbert, Proc. U. S. Nat. Mus., 374, 1878 (Beaufort, N. C.); Jordan & Gilbert, Synopsis Fish. N. Am., 735, 1883; Jordan, Cat. Fish. N. Am., 115, 1885; Jordan, Proc. U. S. Nat. Mus., 541, 1884 (foot-note).

Prionotus sarritor Jordan & Gilbert, Proc. U. S. Nat. Mus., 615, 1882 (Charleston; Beaufort); Jordan & Gilbert, Synopsis Fish. N. Am., 974, 1883 (name only); Jordan & Swain, Proc. U. S. Nat. Mus., 541, 1884 (foot-note).

Habitat.—South Atlantic coast of United States; known only from North and South Carolina.

This species is abundant along the Carolina coast, but we have not noticed it elsewhere. The description of *Trigla evolans* given by Linnæus is of very little value, but the redescription of the type given by Dr. Bean leaves little doubt that it is the species formerly called *Prionotus sarritor* by Jordan & Gilbert. In this species the gill-rakers are longer than in any other except its analogue, *P. strigatus.*

11. Prionotus miles.

Prionotus miles Jenyns, Zool. Beagle, Fishes, 29, pl. 6, 1842 (Chatham Island; Galapagos); Günther, Cat. Fish. Brit. Mus., ii, 196, 1860 (copied).

Habitat.—Galapagos Archipelago.

Nothing seems to be known of this species beyond what is contained in the original description. It seems to be related to *P. evolans*, or it may prove to be the adult form of *P. horrens.*

12. Prionotus tribulus.

Trigla carolina Bloch, Ichthyologia, 352, about 1790 (Carolina); (not of Linnæus.)

Trigla tribulus Cuvier, Règne Animal, 1829 (name only).

Prionotus tribulus Cuv. & Val., Hist. Nat. Poiss., iv, 98, 1829, pl. 74 (New York; Carolina); Dekay, New York Fauna, Fishes, 48, 1842 (New York; Charleston); Günther, Cat. Fish. Brit. Mus., ii, 195, 1860 (New Orleans; Texas); Jordan & Gilbert, Proc. U. S. Nat. Mus., 373 and 374, 1878 (Beaufort); Goode, Proc. U. S. Nat. Mus., iii, 1879 (St. Augustine); Goode & Bean, Proc. U. S. Nat. Mus., 128, 1879 (Pensacola); Jordan & Gilbert, Proc. U. S. Nat. Mus., 288, 1882 (Galveston); Jordan & Gilbert, Proc. U. S. Nat. Mus., 615, 1882 (Charleston); Jordan & Gilbert, Synopsis Fish. N. A., 735, 1883); Bean, Cat. Fishes, London Intern. Exhib., 1883, 49 (Galveston); Jordan & Swain, Proc. U. S. Nat. Mus., 233, 1884 (Cedar Keys, Fla.); Jordan, Cat. Fish. N. A., 1885, 115.

Habitat.—South Atlantic and Gulf coasts of the United States; north to New York.

This abundant species is well distinguished from the others of the Atlantic by the greater development of the spines of the head. The young have these spines much larger and more compressed than the adult, and in the very young, three or four strong knife-like spines are developed on each side of the snout, as in the types of *P. horrens*. In very young examples the spine at the base of the preopercular spine is much larger than the latter.

The synonymy of this species offers no difficulty. In our opinion, this is the species intended by Bloch in his figure of *Trigla carolina*, and not the *P. punctatus* as supposed by Cuvier & Valenciennes.

13. Prionotus horrens.

Prionotus horrens Richardson, "Voy. Sulph. Ichth., 79, 1843, t. 42, fig. 1-3;" (Gulf of Fonseca); Günther, Cat. Fish. Brit. Mus., ii, 195, 1860 (copied); Jordan, Proc. U. S. Nat. Mus., 387, 1885 (name only).

Habitat.—Pacific coast of Central America.

This species is known from several young examples now in the British Museum. These are almost exactly like the young of *P. tribulus*, differing chiefly in the still larger proportionate size of the knife-like spines on the head. It is not unlikely that they may prove to be the young of *P. miles* or possibly of *P. birostratus*, but a more accurate knowledge of both these species is needed before such an identification can be more than suggested. The following notes on the types of *Prionotus horrens* were taken by Professor Jordan in London.

Three young specimens, allied to *P. tribulus*, but the spines still larger and more knife-like. First spine on edge of snout broad and serrate, three behind this progressively larger, then two large spines on preopercle, the posterior one the largest. Two smaller ones on opercle and one very large on the scapula; two sharp ones over each eye; one behind the eye; two on top of head and two on occiput. Mouth large, maxillary reaching front of eye, $2\frac{1}{3}$ in head; gill-rakers long and slender, 5. Scales small. Pectorals short, 3 in body, reaching somewhat past second dorsal front; pectorals and tip of caudal dusky. No groove behind the eye. Belt of palatine teeth narrow.

14. Prionotus birostratus.

Prionotus birostratus Richardson, "Voy. Sulph. Ichth., 81, 1843, pl. 42, fig. 4-6, Gulf of Fonseca"; Günther, Cat. Fish. Brit. Mus., ii, 196, 1860, (copied); Jordan, Proc. U. S. Nat. Mus., 387, 1885 (Panama).

Habitat.—Pacific coast of Central America.

Several specimens of this species were obtained by Professor Gilbert, in Panama, at 1883. These were destroyed by fire before any description was taken, and now the species is only known from the original account of Richardson.

15. Prionotus japonicus.

Prionotus japonicus Bleeker, "Japan, 398, 1854" (Japan); Bleeker, Verhand. Batav. Genootsch., xxvi, Japan, 75, tab. 5, fig. 1"; Günther, Cat. Fish. Brit. Mus., ii, 196, 1860.

Habitat.—Coasts of Japan.

This species is unknown to us. Not having access to Bleeker's description and figure, we are unable to assign it its proper place in the genus.

RECAPITULATION.

W = West Indian fauna; U = Atlantic coast of United States; C = California; P = Panama; J = Japan.

PRIONOTUS Lacépède.

1. *Prionotus alatus* Goode & Bean. U.
2. *Prionotus punctatus* Bloch. W. (Identification not quite certain.)
3. *Prionotus carolinus* Linnæus. U.
4. *Prionotus scitulus* Jordan & Gilbert. U.
5. *Prionotus stephanophrys* Lockington. C.
6. *Prionotus rubio* Jordan. W.
7. *Prionotus ophryas* Jordan & Swain. U.
8. *Prionotus stearnsi* Jordan & Swain. U.
9. *Prionotus strigatus* Mitchill. U. (Probably a northern variety of *P. evolans.*)
10. *Prionotus evolans* Linnæus. U.
11. *Prionotus miles* Jenyns. P.
12. *Prionotus tribulus* Cuvier & Valenciennes. U.
13. *Prionotus horrens* Richardson. P. (Based on young specimens, perhaps of *P. miles.*)
14. *Prionotus birostratus* Richardson. P.
15. *Prionotus japonicus* Bleeker. J.

List of nominal species, with identifications.

[Tenable specific names are in italics.]

Nominal species.	Year.	Identification.
Trigla *evolans* Linnæus	1766	Prionotus evolans.
Trigla *carolina* Linnæus	*1770	P. carolinus.
Trigla *punctata* Bloch	*1790	P. punctatus.
Trigla lineata Mitchill	1814	P. strigatus.
Trigla palmipes Mitchill	1814	P. carolinus.
Trigla *strigata* Cuvier	1829	P. strigatus.
Prionotus *tribulus* Cuvier and Valenciennes	1829	P. tribulus.
Prionotus *miles* Jenyns	1842	P. miles.
Prionotus *horrens* Richardson	1843	P. horrens.
Prionotus *birostratus* Richardson	1843	P. birostratus.
Prionotus pilatus Storer	1845	P. carolinus.
Prionotus *japonicus* Bleeker	1854	P japonicus.
Prionotus *stephanophrys* Lochington	1880	P. stephanophrys.
Prionotus *scitulus* Jordan and Gilbert	1882	P. scitulus.
Prionotus sarritor Jordan and Gilbert	1882	P. evolans.
Prionotus *alatus* Goode and Bean	1883	P. alatus.
Prionotus *stearnsi* Jordan and Swain	1884	P. stearnsi.
Prionotus *ophryas* Jordan and Swain	1884	P. ophryas.
Prionotus *rubio* Jordan	1886	P. rubio.

*About.

INDIANA UNIVERSITY, *February* 15, 1886.

A REVIEW OF THE AMERICAN SPECIES OF BELONIDÆ.

By DAVID S. JORDAN and MORTON W. FORDICE.

In the present paper we have attempted to give the synonymy of the American species of Needle-fishes or *Belonidæ*, together with analytical keys by which the genera and species may be distinguished.

The American species have been, until lately, all referred to the genus *Belone*. The type of the latter genus, *Esox belone* L., has, however, well-developed gill-rakers, while, in all the American species thus far examined, these appendages are wholly absent. This character seems to be of sufficient importance to necessitate the separation of these species from *Belone*, and other less important differences make still further subdivision convenient.

The genera of *Belonidæ* recognized by us may be thus compared:

ANALYSIS OF GENERA OF BELONIDÆ.

a. Gill-rakers well developed, slender, and moderately numerous; vomer sometimes with teeth; body subterete or moderately compressed; dorsal and anal falcate ..... BELONE, 1.

aa. Gill-rakers obsolete; vomer toothless.

b. Anterior dorsal rays prolonged, forming a lobe which is more or less falcate; caudal fin lunate or emarginate, the lower lobe more or less produced. TYLOSURUS, 2.

bb. Anterior dorsal rays not prolonged, not forming a lobe; caudal convex; body not compressed, nearly as broad as deep; the caudal peduncle slender. POTAMORRHAPHIS, 3.

Genus I. BELONE.

MASTACEMBELUS, Klein, Pisc. Missus., iv, 17 (pre-Linnæan).

ESOX sp. Linnæus, and of early writers. (Not type.)

ESOX Rafinesque.* Caratteri di Alcuni nuovi Genera, 1810; 59 (restricted to *Esox belone*).

RAMPHISTOMA Rafinesque (MSS.?): Swainson, Nat. Hist. Classi'n Anim., ii. 1839, 296 (*vulgaris=belone*).

MACROGNATHUS Gronow, Systema, Ed. Gray, 1854, 147 (*scolopax = belone*).

MASTACEMBELUS Bleeker, Nederl. Tijdskr. Dierk., iii (*belone:* after Klein).

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*Rafinesque observes:

"Il genere *Esox* di Linneo è stato diviso da Lacépède in quattro generi, *Esox*, *Sphyræna*, *Synodus* e *Lepisosteus;* io propongo di dividere nuovamente in due il suo genere *Esox;* lascierò questo nome alle specie marine che hanno il corpo tetragono con due linee laterali da ogni lato como nel genere *Exocœtus*, le mascelle lunghe e strette, le ale dorsale lunghe giungendo dall' ano fino alla coda e falciformi, &c.; mentre formerò un nuovo genere col nome di *Lucius* della specie fluviatile che hanno il corpo cilindrico, una sola linea laterale, le mascelle larghe, e le ale dorsali ed anali corte e rotondato."

This genus is well distinguished from the others in this group by the presence of gill-rakers. We are not sure as to the number of species which it may contain. The presence of gill-rakers has been verified by us only in *Belone belone* L. (= *vulgaris* Cuvier) and in *Belone platyura* Bennett. Dr. Vinciguerra informs us that gill-rakers occur in *Belone acus* Risso also, but the latter nominal species is regarded by Steindachner as based only on specimens of *B. belone* in which the vomerine teeth are abnormally undeveloped. In all the other species which we have seen gill-rakers are absent.

The question as to the name which this genus should retain offers some difficulty. The first definite restriction of the composite Linnæan genus *Esox* is that of Rafinesque, who retains as the type *Esox belone*. It is equally certain, however, that if we could question Linnæus as to his intended type (as some ornithologists have proposed to do) the species selected by him would be *Esox lucius*. Artedi first used the name *Esox* in a generic sense, and at first only *E. lucius* was included by him in it. The name of *Esox* was taken by Artedi from Pliny, and the *Esox* of Pliny was regarded by Artedi as being the common pike.

Besides the differences in the development of the gill-rakers, the typical species of *Belone* differs from all our *Tylosuri* in the form of the body, in the development in most individuals of vomerine teeth, in the posterior position of the ventrals, and in the comparatively smooth upper surface of the head. For purposes of comparison we give here a description and an outline of the synonymy of *Belone belone*. The specimens examined by us are all from Venice.

1. **Belone** belone.* Gar-fish or Needle-fish of Europe.

Esox belone Linnæus, Systema Naturæ, x, 1758, 314 (and of early authors).
Belone acus Risso, Europe Méridionale, iii, 443, 1826, and of Cuv. & Val., Günther, etc.
Belone vulgaris Fleming, British Animals, 184, 1828; Cuv. & Val., xviii, 399, 1846; Günther, vi, 254; Steindachner, Sitzb. Akad. d. Wiss., Wien, 1868, lvii, 732; Day, Fish. Gt. Britain and Ireland, 147, and of most recent writers.
Ramphistoma vulgaris Swainson, Fishes, etc., ii, 297, 1830.
Belone rostrata Faber, Fische Islands, 152, 1829.
Hemirhamphus europæus Yarrell, "Mag. Nat. Hist., 1837, 505" (Young).
Macrognathus scolopax Gronow, Systema, ed. Gray, 1854, 147.
Hemirhamphus obtusus Couch, "Zoology, 1978," about 1860 (Young).
Belone linnæi Malm., "Bohusläns Fauna," 553, 1866.
? *Belone gracilis* Günther, vi, 252, 1846 (not of Lowe ?).
? *Belone euxini* Günther, vi, 252, 1846.
? *Belone cornidii* Günther, vi, 255, 1846.

Habitat.—Mediterranean Sea and northward along the coasts of Europe to Norway and the Baltic Sea.

* If the above synonymy be correct, all the European species of *Belone* belong to a single species, *Belone belone*. The character of the absence of vomerine teeth, assumed to distinguish *Belone acus*, *euxini*, and *gracilis* from *B. vulgaris* and *B. cornidii*, has been shown to be valueless, and the differences in the size of the scales and the size of the teeth, assumed to distinguish these from each other, still lack precision of definition.

Head $3\frac{1}{4}$ in length; depth 5 in head; breadth at pectorals $9\frac{1}{2}$ in head. D. I., 16; A. 1,19. Scales about 225; 150 series before dorsal. Length of specimen measured (from Venice) 17 inches.

Body rather slender, distinctly compressed, more so than in any of the species of *Tylosurus* proper, but much less so than in *Tylosurus hians;* caudal peduncle rather slender and long, compressed, everywhere deeper than broad, and without trace of keel of any sort.

Jaws slender and long, the upper jaw from eye contained 5 times in length of body, and 2 times length of rest of head. Mouth not capable of being completely closed, there being a slight arch at base of upper jaw. Eye rather small, $1\frac{1}{10}$ in interorbital width, $2\frac{1}{5}$ in post orbital part of head, and $6\frac{3}{4}$ in snout.

Upper jaw shorter and somewhat slenderer than lower, the jaws more unequal than in *Tylosurus.*

Teeth rather small, slender and close-set, those in upper jaw considerably larger than those in the lower, the latter most numerous; the small teeth outside of these little conspicuous. Vomer with a small patch of villiform teeth in most specimens, this occasionally little developed or obsolete (*acus* Risso). Bones and scales somewhat green.

Maxillary chiefly concealed by the preorbital.

Head strongly compressed, broader above than below.

Top of head less uneven than in the species of *Tylosurus*, rather narrow, and transversely convex, with a rather broad and very shallow median depression, which is scaly for its entire length. Superciliary and temporal ridges little prominent, scarcely striate. Two slight folds across edge of preopercle.

Cheeks with rather large deciduous scales, arranged in about 7 rows; opercle with similar scales. Scales on body rather large, but very thin and deciduous.

Gill-rakers slender and rather numerous: about 18 developed, the longest not quite as long as pupil.

Dorsal fin of moderate length and height, the posterior rays low, the anterior lobe $1\frac{2}{3}$ in postorbital part of head.

Anal higher than dorsal and inserted considerably farther forward. Caudal fin moderately forked, the lower lobe little longer than the upper, one-fourth longer than postorbital part of head.

Pectorals short and broad, $1\frac{1}{6}$ in postorbital part of head. Ventrals small, $1\frac{1}{2}$ in postorbital part of head, their insertion unusually far back, midway between axil of pectoral and base of caudal.

Color greenish above, sides and lower parts silvery; a very obscure silvery lateral streak; a dark streak along middle of back, a dusky spot on supercilium; no black bar on opercle. Fins mostly pale.

Genus II. TYLOSURUS.

TYLOSURUS Cocco, "Lettere in Giornale Sci. Sicilia, xvii," 18, 1829 (*cantraini=imperialis=acus?*).

TYLOSURUS Jordan & Gilbert, Synopsis Fish. N. A., 1883, 372.

ATHLENNES, subgenus nova (*hians*).

The name *Tylosurus* (more correctly written *Tylurus*) was framed by Cocco, for those species of this group which have a keel or callus on the side of the caudal peduncle. This character has no generic importance, but as the type of *Tylosurus* is also destitute of gill-rakers, the name must be retained by the group thus distinguished.

Tylosurus imperialis (=*cantraini*) is a rare species which we have never seen. We are indebted to our friend Dr. Vinciguerra, of Genoa, for our information in regard to it.

The American species of *Tylosurus* are numerous, for the most part well defined and easily recognizable, though very ill-described by the earlier authors. Most of them seem to have a wide geographical range.

ANALYSIS OF AMERICAN SPECIES OF TYLOSURUS.*

a. Body not compressed, its greatest breadth more than two-thirds its greatest depth. (*Tylosurus.*)

b. Mouth capable of being nearly or quite closed, the upper jaw not conspicuously arched at base.

c. Caudal peduncle compressed, deeper than broad, without trace of keel along the lateral line; dorsal and anal fins short, each of 13 to 16 rays, the posterior rays not elevated; anal longer than dorsal and inserted farther forward; jaws slender, about twice as long as rest of head; no fold of skin across preopercle; caudal subtruncate, the lower lobe somewhat produced sides with a bluish-silvery band; species of small size, with the scales and bones not green.

d. Scales comparatively large, about 85 before the dorsal fin, and about 7 or 8 rows on the cheeks; body robust, the depth about 5 in head; maxillary entirely concealed by the preorbital; ventral fins very short, not half length of postorbital part of head, their insertion nearer base of caudal than gill-opening; coloration pale, the dorsal and caudal brick-red in life; lateral stripe narrow for its entire length; no scapular blotch. D. 1, 13; A. 1, 13. Lat. l. 150. NOTATUS, 2.

dd. Scales small, 140 to 150 before dorsal fin, about 12 rows on the cheeks; body slender; ventrals inserted at a point nearer cheeks than base of caudal; fins without red; lateral stripe broadened below the dorsal fin.

e. Region above base of pectorals with a conspicuous round blackish blotch; maxillary not entirely concealed by preorbital; eye $2\frac{1}{2}$ in postorbital part of head; head $2\frac{2}{3}$ in length; depth $6\frac{2}{3}$ in head. D. 1, 14; A. 1, 15. Lat. l. 215 ..... SCAPULARIS. 3.

* *Tylosurus galeatus*, an ally of *T. raphidoma*, is here omitted, as being insufficiently described.

ee. Region above base of pectorals without black spot.

f. Body very slender, the depth 7 in head, which is $2\frac{5}{7}$ in body; eye moderate, $2\frac{1}{3}$ to $2\frac{3}{4}$ in postorbital part of head; no distinct notch in the temporal ridge, maxillary not entirely concealed by preorbital. D. I. 15; A. I, 17. Lat. l. 225 ..... SUBTRUNCATUS, 4.

ff. Body less slender, the depth 6 in head, which is $2\frac{5}{10}$ in body; eye large, $2\frac{1}{3}$ in postorbital part of head; a distinct notch on temporal ridge close behind eye; maxillary almost entirely concealed by the preorbital. D. I, 15; A. I, 17. Lat. l. 200 ..... EURYOPS, 5.

oo. "Caudal peduncle very much depressed, wider than deep, but without any keel or trace of one. Head $2\frac{3}{8}$ in length; eye $2\frac{1}{2}$ in postorbital part of head; top of head nearly smooth; maxillary nearly concealed by preorbital; body subterete; caudal moderately emarginate; snout very nearly twice length of rest of head; brownish above, silvery below, a bluish lateral stripe edged below with black and yellowish; scales not very small (23 rows between dorsal and anal fins). D. 16; A. 17." (*Cope.*) .. DIPLOTÆNIA, 6.

ooc. Caudal peduncle more or less depressed, or at least, with a more or less developed dermal keel along the lateral line: scales and bones more or less green.

g. Dorsal and anal fins short, each of 14 to 19 rays, the anal larger than the dorsal and beginning farther forward; last rays of dorsal and anal low: jaws slender, about twice as long as rest of head; no folds of skin across preopercle.

h. Eye very small, 4 to 5 times in postorbital part of head; caudal keel sharp, black in color; body and tail much depressed; maxillary not entirely hidden by preorbital; caudal lunate, the lobes subequal; scales minute.

i. "Postorbital part of head rather more than half length of snout, its length 5 times diameter of eye; ventrals a little nearer head than base of caudal; head 3 in length, D. I, 14; A I, 15." (*Günther*). MICROPS, 7.

ii. "Postorbital part of head $2\frac{3}{4}$ in length of snout; its length 4 times that of eye; ventrals midway between head and base of caudal; head about $2\frac{3}{4}$ in length." (*Steindachner*) ..... AMAZONICUS, 8.

hh. Eye moderate, 2 to $3\frac{1}{4}$ times in postorbital part of head.

j. "Caudal fin forked; caudal keel sharp, broad and conspicuous; top of head flat, striated, without median groove; base of upper jaw much depressed; maxillary entirely hidden by preorbital; teeth very small; ventral fin midway between eye and caudal; scales not very small. D. I, 13; A. I. 18." (*Günther.*) ARDEOLUS, 9.

jj. Caudal fin unequally lunate, the emargination not deep, the lower rays moderately produced; scales very small; sides with a silvery lateral stripe; caudal keel not very conspicuous, not black; top of head with median groove; maxillary not entirely concealed by preorbital; ventral inserted midway

between preopercle and base of caudal. Species of moderate size, with the scales and bones more or less green.

k. Body very slender, the depth 6¼ to 7 in length of head; caudal keel not very small.

l. Posterior half of pectorals abruptly black; eye large, 2¼ in postorbital part of head. D. 1, 16; A. 1, 17. Lat. l. 250 ..... STOLZMANNI, 10.

ll. Posterior half of pectorals pale, like the base of the fin; eye rather small, 2⅝ in postorbital part of head. D. 1, 15; A. 1, 17. Lat. l. 370..... EXILIS, 11.

kk. Body moderately slender, the depth 5½ in length of head; caudal keel little developed.

x. Eye moderate, 2½ in postorbital part of head; pectorals not black posteriorly. D. 1, 15; A. 1. 17. Lat. l. 300; a dark bar on opercle.. MARINUS. 12.

xx. Eye small, 3¼ in postorbital part of head. D. 13 or 14; A. 15 or 16; pectoral pale..... ALMEIDA, 13.

gg. Dorsal and anal fins long. each of 17 to 25 rays, the last rays of the dorsal fin more or less elevated in the young, becoming lower in the adult; caudal keel rather strong, black; one or more folds of skin across the edge of the preopercle; caudal fin deeply emarginate or unequally forked. Ventrals inserted midway between base of caudal and middle of eye. Species of large size, with the scales and bones green; no distinct lateral stripe.

m. Beak short and very strong, its length 1½ to 1⅝ times length of rest of head; body comparatively robust, the depth more than one-fifth length of head.

n. Dorsal fin of moderate length, its rays 1, 16; anal rays 1, 17; insertion of dorsal notably behind that of anal; snout very short, 1½ times length of rest of head. Lat. l. 440..... ..... FODIATOR, 14.

nn. Dorsal fin long, its rays 1, 21 to 1, 24; anal rays 1, 22 to 1, 24; insertion of dorsal almost opposite that of anal; snout longer, 1⅜ to 1⅝ length of rest of head. Lat. l. about 350..... RAPHIDOMA, 15.

mm. Beak strong, but more elongate, its length about twice length of rest of head; dorsal beginning behind front of anal.

o. "Greatest depth of body equal to length of pectoral; teeth shorter and weaker than in *T. acus*. D. 21 to 22; A. 19 or 20; a grayish lateral streak" (*Steindachner*)..... PACIFICUS, 17.

oo. Greatest depth of body about two-thirds length of pectoral. D. 1, 23; A. 1, 21. Lat. l. 380; no lateral stripe ..... ACUS, 18.

bb. Mouth not closing completely, the upper jaw arched at base, somewhat as in *T. hians;* lobes of dorsal and anal low, the last rays elevated; depth 20 in total length with caudal; head 3⅖; body broad, compressed; breadth of body ⅔ its depth, which is about equal to postorbital part of head; preopercle with folds of skin; eye 10⅛ in head, 2 1/10 in postorbital part; beak

slender, more than twice as long as rest of head; teeth rather weak; preopercle with two cross-folds of skin; caudal peduncle with a strong, black keel; caudal fin moderately forked, the lower lobe much the longer; dorsal inserted a little behind anal; ventrals midway between base of caudal and middle of eye; skull narrow. D. 1,24; A. 1, 22. Scales small, green, about 210 before dorsal. Bluish white below, a faint bluish band along sides; fins bluish ..... CARIBBÆUS, 19.

aa. **Body very strongly compressed**, its greatest breadth not half its greatest depth (*Athlennes*); caudal peduncle not compressed, without keel; jaws long and very slender, the upper strongly arched upward at base, so that the mouth cannot be closed: snout twice length of rest of head: eye large, $2\frac{1}{2}$ in postorbital part of head; maxillary entirely concealed by preorbital; a fold of skin across preopercle: opercle smooth: insertion of ventrals well forward, midway between front of arch of upper jaw and base of caudal; caudal deeply forked: dorsal and anal falcate, the latter beginning farther forward: pectorals long, falcate: scales minute: species of large size with scales (and bones) green: no lateral band: sides silvery, with round, dark blotches in youth; fins with black tips. D. 1, 25: A. i, 26. Lat. l. about 520 ..... HIANS, 20.

2. Tylosurus notatus.

Belone notata Poey, Memorias, ii, 293, 1860 (Havana): Günther, vi, 1866, 248 (Jamaica): Poey, Synopsis Pisc. Cubens., 1868, 382; Poey, Enumeratio Pisc. Cubens., 1875, 120; Goode, Proc. U. S. Nat. Mus., 1879, 151 (Pensacola).

Tylosurus notatus Jordan & Gilbert, Syn. Fish. N. A., 1883, 373 (copied); Jordan, Proc. U. S. Nat. Mus., 1884, 111 (Key West); Bean & Dresel, Proc. U. S. Nat. Mus., 1884, 168 (Jamaica); Jordan, Cat. Fish N. A., 59; Jordan, Proc. U. S. Nat. Mus., 1886, 33 (Havana).

Habitat.—West Indian fauna, north to Pensacola.

Head, $2\frac{4}{7}$; depth, 5 in head. D. I., 13. A. 1, 13. Length (418, Key West), 16 inches.

Body robust, not at all compressed, scarcely deeper than broad, except at base of caudal; the breadth of body between pectorals 6 in head; no keel on caudal peduncle, the lateral line not black and not more conspicuous on the tail than elsewhere.

Jaws slender, rather long, the upper jaw from eye contained 4 times in length, and $1\frac{2}{5}$ times length of rest of head. Mouth capable of being completely closed. Eye large, its diameter equal to interorbital width, $2\frac{1}{4}$ in postorbital part of head and 6 in snout.

Teeth slender and pointed, those of the inner row on each side, in each jaw, enlarged, about 25 of them being canine-like. Teeth and bones of head not green. Maxillary entirely concealed by the preorbital. Interorbital space, with a rather broad and deep median groove, which is widened and scaly anteriorly, with an inconspicuous median

ridge. Temporal and superciliary angles sharply defined, the bones above with radiating striæ. A very slight notch on temporal ridge, behind eye. Vertex with a blunt median ridge, on each side of which is a depression. Two parallel ridges on each side of occiput. No fold of skin across lower posterior edge of preopercle. Cheeks with rather large scales in 7 or 8 series; opercles with smaller scales.

Scales comparatively large, loose, not green, 85 before the dorsal fin, about 150 in the lateral line.

No gill rakers.

Dorsal fin short and rather high, the last rays short, the anterior lobe $1\frac{1}{2}$ in postorbital part of head. Base of fin a little longer than postorbital part of head. Anal longer and higher than dorsal, beginning in front of the latter. Caudal subequally lunate, little notched, the lower lobe short, about equal to postorbital part of head. Pectorals $1\frac{1}{6}$ in postorbital part of head. Ventrals very short, $2\frac{1}{3}$ in postorbital part of head, placed unusually far back, their insertion midway between base of median caudal rays and axil of pectoral.

Color, in life, very pale greenish, the lateral stripe well defined, silvery bluish, about one-third pupil, and not widened below dorsal. Edges of scales above with many dark points. A narrow blue-black line along edge of each jaw. Tips of all the vertical fins of a conspicuous pale brick-red. Other fins pale olivaceous. A blue-black vertical blotch on front of opercle above. No axillary or scapular blotch. Lining of opercles dark.

Color in spirits very pale, with a narrow greenish lateral band and black opercular blotch. This species is very common in the West Indies, as also about the Florida Keys. It is one of the most strongly marked of the group, and since its discovery has been confounded with no other.

3. Tylosurus subtruncatus.

Tylosurus scapularis Jordan & Gilbert, Bull. U. S. Fish Comm., 1881, 307; 1882, 109 (Panama); Jordan, Proc. U. S. Nat. Mus., 1885, 370 (Panama).

Habitat.—Pacific coast of tropical America; Panama.

Only the original types of this species are known. It is very close to *T. subtruncatus*, but, by its coloration at least, it may be easily distinguished.

4. Tylosurus subtruncatus.

Belone subtruncata Poey, Memorias Cuba, ii, 1861, 295 (Havana); Poey, Synopsis, 1868, 382; Poey, Enumeratio, 1875, 120.

Belone depressa Poey, Memorias Cuba, ii, 296, 1861 (Havana); Poey, Synopsis, 1868, 382; Poey, Enumeratio, 1875, 120 (not of Günther).

Tylosurus sagitta Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 25 (Key West); Jordan, l. c. 1884, 112 (Key West); Jordan, Cat. Fish. N. A., 59, 1885.

Habitat.—West Indian fauna; Key West and southward to Cuba.

Head, $2\frac{5}{6}$ in length; depth, 7 in head; breadth, at pectoral, 8 in head. D. 1, 15; A. 1, 17. Lat. l. 225. Scales before dorsal, about 150. Length of specimen, 13 inches.

This species has been well described in the Proc. U. S. Nat. Mus. under the name of *Tylosurus sagitta*. Examination of five specimens from Key West shows some variation in the size of the eye, as follows:

Eye in interorbital width.	In postorbital.	In head.
$\frac{9}{10}$	$2\frac{1}{4}$	$10\frac{1}{3}$
1	$2\frac{1}{2}$	$10\frac{1}{2}$
1	$2\frac{1}{2}$	$10\frac{1}{2}$
1	$2\frac{3}{4}$	10
$1\frac{1}{6}$	$2\frac{3}{4}$	$11\frac{1}{2}$

Contrary to the usual rule, the eye seems to be proportionately smaller in the younger specimens.

Depth of body at pectoral, $1\frac{5}{6}$ in postorbital part of head; breadth at pectoral, 2; caudal subtruncate, the lower lobe produced, longer than postorbital part of head.

This small species is rather scarce in the waters about Key West. We have seen no specimens from any other locality, but there seems to be good reason for believing that its range extends throughout the West Indies.

Belone subtruncata of Poey agrees well with our specimens. The eye ($2\frac{1}{2}$ in postorbital part of head) is too small for *T. euryops*.

The type of *Belone depressa* Poey is in the National Museum. This has been compared with the types of *T. sagitta*, by Dr. Bean, who informs me that they are identical.

It is possible that Marcgrave's figure of the Timucu, or *Esox brasiliensis** L., belongs to this species, but of this there can be no certainty.

5. Tylosurus euryops.

Tylosurus euryops Bean & Dresel, Proc. U. S. Nat. Mus. 1884, 168 (Jamaica); Jordan, Proc. U. S. Nat. Mus. 1886, 35 (Havana).

Habitat.—West Indian Fauna; Cuba, Jamaica.

Head, $2\frac{9}{10}$; depth, 6 in head; breadth, 7. D. 1, 15; A. 1, 17. Lat. l, about 200. Scales before dorsal 140. Length (958, Havana), $12\frac{1}{2}$ inches.

Body slender, more robust than in *T. subtruncatus*, not at all compressed, scarcely deeper than broad, except at base of caudal; no keel on caudal peduncle, the lateral line not black, and not more conspicuous there than elsewhere.

Jaws slender, long, the upper jaw from eye contained $4\frac{1}{2}$ times in length, and $1\frac{7}{8}$ times the length of the rest of the head. Mouth capable

* The following is the Linnæan description: "Brasiliensis, 8. E. maxilla inferiore longissima, corpore serpentino. D. 12, P. 10, V. 6, A. 17, C. 16.

"*Maregr. bras.*, 168, Timucu, Brown, jam. 443, T. 45, f. 2. Esox maxilla inferiore producta.

"*Habitat* in America *australi.*"

of being completely closed. Eye large, distinctly larger than in *T. subtruncatus*, its diameter a little less than interorbital width, $2\frac{1}{5}$ in post-orbital part of head, and 6 in the snout.

Teeth small and slender, those of the inner row on each side in each jaw fewer and smaller than in *T. notatus*. Teeth, bones, and scales not green.

Maxillary almost entirely covered by the preorbital.

Interorbital space with a rather broad and deep median groove, which is widened and scaly anteriorly, with a slight median ridge. Superciliary ridge rather sharp, temporal ridge less acute, all the bones of upper part of head with rather sharply defined ramose radiating striæ. A sharp notch in the temporal ridge, close behind eye. Vertex nearly flat, with a blunt ridge on either side. No distinct fold of skin on lower posterior edge of preopercle.

Cheeks with moderate scales, in about 12 series. Opercles with very small scales.

Scales small, not green.

No gill-rakers.

Dorsal fin rather short and low, the last rays short, the anterior lobe $1\frac{1}{2}$ in postorbital part of head. Base of fin half more than postorbital part of head. Anal longer and higher than dorsal and beginning a little before it. Caudal subtruncate, with the lower lobe produced, the lower lobe about equal to postorbital part of head. Pectorals $1\frac{1}{4}$ in postorbital part of head. Ventrals $1\frac{3}{4}$; their insertion midway between base of middle caudal rays and posterior margin of pupil.

Color dusky greenish above, the dark color produced by dark punctulations. Sides and belly pale. A well-defined dark-bluish lateral stripe which is narrow and sharply defined toward the head, becoming broader behind the middle of the body. An obscure dusky streak along middle of back. A faint dusky bar on front of opercle. Axil dusky. Fins all dusky olivaceous, the tips darker, except in the pectoral, which is rather pale. Lining of opercles dark.

A single specimen obtained by Dr. Jordan in the market at Havana furnishes our knowledge of this species. It is very close to *T. subtruncatus*, but it is more robust, with larger eye and somewhat different sculpture of the bones of the head.

Dr. Bean has compared the type of *T. euryops* with the types of *B. depressa* and *T. sagitta*, and notes the same differences.

Poey seems not to have distinguished this fish from his *subtruncata* and *depressa*.

6. **Tylosurus diplotænia.**

Belone diplotænia Cope, Trans. Am. Philos. Soc., 1871, 481 (St. Martin's).

Habitat.—West Indian Fauna.

This species is known to us only from the description of Professor Cope.

7. Tylosurus microps.

Belone microps Günther, Cat. Fish. Brit. Mus., vi, 237, 1886 (Surinam).

Habitat.—Brazilian Fauna; Surinam.

This species is known to us only from Dr. Günther's description.

8. Tylosurus amazonicus.

Belone amazonica Steindachner, Ichth. Beitr., iii, 66, 1875 (Amazon River, at Pará, Manacapuru, and Tajapuru).

Habitat.—Brazil; mouth of the Amazon.

This species is known to us only from the account given by Dr. Steindachner. It seems to be very close to *T. microps*, and as Steindachner has suggested, it may prove identical with the latter.

9. Tylosurus ardeolus.

?Belone ardeola Cuv. & Val., xvii, 1846, 425 (Martinique).
?Belone cigonella Cuv. & Val., xviii, 1846, 436 (Porto Rico).
?Belone argalus Le Sueur MSS., Cuv. & Val., xviii, 1846, 439 (Guadeloupe).
Belone depressa Günther, vi, 1866, 235. (Dominica; Jamaica) (not of Poey).

Habitat.—West Indian Fauna.

Dr. Günther has described, under the name of *Belone depressa*, a species apparently valid, but having little in common with the *Belone depressa* of Poey, which is our *Tylosurus subtruncatus*. Species more or less similar to this of Günther have been very briefly and insufficiently described by Valenciennes under the names of *ardeola*, *cigonella*, and *argalus*. We refer all these names provisionally to one species, *ardeolus*, which is unknown to us. The types of none of these species are now to be found in the museum at Paris.

10. Tylosurus stolzmanni. "Sierrita."

Belone stolzmanni Steindachner, Ichth. Beitr., vii, 21, 1878 (Tumbez, Peru).
Tylosurus stolzmanni Jordan, Proc. U. S. Nat. Mus., 1885, 370 (Mazatlan); Jordan, Cat. Fish. N. A., 59.
Tylosurus sierrita Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 458 (Mazatlan); Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 106 (Mazatlan).

Habitat.—Pacific Coast of tropical America; Mazatlan; Peru.

This species is the southern representative of *T. exilis*, from which it differs in little except the marked coloration of the pectorals. The description of *Belone stolzmanni* from Peru agrees too closely with that of *T. sierrita* from Mazatlan for us to regard the two as distinct. It has been well described in these proceedings under the name of *T. sierrita*.

11. Tylosurus exilis. California Needle-fish.

Belone exilis Girard, Proc. Ac. Nat. Sci. Phila., 1854, 189 (San Diego, Cal.); Girard, U. S. Pac. R. R. Surv. 1859, 158 (San Diego); Günther, vi, 1866, 238 (copied); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 30 (San Diego).
Tylosurus exilis Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 457 (Santa Barbara; San Pedro: San Diego); Jordan & Jouy, Proc. U. S. Nat. Mus. 1881, 13 (San Diego); Jordan & Gilbert, l. c. 1881, 43 (Santa Barbara; San Diego); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 374; Jordan, Cat. Fish. N. A., 1885, 59.

Habitat.—Coast of Southern California.

Head $2\frac{4}{5}$; depth 7 in head; breadth at pectorals 9. D. 1.15, A. 1.17. Scales 370; 280 before dorsal. Length (specimen from San Diego) 13 inches.

Body very slender, subterete, the depth medially little more than the breadth. Caudal peduncle very slender, depressed, broader than deep, the lateral line passing into moderately elevated keel, which is similar to that in *T. marinus*, but a little more conspicuous. Caudal keel scarcely darker in color than the surrounding region.

Jaws very long and slender, the upper jaw from eye $3\frac{1}{2}$ times in the length and 2 times length of rest of head.

Mouth closing almost completely, the base of the upper mandible scarcely arched at all. Eye small, about equal to interorbital width, $2\frac{3}{4}$ in postorbital part of head, and 8 in snout.

Teeth sharp and slender, about 25 in the enlarged outer series in each jaw, the small teeth between these numerous, but rather short.

Scales and probably bones also somewhat green, but less so than in *T. marinus*, much less so than in *T. raphidoma*.

Maxillary not nearly concealed by preorbital.

Interorbital area with a rather deep scaly median depression, which becomes much wider on the snout, its median ridge very small. Superciliary and temporal ridges little prominent, scarcely striate, the temporal ridge nearly straight, without notch behind eye, but with a distinct lateral process about as long as pupil above preopercle. Vertex not depressed. No fold of skin across preopercle.

Cheeks and opercles covered with very small scales, the cheek scales in about 27 rows. No gill rakers.

Dorsal fin rather low, the posterior rays low; the anterior lobe $1\frac{1}{4}$ in postorbital part of head; base of the fin equal to eye and postorbital part of head.

Anal higher than dorsal, and beginning considerably farther forward.

Caudal fin formed as in *T. marinus*, the lower lobe one-fifth longer than postorbital part of head. Posterior margin of the fin slightly lunate.

Pectorals $1\frac{1}{6}$ in postorbital part of head. Ventrals $1\frac{3}{4}$, their insertion midway between base of middle caudal rays and edge of preopercle.

Color light green, silvery below. A distinct bluish-silvery lateral band which becomes broader under the dorsal fin. Opercular bar very faint or obsolete. Fins all pale, the caudal and dorsal with some dark points, becoming a little dusky.

This species is common on the coast of Southern California, where it represents the *marinus* of the Atlantic Coast. In all respects of size and habits the two are remarkably similar, and the Pacific species is scarcely distinguishable except by the greater slenderness of the body.

12. Tylosurus marinus. Common Gar-fish, Bill-fish, or Needle-fish.

Bill-fish, Schöpf, Schrift. Gesellsch. Naturf. Freunde, viii, 177, 1788 (Long Island).

Esox belone var. *marinus* Bloch & Schneider, Systema Ichthyol., 1801, 391 (description erroneous; after Schöpf).

Tylosurus marinus Jordan & Gilbert, Syn. Fish. N. A., 1883, 901; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 387 (Charleston); Bean, Proc. U. S. Nat. Mus., 1883, 366 (Havre de Grace); Jordan & Swain., Proc. U. S. Nat. Mus., 1884, 231 (Cedar Key, Fla.); Jordan, Cat. Fish. N. A., 1885, 59; Jordan, Proc. U. S. Nat. Mus., 1885 (Beaufort).

Esox longirostris Mitchill, Am. Monthly Mag., ii, 1818, 322 (Hudson R.).

Belone longirostris Gill, Cat. Fish. East Coast N. A., 1861, 38; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 368 (Neuse R., N. C.); Jordan & Gilbert, l. c., 1878, 383 (Beaufort, N. C.); Bean, Proc. U. S. Nat. Mus., 1879, 31 (Kiel Bay); Goode, l. c., 1879, 116 (St. John's River, Florida); Bean, Proc. U. S. Nat. Mus., 1879, 150 (Pensacola); Bean, l. c., 1880, 103 (Noank, Conn.; Wood's Holl, Mass.).

Tylosurus longirostris Jordan & Gilbert, Syn. Fish. N. A., 1883, 374.

Belone truncata Le Sueur, Journ. Ac. Nat. Sci. Phila., i, 126, 1821 (New York Market; Philadelphia Market; Newport Market); Storer, Rept. Fish. Mass., 1839, 98 (Holmes' Hole, Martha's Vineyard); De Kay, New York Fauna, Fishes, 1842, 227, pl. 35, f. 112; Storer, Synopsis, 1846, 186; Cuvier & Valenciennes, Hist. Nat. Poiss., xviii, 422 (New York; Philadelphia; Newport; New Orleans).

Belone truncata Günther, vi, 1866, 244 (New Orleans; in part; other localities mentioned, "Jamaica," "Bahia," "Demerara," probably belong to *T. almeida*).

Belone scrutator, Girard, U. S. Mex. Bound. Surv., Ichth., 30, pl. 13, f. 1, 1859 (Brazos Santiago; Saint Joseph's Island, Texas).

Habitat.—Atlantic Coast of the United States, from Cape Cod to Northern Florida and Texas, ascending all the rivers.

Head, $2\frac{4}{5}$; depth, $5\frac{1}{2}$ (in head); breadth at pectorals, $7\frac{1}{4}$ in head. D. 1. 15, A. 1. 17. Scales, 300; 240 series before dorsal. Length (3646; Beaufort, N. C.), 22 inches.

Body rather slender, not at all compressed; almost as broad as deep medially; caudal peduncle depressed, broader than deep, the lateral line passing into a slight elevated ridge or keel, which is not black.

Jaws slender, long; the upper jaw, from eye, contained $4\frac{1}{2}$ times in length, and 2 times length of rest of head. Mouth not capable of being completely closed, there being a very slight arch of base of upper mandible. Eye moderate, proportionately larger in adult specimens, about $1\frac{1}{6}$ in interorbital width, $2\frac{1}{4}$ to $2\frac{1}{2}$ in postorbital part of head and 7 in snout.

Teeth rather large; about 30 of the large teeth in the outer row on each side of each jaw, the small teeth between and outside of these unusually large and conspicuous.

Bones and scales more or less green.

Maxillary not nearly concealed by the preorbital.

Interorbital area with a broad, shallow scaly depression, which has a rather broad median ridge. Superciliary and temporal ridges mod-

erately prominent, coarsely striate. Vertex flattish, not depressed. Temporal ridge without distinct notch behind eye. Two parallel ridges on each side of occiput. No fold of skin across preopercle on lower posterior margin.

Cheeks covered with small scales in about 16 rows; opercle covered with similar scales which are scarcely smaller.

No gill-rakers.

Dorsal fin of moderate length and height, the posterior rays low, even in young specimens, the anterior lobe $1\frac{1}{3}$ in postorbital part of head; base of the fin equal to eye and postorbital part of head.

Anal a little higher than dorsal, and beginning a little farther forward.

Caudal slightly lunate, the middle rays a little shorter than upper; the lower a little produced, a little longer than postorbital part of head.

Pectorals equal to postorbital part of head. Ventrals $1\frac{4}{5}$ in postorbital part of head, their insertion midway between origin of middle caudal rays and edge of preopercle.

Color, clear greenish above, sides and below silvery; a narrow, bluish silvery lateral streak, less distinct than in *T. subtruncatus* and *T. notatus*, becoming wider and usually fainter under the dorsal. This stripe is usually plainer in young examples. A conspicuous dark bar on front of opercle. A dark median stripe on back. Fins dusky olivaceous, with no distinct black markings. Axil dusky.

The synonymy of this species offers little room for doubt. The description given by Bloch & Schneider amounts to nothing, but such as it is, it is drawn from Schöpf, and no doubt seems to exist as to what Schöpf had in mind.

The synonymy, as well as the description given by Dr. Günther, indicates the confusion of this species with others, especially with *T. almeida*. No other author seems to have recorded *T. marinus* from the West Indies, and we question its occurrence there. It is not found at Key West or Havana.

13. Tylosurus almeida.

? Timucu Marcgrave, Pisc. Brasil., 1648, 168 (Brazil).

? Esox brasiliensis Linnæus, Systema Naturæ, ed. x, 1748, 314 (in part based on *Timucu* of Marcgrave, and on a description of a *Hemirhamphus* from Jamaica by Brown, the name *brasiliensis* evidently taken from Marcgrave; the description chiefly from Brown: not of Bloch, who uses the name for a *Hemirhamphus*).

Belone almeida Quoy & Gaimard, Voyage de l'Uranie, Zoöl., 226, 1824 (fide Cuv. & Val.).

Belone timucu Cuvier & Valenciennes, xviii, 1846, 426 (Rio Janeiro); Guichenot "Ramon de la Sagra, Poiss., pl. 4, f. 1, abt. 1860" (Cuba).

Belone truncata var. *guianensis* Günther, vi, 245, 1866 (Surinam); (not of Müller & Troschel).

Habitat.—West Indian Fauna; Cuba to Brazil.

Typical examples of *Belone timucu* in the museum at Paris belong to

a species very close to *T. marinus*, differing chiefly in the smaller eye (3 to $3\frac{1}{4}$ in postorbital part of head) and in the fewer fin-rays (D. 13 or 14; A. 15 or 16). The type of *Belone almeida* Q. & G. is regarded by Valenciennes as identical with his *B. timucu*, but the scanty description of Quoy and Gaimard is of little value for purposes of identification. The species was named for Don Fr. Almeida, a young secretary of the Portuguese legation at Paris.

This species may be the *Timucu* of Marcgrave, and therefore the original *Esox brasiliensis* of Linnæus, but the figure of Marcgrave looks even more like the *T. subtruncatus* than like *T. almeida*.

Doubtless further material will show *T. almeida* to be the southern representative or subspecies of *T. marinus*, as supposed by Dr. Günther, and the two may be wholly inseparable.

14. Tylosurus fodiator.

Tylosurus fodiator Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 859 (Mazatlan); Jordan & Gilbert, Bull. U. S. Fish Com., 1882, 106 (Mazatlan); Jordan, Proc. U. S. Nat. Mus., 1885, 370; Jordan, Cat. Fish. N. A., 1885, 59.

Habitat.—Pacific Coast of Mexico; Mazatlan.

This very large and robust species has been thus far found only about Mazatlan. It represents on the Pacific coast the *raphidoma* of the Atlantic.

15. Tylosurus raphidoma. Hound-fish; Aguja de Casta.

Belone raphidoma Ranzani, Nov. Comm. Acad. Sci. Inst. Bonon, v, 1842, 359, pl. 37, f. 1 (Brazil); Günther, vi, 249, 1846 (copied).

Tylosurus raphidoma Jordan, Proc. U. S. Nat. Mus., 1886, 35 (Havana).

Belone gerania Cuv. & Val., xviii, 437 (Martinique); Günther, vi, 241, 1846 (copied).

Belone crassa Poey, Memorias, ii, 291, 1861 (Cuba); Poey, Synopsis, 1868, 382; Poey, Repert., ii, 1869, 165; Enumeratio, 1875, 120.

Tylosurus crassus Jordan, Proc. U. S. Nat. Mus., 1884, 112 (Key West); Jordan, Cat. Fish. N. A., 1885, 59.

Belone melanochira Poey, Memorias, ii, 294, 1861 (Havana); Günther, vi, 249, 1866 (copied); Poey, Synopsis, 1868, 382; Poey, Enumeratio, 1875, 120.

Tylosurus gladius Bean, Proc. U. S. Nat. Mus., 1882, 430 (Pensacola); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 901; Bean & Dresel, Proc. U. S. Nat. Mus., 1884, 168 (Jamaica).

Adult ($26\frac{1}{2}$ inches in length), from Key West. Head, $3\frac{1}{3}$ in length; depth at pectoral, $4\frac{3}{4}$ in head; breadth at pectoral, $5\frac{1}{5}$ in head; depth in postorbital part of head, $1\frac{1}{4}$; breadth in same, $1\frac{1}{2}$. Eye in head, 9; in postorbital part, $2\frac{1}{5}$; D. I, 21 to 1, 24; A. I, 21 to 1, 23; lat. l. more than 300; 225 scales before dorsal.

Young ($19\frac{1}{2}$ inches), from Key West. Head, $3\frac{1}{6}$; depth at pectoral, $5\frac{1}{4}$ in head; breadth at pectoral, $5\frac{5}{6}$ in head; depth in postorbital part, $1\frac{1}{4}$; breadth, $1\frac{1}{2}$. Eye in head, $8\frac{1}{2}$; in postorbital part, $2\frac{1}{10}$. Dorsal fin inserted almost opposite front of anal; the latter less advanced than in other species. Anal fin shorter than dorsal.

This species has been well described, both by Dr. Bean and by Dr. Jordan. It seems to be common through the West Indies, the numerous specimens before us, of all sizes, being from Key West and Havana.

This is certainly the *gladius* of Bean, and the *crassa* of Poey. A type of *Belone melanochira* of Poey is in the National Museum, and this, Dr. Bean informed us, is identical with young specimens of the present species collected by Dr. Jordan at Key West.

The *Belone gerania* of Valenciennes is scantily described, but the probabilities are that this species was intended, although some of the measurements are erroneous, or, at least, ambiguous (son bec * * * "ne dépasse la longueur de la joue que d'un cinquième"). The eye in *B. gerania* would seem to be unusually large, more than half the postorbital part of the head. We have not seen the original account of *Belone raphidoma*. The extract given by Dr. Günther applies best to this species, with which Günther has identified it. The statement that the origin of the dorsal is opposite that of the anal especially indicates this species rather than *T. aeus*, in which the anal begins farther forward. A tracing of Ranzani's figure of *B. raphidoma* has been sent to us by Mr. Garman. It agrees entirely with the present species. The type of *Belone crassa* Poey, now in the museum at Cambridge, has been compared by Mr. Garman with Ranzani's description, and no differences are apparent. There is, therefore, apparently no doubt that the name *raphidoma* should be retained for this species.

Young specimens of this species have the beak more slender and rather longer proportionally, the last rays of the dorsal more elevated, and the tips of the fins, especially the posterior half of the pectoral, more decidedly black.

16. Tylosurus galeatus.

Belone galeata Cuv. & Val., Hist. Nat. Poiss., xviii, 1846, 429 (Cayenne).

Habitat.—West Indian Fauna.

We know this species only from the description given by Valenciennes. If this be correct, it should be a species distinct from *T. raphidoma*, from which it seems to differ in the fin-rays (D. 15, A. 17), and in having the caudal little forked, with no keel on its peduncle; from *T. notatus* it would seem to differ in having the beak rather strong and only $1\frac{2}{3}$ times the length of the rest of the head. The scales are said to be small, and the description* of the upper part of the head suggests *T. raphidoma*. We are unable to find the type either of *B. gerania* or *B. galeata* in the museum at Paris.

* "Remarquable par l'espèce de casque osseux que dessinent sur la tête les os du crâne ; toute leur surface est lisse ; la cannelure est très large et comme évasée dans la région des os du nez ; les bords ont des échancrures qui rappellent à certains égards ceux d'un violon." (Cuv. & Val.).

17. Tylosurus pacificus.

Belone pacifica Steindachner, Ichth. Beitr., iii, 65, 1875 (Panama; Acapulco).
Tylosurus pacificus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 624 (Panama); Jordan, Proc. U. S. Nat. Mus., 1885, 370 (Panama).

Habitat.—Panama Fauna; Acapulco, Panama.

This species is the Pacific coast representative of *T. acus*, from which it is scarcely to be distinguished except by the rather stouter body, smaller teeth, and shorter vertical fins. Two or three specimens were found by Professor Gilbert in the markets of Panama.

18. Tylosurus acus. Hound-fish; Agujon.

Sphyræna acus Lacépède, Hist. Nat. Poiss., v, 1803, 6, pl. 1, f. 3. (Martinique; from a drawing by Plumier.)
Tylosurus acus Bean, MSS.
?Esox imperialis Rafinesque, Caratteri di Alcuni Nuovi Generi, 1810, 59 (Palermo).
?Tylosurus imperialis Doderlein, Prospetto Metodico Pesci della Sicilia, 1879, 58 (Palermo).
Belone caribbæa Günther, vi, 1866, 241 (Dominica; Jamaica; New Orleans); Cope, Trans. Am. Phil. Soc., 481, 1871 (Lesser Antilles) (not of Le Sueur).
Tylosurus caribbæus Jordan, Cat. Fish. N. A., 1885, 59; Jordan, Proc. U. S. Nat. Mus., 1886, 26 (Beaufort).
?Tylosurus cantrainii Cocco, "Lettere in Giorn. Sci. Lett. Sic., xviii. 18, tab. 1, f. 4, 1829" (Messina): Bonaparte, Fauna. Ital. Pesc.
?Belone cantrainii Cuv. & Val., xviii, 418, 1846 (copied); Günther, vi, 242 (copied).
Belone latimana Poey, Memorias Cuba, ii, 290, 1861 (Havana); Günther, vi, 1866, 249 (copied); Goode, Proc. U. S. Nat. Mus., 1878, 6 (Buzzard's Bay, Mass.).
Belone jonesi Goode, Amer. Journ. Sci. Arts, 1877, 295 (Bermuda); Goode, Proc. U. S. Nat. Mus., 1878, 462 (Bermuda).
Belone jonesi Günther, Ann. Mag. Nat. Hist., iii, 1879, 150 (Bermuda).
Belone hians Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 383 (Beaufort, N. C.; Young).

Habitat.—West Indian Fauna. Bermudas, straying northward to Cape Cod, and perhaps crossing the ocean to Sicily.

It is possible that more than one species is included in the above synonymy, but so far as we can decide, all these names refer to a single species, widely distributed and varying somewhat with age.

The best description of this species extant is that of Professor Goode under the name of *Belone jonesi*, and his description we may now adopt for this species as understood by us.

So far as the description goes, the *jonesi* of Günther may be either this species or *raphidoma*, but as Günther's types as well as Goode's came from Mr. J. Matthew Jones at Bermuda, we may accept, as unquestioned, Goode's statement that the two are identical. We have seen that the height of the last dorsal rays is subject to great variation in *T. raphidoma*, the young as a rule having these rays elevated, as also some old examples, while in others, these rays are short, the tips being apparently worn off. According to Dr. Bean, who has compared specimens of *T. latimanus* with the types of *T. jonesi*, no other tangible differences

exist and these may all be regarded as forming a single species. It is probable also, as Dr. Bean has already noticed, that the *Sphyræna acus*, roughly figured by Lacépède, is the same species. The long snout separates it from *raphidoma*, the small eye from *T. caribbæus*, and the long fins and other characters distinguish it from the other West Indian species. The species should then, without much doubt, be designated as *Tylosurus acus*.

The *Belone caribbæa* of Le Sueur may be the same, but in the specimens in the museum at Paris the eye is very large, larger than in *B. hians* and half the postorbital part of the head. These have a similar prolongation of the last rays of the dorsal. The upper jaw in *T. caribbæus* is arched at base, somewhat as in *T. hians*. In Günther's description of *Belone caribbæa*, the last rays of the dorsal are said to form a lobe as high as the anterior lobe, while the eye is said to be $2\frac{1}{2}$ times in the postorbital part of the head.

If Günther's *Belone caribbæa* with the elevated posterior dorsal rays be regarded as synonymous with *T. acus*, there seems to be no reason why the European *T. imperialis* (=*T. cantraini*) may not be the same species also. This species is rather rarely taken off the coasts of Sicily, according to the Italian authors. Its descriptions agree fully with those of our *acus*, excepting in the elevation of the dorsal fin, in which it agrees with Günther's account of *T. caribbæus*, and with a young example of *T. acus* taken by Dr. Jordan at Beaufort. If this identification be correct, this will be another example of fishes common to Mediterranean and West Indian waters (as *Myctenoperca scirenga*, *Sparus pagrus*, *Mullus surmuletus*, etc.).

Rafinesque's rough figure of his *Esox imperialis* shows the upper jaw very slightly arched at base. It may be that his fish is our *T. caribbæus*, if indeed that be not the same as *T. acus*. In any case, the nomenclature of neither species can be regarded as definitely settled.

We are indebted to Professor Pietro Doderlein for the following notes (here translated from the Italian) in regard to the Italian species known as *Tylosurus imperialis:*

"As to *Tylosurus imperialis*, I will say that I find the figure and description of Lacépède (*Esox belone*, 1, v, pl. 7, p. 308) corresponding closely to the species in question (with the exclusion of a great part of the synonymy). In this it is evident that Lacépède has confused several different species. I find that this species corresponds in many characters with *Belone caribbæa* Le Sueur, Günther, and the *Belone latimana* Poey, and I presume that these forms represent a single species, as you have already suggested (Syn. Fish. N. A., pp. 901, 397). As you know, certain small differences may always exist among individuals from different waters, and between adults and young. This is here the case. The number of rays in the vertical fins is variable in certain limits, the number seemingly increasing with age. The length of the snout is also variable, being a little longer in proportion in the young. But

this will not prevent us from seeing in these a single identical species, all the characters of importance being always alike.

"The museum of Palermo has of this *Tylosurus* three large prepared skins, two skeletons, and one young specimen in alcohol. For better comparison I give here the measurements of all these:

	Stuffed specimen, total length M. 1.22.	Stuffed specimen, total length M. 0.95.	Stuffed specimen, total length M. 0.94.	Skeleton, total length M. 0.955.	Skeleton, total length M. 0.94.	Young example in alcohol, length M. 0.408.
Length from tip of snout to front of dorsal	M. 0.90	M. 0.70	M. 0.69	M. 0.695	M. 0.685	M. 0.295
Length from tip of snout to origin of ventral	.70	.53	.53	.54	.526	.226
Length from tip of snout to origin of pectoral	.31	.26	.26	.264	.26	.115
Length from tip of snout to front of eye	.20	.17	.17	.17	.17	.08
Distance from front of eye to gill opening	.11	.08	.08	.085	.084	.034
Length of head	.315	.253	.26	.265	.264	.116
Depth at pectoral	.059	.059	.06			
Dorsal rays	25	24	24	25	24	23
Anal rays	23	22	22	23	22	22
Pectoral rays	13	13	13	13	13	13
Ventral rays	I, 5	I, 5	I, 5	I, 5		I, 5

19. Tylosurus caribbæus.

Belone caribbæa Le Sueur, Jour. Acad. Nat. Sci. Phila., ii, 1821, 127 (Caribbean Sea); Cuvier & Valenciennes, xviii, 1846, 430 (Martinique; St. Bartholomew).

Belone altipinna, Poey, Memorias, 293, 1861 (Cuba): Poey, Syn., 381, 1868: Poey, Enumeratio, 120, 1875.

Habitat.—West Indian Fauna; Cuba.

We know this species only from the specimens from Martinique in the museum at Paris, described by Valenciennes. It is very close to *T. acus*, and may be the same, but the upper jaw is somewhat arched at base and the eye is very large ($2\frac{1}{10}$ in postorbital part of head). Poey's *B. altipinna* is doubtless identical with these specimens, and the original *caribbæa* of Le Sueur is presumably the same.

20. Tylosurus hians.

Belone hians Cuvier & Valenciennes, xviii, 432, 1846 (Havana, Bahia); Günther, vi, 1866, 248 (West Indies, Bahia); Steindachner, Ichth. Beitr., iii, 64, 1875 (Acapulco); Goode, Proc. U. S. Nat. Mus., 1879 (Florida).

Tylosurus hians Jordan & Gilbert, Synopsis, 1883, 373, 901; Jordan, Proc. U. S. Nat. Mus., 1885, 370; Jordan, l. c. (Havana): Jordan, Cat. Fish. N. A., 1885, 59.

Belone maculata Poey, Memorias, ii, 290, 1861 (Havana): Cope, Trans. Am. Philos. Soc., 1871, 481 (St. Kitts).

Habitat.—West Indies ranging to Brazil, and occasionally northward. Also recorded from the Pacific coast at Acapulco.

Head, 4; depth at pectoral in head, 4; breadth, 9 in head; depth, a little more than postorbital part of head; breadth, 2 in same. D. I,25; A. I,26; lat. l. about 520; 430 scales before dorsal. Length, 956 I. U. from Havana, 32 inches.

Body strongly compressed, deepest above ventrals, where it is more

than twice as deep as broad; caudal peduncle not compressed, without keel, the lateral line not conspicuous and not black.

Jaws long and very slender, upper jaw with a peculiar arch at base, so that for a distance about equal to length of eye the two jaws do not come in contact. In this region only small teeth are present in either jaw. In front of this open space the teeth in both jaws are rather large, but smaller than in most of the species. Anteriorly they become again quite small, and toward the front of the jaw only minute teeth are present. Above the open space in jaw the upper surface of the jaw is very convex, both transversely and longitudinally; anteriorly the jaw is much depressed, with a median groove; snout, $5\frac{3}{4}$ in length of body, twice length of rest of head, maxillary entirely concealed by the preorbital.

Top of head with a broad shallow median groove, covered with transparent skin and anteriorly scaly. Superciliary bones not prominent, the bones with longitudinal striæ; vertex depressed, not scaly.

Eye large, $1\frac{1}{5}$ in interorbital space; in head, $9\frac{1}{2}$; $2\frac{1}{2}$ in postorbital part of head, 7 in snout.

Cheeks and preopercle rather closely scaled except below. Opercle naked, covered with smooth silvery skin. A little fold of skin like a mucous tube across lower anterior part of preopercle; this less conspicuous than in *T. raphidoma*.

Scales very small, green. Teeth and bones more or less green. No gill-rakers.

Dorsal fin falcate, the anterior lobe $3\frac{1}{4}$ in head; the last rays also more or less elevated, especially in the young, the longest of these rays in adult $5\frac{3}{4}$ in head. Anal higher than dorsal, and beginning further forward; the posterior rays not at all elevated. Pectorals long, falcate, $3\frac{3}{5}$ in head. Ventrals $4\frac{2}{3}$ in head, their insertion midway between base of middle rays of caudal and front of arch of upper jaw. Caudal deeply forked, the lower lobe $2\frac{2}{3}$ in head: the upper, 3.

Color in spirits deep green above, sides bright silvery (young with a series of round dark blotches). A dusky bar on front of opercle; fins all dusky; the tips of the rays black, especially the pectorals, ventrals, and lobes of dorsal and anal.

Our specimens of this species are from Cuba and from Beaufort, North Carolina. No real doubt is connected with the synonymy of this species. The insertion of the ventrals is incorrectly given by Valenciennes as "a little before the middle of the total length." This mistake or ambiguity of expression is corrected by Poey, who however gives a new name, *maculata*, to the Cuban species. We regard *maculata* as without question identical with *hians*.

Steindachner identifies with *T. hians* specimens obtained by him at Acapulco. If this identification be correct, this is the only species of the group common to the two coasts of America.

The *Belone hians* is so remarkably different in the form of the body from the other species of *Tylosurus*, that it may be regared as forming

a distinct subgenus or possibly genus. For this group the name *Athlennes** has been given. But one species is known. Its characters are given in contrast with those of the species of *Tylosurus* in our analysis of the latter.

Genus III. POTAMORRHAPHIS.

POTAMORRHAPHIS Günther, vi, 1866, 256 (*taniata*).

This genus is well distinguished from the others in the family by the form of its dorsal and caudal fins. Its single known species inhabits the fresh waters of Brazil and Guiana.

ANALYSIS OF SPECIES OF POTAMORRHAPHIS.

a. Dorsal rays 30 to 34; anal rays 25 to 30; lat. l. 180; trunk tetraëdral, as broad as deep; tail long, strongly compressed, without keel; beak broad, strongly depressed, the lower jaw broader and longer than upper; teeth small; eye small, $2\frac{1}{2}$ in postorbital part of head; maxillary half hidden; ventrals far back, inserted midway between base of pectoral and caudal; anterior rays of dorsal very low, those of anal considerably elevated. A dusky lateral band on sides. GUIANENSIS, 21.

21. Potamorrhaphis guianensis.

Belone guianensis "Schomburgk, Fish, Guiana, 1841, ii, pl. 1, 131" (Guiana; name only?).

Tylosurus guianensis Müller & Troschel, "Schomburgk, Reise Brit. Guiana, iii, 626, 1843" (Guiana).

Belone scolopacina Cuv. & Val., xviii, 428, 1846 (Rio de la Mana, Cayenne); Günther, vi, 256 (copied).

Belone taniata Günther, vi, 256, 1866 (Rio Capin, Brazil).

Potamorrhaphis taniata Steindachner, Ichth. Beitr., iii, 68, 1875 (Amazon River at Teffé, Villa Bella, Porto do Moz, Santarem, Gurupa, Hyavary River, Lake Manacapuru, etc.).

Habitat.—Rivers of Guiana and Brazil.

Head $2\frac{3}{4}$; depth 8 in head; breadth at pectoral $8\frac{1}{3}$; D. 34; A. 30; Lat. l. about 174; scales before dorsal 108; length (specimens from Itaituba) $8\frac{1}{2}$ inches.

Body slender, subquadrate in section, broad anteriorly; tail long and slender, much compressed, the lateral line not forming a keel and not black.

Jaws very long and slender, the lower much broader than the upper and somewhat longer; length of upper jaw from eye $3\frac{2}{3}$ times in length of body and $2\frac{1}{2}$ times length of rest of head. Mouth closing completely. Eye small, its diameter $1\frac{1}{5}$ in interorbital space, $2\frac{1}{3}$ in postorbital part of head and 10 in snout. Teeth very small and slender (in comparison with those of most species of *Tylosurus*). Teeth, bones, and scales apparently not green; maxillary not nearly covered by the preorbital.

Interorbital space with a deep naked channel, on each side of which is a slight ridge; vertex somewhat convex; superciliary ridge rather sharp; bones of head little striate; no distinct fold of skin across edge of preopercle; cheek entirely scaled, its scales moderate in size, scales on body comparatively large.

*Ἀθλεννής, "without mucosity," an epithet applied by early authors to their βελόνη or *Acus*, according to Valenciennes.

No gill-rakers.

Dorsal fin long and low, not at all falcate, its rays gradually and slowly shortened from the first; first dorsal ray 2 in postorbital part of head. Anal fin falcate, its insertion a little behind that of dorsal, its lobe $1\frac{1}{5}$ in postorbital part of head.

Caudal fin pointed, its length $1\frac{1}{6}$ times postorbital part of head. Ventral inserted far back, midway between base of caudal and base of pectoral.

Pectoral very narrow and pointed as long as postorbital part of head.

Color in our specimens entirely faded; the middle of sides apparently with a darker lateral shade.

Our specimens of this species are from Itaituba, in Brazil. According to Dr. Steindachner, it is very abundant in the Amazon River.

Steindachner says that the "oldest name for this species is that of *Belone? guianensis* Schomburgk; since, however, no description is given in Schomburgk's work, that proposed by Dr. Günther may be retained." We have not examined either Schomburgk's work or that of Müller & Troschel, but it is presumable that either the one or the other contains description enough to justify the use of Schomburgk's name, in preference to the later one of Valenciennes. We have examined the types of *Belone scolopacina* in the museum at Paris. They belong to the species here described. The very bad condition of the specimens led Valenciennes to make a gross miscount of the fin-rays ("D. 14; A. 17").

RECAPITULATION.

We here repeat the list of the species of American and European *Belonidæ* recognized by us, with an indication of their geographical distribution: C. (California); P. (Panama fauna); E. (Europe); W. (West Indies); R. (Rivers of Brazil); U. (Atlantic Coast of the United States).

Genus 1. BELONE Cuvier.

1. *Belone belone* L. E. (Perhaps two or three species included in the synonymy.)

Genus 2. TYLOSURUS Cocco.

§ *Tylosurus.*

2. *Tylosurus notatus* Poey. W. U.
3. *Tylosurus scapularis* Jordan & Gilbert. P.
4. *Tylosurus subtruncatus* Poey. W. U. (Synonymy somewhat doubtful; perhaps should be called *brasiliensis*.)
5. *Tylosurus euryops* Bean & Dresel. W.
6. *Tylosurus diplotænia* Cope. W. (Species unknown to us.)
7. *Tylosurus microps* Günther. R.
8. *Tylosurus amazonicus* Steindachner. R. (Perhaps identical with *T. microps*.)
9. *Tylosurus ardeolus* Cuv. & Val. W. (Species doubtful as to name and synonymy; unknown to us.)
10. *Tylosurus stolzmanni* Steindachner. P.
11. *Tylosurus exilis* Girard. C.
12. *Tylosurus marinus* Bloch & Schneider. U.
13. *Tylosurus almeida* Quoy & Gaimard. W. (Perhaps to be called *T. brasiliensis*; probably a variety of *T. marinus*.)

14. *Tylosurus fodiator* Jordan & Gilbert. P.
15. *Tylosurus raphidoma* Ranzani. W. U. (Some of the synonymy uncertain.)
16. *Tylosurus galeatus* Cuv. & Val. W. (Species unknown to us.)
17. *Tylosurus pacificus* Steindachner. P.
18. *Tylosurus acus* Lacépède. W. U. E.? (Perhaps two or three species (*acus, imperialis, longimanus*) included in the synonymy.)
19. *Tylosurus caribbæus* Le Sueur. W. (Some of the synonymy doubtful.)

§ *Athlennes* Jordan & Fordice.

20. *Tylosurus hians* Cuv. & Val. W. U. P.

Genus 3. POTAMORRHAPHIS Günther.

21. *Potamorrhaphis guianensis* Schomburgk. R. (Perhaps to be called *P. scolopacina.*)

List of nominal species, with identifications.

[Tenable specific names are in italics.]

List of nominal species.	Date.	Identification.
Esox *belone*, Linnæus	1758	Belone belone.
Esox brasiliensis, Linnæus	1758	Hemirhamphus balao.
		? Tylosurus almeida.
Esox belone var. *marinus*, Bloch & Schneider	1801	Tylosurus marinus.
Sphyræna *acus*, Lacépède	1803	Tylosurus acus.
Esox imperialis, Rafinesque	1810	Tylosurus (acus?) imperialis.
Esox longirostris, Mitchill	1818	Tyl. marinus.
Belone *caribbæa*, Le Sueur	1821	Tyl. caribbæus.
Belone *almeida*, Quoy & Gaimard	1825	Tyl. almeida.
Belone acus, Risso	1826	Belone belone.
Belone vulgaris, Fleming	1828	Belone belone.
Belone rostrata, Faber	1829	Belone belone.
Tylosurus cantrainii, Cocco	1829	Tyl. (acus?) imperialis.
Hemirhamphus europæus, Yarrell	1837	Belone belone.
Belone *guianensis*, Schomburgk	1841	Potamorrhaphis guianensis.
Belone *raphidoma*, Ranzani	1842	Tyl. raphidoma.
Belone *ardeola*, Cuv. & Val	1846	Tyl. ardeolus.
Belone timucu, Cuv. & Val	1846	Tyl. almeida.
Belone scolopacina, Cuv. & Val	1846	Potam. guianensis.
Belone *galeata*, Cuv. & Val	1846	Tyl. galeatus.
Belone *hians*, Cuv. & Val	1846	Tyl. hians.
Belone cigonella, Cuv. & Val	1846	Tyl. ardeolus?
Belone gerania, Cuv. & Val	1846	Tyl. raphidoma.
Belone argalus, Le Sueur	1846	Tyl. ardeolus?
Macrognathus scolopax, Gronow	1854	Belone belone.
Belone *exilis*, Girard	1854	Tyl. exilis.
Belone scrutator, Girard	1859	Tyl. marinus.
Hemirhamphus obtusus, Couch	1860	Belone belone.
Belone maculata, Poey	1861	Tyl. hians.
Belone crassa, Poey	1861	Tyl. raphidoma.
Belone latimana, Poey	1861	Tyl. acus.
Belone altipinna, Poey	1861	Tyl. caribbæus.
Belone *notata*, Poey	1861	Tyl. notatus.
Belone melanochira, Poey	1861	Tyl. raphidoma.
Belone *subtruncata*, Poey	1861	Tyl. subtruncatus.
Belone depressa, Poey	1861	Tyl. subtruncatus.
Belone limnæi, Malm	1866	Belone belone.
Belone *microps*, Günther	1866	Tyl. microps.
Belone gracilis, Günther	1866	Belone (belone) gracilis.
Belone euxini, Günther	1866	Belone (belone) euxini.
Belone cornidii, Günther	1866	Belone (belone) cornidii.
Belone tæniata, Günther	1866	Potam. guianensis.
Belone *diplotænia*, Cope	1871	Tyl. diplotænia.
Belone *pacifica*, Steindachner	1875	Tyl. pacificus.
Belone *amazonica*, Steindachner	1875	Tyl. (microps) amazonicus.
Belone jonesi, Goode	1877	Tyl. acus.
Belone *stolzmanni*, Steindachner	1878	Tyl. stolzmanni.
Belone jonesi, Günther	1879	Tyl. acus.
Tylosurus sierrita, Jordan & Gilbert	1881	Tyl. stolzmanni.
Tylosurus *fodiator*, Jordan & Gilbert	1881	Tyl. fodiator.
Tylosurus *scapularis*, Jordan & Gilbert	1881	Tyl. scapularis.
Tylosurus gladius, Bean	1882	Tyl. raphidoma.
Tylosurus sagitta, Jordan & Gilbert	1884	Tyl. subtruncatus.
Tylosurus *euryops*, Bean & Dresel	1884	Tyl. euryops.

INDIANA UNIVERSITY,
January 22, 1886.

DESCRIPTION OF RALLUS JOUYI, WITH REMARKS ON RALLUS STRIATUS AND RALLUS GULARIS.

By LEONHARD STEJNEGER.

Rallus striatus is said to occur from India throughout Burmah, Cochin China, Malacca, Sumatra, Java, Southern China, the Philippine Islands, and Formosa. But it seems that several species or subspecies have been lumped together under this name. The type of *R. striatus* came from the Philippines, and Brisson described it as having "the lower part of the hind neck, back and scapulars of a blackish brown, each feather being marked on both sides with transverse whitish spots" (Ornith., V, 1760, p. 168). A specimen in the National Museum (No. 77009), said to have come from the Philippine Islands, agrees very minutely with his full and excellent description, and I, therefore, take it to be the typical *R. striatus*.

Two specimens before me (U. S. Nat. Mus., Nos. 15427, 95823), one obtained by Peale in "Malacca," the other by Dr. Cantor in Penang, may be regarded as nearly typical *R. gularis* HORSF., which was originally described from Java.

The other specimens in our museum (Nos. 85751, 85752) differ considerably from the foregoing ones, as will be shown further on, and as they were obtained by Mr. P. L. Jouy, whose excellent collections from China and Japan have added so much to our knowledge of the ornithology of these countries, I take great pleasure in calling this unnamed species *Rallus jouyi* or *Hypotænidia jouyi*.

Rallus striatus LINN. (S. N., 12 ed., 1766, I, p. 262) has the upper surface blackish brown with small, but very distinct white dots, which on the wings extend transversely into sharply-defined white bars, while in the other two forms the color of the back is more or less olive; the rufous on the upper head and neck is deeper, nearly chestnut, and in the middle, from the bill down to the back, washed so strongly with dusky that it blends nearly imperceptibly with the blackish brown of the back, while the outer edges of the chestnut portion form a brighter band running from the supraloral region over the eyes and down along the sides of the neck, ill-defined above, but sharply contrasting with the gray of the sides of the head and neck. Lores, cheeks, fore neck and breast gray, darker than in the allied forms, and slightly washed with olivaceous. Entire abdomen and the tibiæ very distinctly barred with whitish and dusky, the flanks similarly barred, the dusky bars, however, being darker, nearly blackish, and broader. The primary coverts are uniform without white bars or spots, while the other upper wing coverts are distinctly barred with white.

Rallus gularis HORSF. (Tr. Linn. Soc., XIII, 1822, p. 196), if the Malaccan specimens do not differ from those found in Java, is of about

the same size as the foregoing species. The color of the back is somewhat lighter, in No. 15427; also more olivaceous, and the white markings form narrow transverse bars across the feathers. The chestnut color of the hind neck is brighter, contrasting strongly with the back. Underneath the gray color is lighter, and the entire abdomen and the tibial feathers are uniformly whitish without bars. The primary coverts are distinctly barred with white like the rest of the upper wing coverts.

Rallus jouyi sp. nov. (♂ ad. type U. S. Nat Mus., No. 85751) is a much larger bird than any of the foregoing species. The coloration of the back is a slightly grayish olive; each feather having an ill-defined dusky spot in the middle, which, however, is only visible externally in the interscapular region, and two or three pairs of transverse white spots bordered anteriorly and posteriorly by blackish; the color of the back extends on the hind neck nearly as far as the occiput, bordered on both sides by a bright rusty chestnut band, which forms a continuation of the color of the pileum and occiput. Chin and throat white; lores, suboccular, and auricular regions, fore neck and upper breast clear bluish gray; sides of breast, flanks, and lower part of the breast with broad white dusky-bordered cross-bars on a ground color which is olive on the sides, gradually becoming grayer towards the middle of the breast; entire abdomen, crissum, under tail-coverts, and tibiæ, distinctly barred with white and dusky gray, narrower than on the flanks and breast. Wings above olive like the back, and with white cross-bands like those of the flanks but more distant; primary coverts with two pairs of transverse white spots; wings underneath, including axillaries, dusky with narrow white cross-bars. Tail colored like the wings. Bill (in the dried skin) orange red, grayish white at tip beyond the nasal groove; feet horny brown.

The female (♀ ad. U. S. Nat. Mus., No. 85752) is quite similar to the male, but the olive of the back is washed with brownish instead of gray; the breast, flanks, and tibiæ are barred as in the male, but the abdomen is nearly uniform whitish.

Habitat.—The two specimens described above are from Shanghai, China. Whether the Indian bird really belongs here I cannot say, but I suspect it does, since Jerdon (B. of Ind., III, p. 726) describes it as having "the upper plumage olivaceous throughout, with narrow white, black-edged bars, and his measurements agree pretty well with mine. If such be the case, this is Reichenbach's *Rallus indicus* (Vollst. Naturg., Novit. Rasor., pl. cccxxii, figs. 2575, 2576 (1851), a name which two years previous was applied by Blyth to the Indian form of Water Rail. I may quote, however, a remark by Mr. Swinhoe (Ibis, 1863, p. 427): "The hind necks of the Formosan birds, as well as of species from Siam, are bright chestnut. This color scarcely shows at all in birds that I have seen from India; but specimens may vary in this respect, and I have seen no large series."

The following table may facilitate the better understanding of the characters of the three forms, as shown in the specimens before me:

Smaller: lower breast not barred { *striatus*, *gularis* } primary coverts uniform, unspotted.

Larger: lower breast barred like the flanks ..... *jouyi* } primary coverts spotted with white.

The difference in size between *striatus* and *gularis*, on one side, and *jouyi*, on the other, is shown by the following

Measurements.

1. RALLUS STRIATUS.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
77009	.....	ad.	Philippines	.....	117	37	36	37	40

2. RALLUS GULARIS.

95823	Dr. Cantor	ad.	Penang.....	.. ..	112	39	35	37	40
15427	Peale	ad.	Malacca.....	.....	117	37	35	.....	.....

3. RALLUS JOUYI.

85751	Jouy, 72	♂ad.	Shanghai.....	July 5, 1881	133	51	44	46	47
85752	Jouy, 73	♀ad.	.....do.....	May 8, 1881	132	50	41	45	48

ON TURDUS ALPESTRIS AND TURDUS TORQUATUS, TWO DISTINCT SPECIES OF EUROPEAN THRUSHES.

By LEONHARD STEJNEGER.

On plate 15, vol. ii, of Dresser's "Birds of Europe" is figured a young female Ring-Thrush of which the author, in the text (vol. ii, p. 114; published in 1872) speaks in the following terms: "We have received from Herr W. Schlüter, of Halle, a naturalist to whose ready assistance we owe the opportunities of describing many a rare bird, a young female of the Ring-Ouzel, evidently in its first winter plumage, of which we add a full description, *as we cannot find any notice of this curious livery in any work we have examined.*" Then follows the description, of which we only quote the following as indicating the chief pecularities of the bird: ". . . . quills brown, externally margined with buffy white, which causes a shade of this color to pervade the whole of the outer surface of the wing; . . . . . under surface of the body chocolate-brown, the whole of the feathers so broadly margined with whitish that the ground-color of the plumage is scarcely perceptible; . . . . . under wing-coverts creamy white, with a narrow longitudinal indication of brown on some of the feathers. . . ." The plate bears out the characters very well, although we note no "chocolate-brown" color; but inasmuch as we have a specimen before us which nearly exactly matches the plate, we think the latter is more correct, the dark markings on the under surface in our specimen being sepia brown.

"This curious livery" is not mentioned in any of the usual standard works on European ornithology. It is not described by Temminck, Nilsson, Naumann,* Degland, Yarrell and Newton, Macgillivray, &c. Neither have authors writing later than the publication of Dresser's grand work given it even a passing notice. Mr. H. Seebohm, who, in 1881, monographed the Thrushes (Cat. B. Brit. Mus., V), and who, in 1883, treated of the Ring-Thrush in his "History of British Birds," has also passed by it in absolute silence.

Nevertheless, as I shall show later on, the "livery" in question has been mentioned repeatedly in the literature, not as a special plumage of the Ring-Thrush, but as a separate species. If some of the authors quoted above had consulted the references cited by themselves in their synonymies, they would have found it described by C. L. Brehm as *Merula alpestris*.

It has been the unfortunate fashion to sneer at the species and sub-

* In the 6th vol. of his great work, pp. 5–14, he gives some additional notes on the Ring-Ouzel, in which he alludes to this "livery" as that of the younger bird. His notes are chiefly based on material furnished him by Gloger, and the specimens referred to are evidently the same later on mentioned by Brehm as belonging to *T. alpestris*.

species of Brehm, and the simple fact that a name was established by him has been sufficient reason to ignore it altogether, and to put it into the synonymy without further investigation. This is not only injustice to Brehm's honest labor and his extreme power of discrimination, but it has resulted in absolute injury to science. In the present case, for instance, I think that I am in position to prove that Brehm was correct, and that there exist two distinct species of Ring-Thrushes in Europe, notwithstanding the fact that hardly a single European ornithologist of the present generation even dreams of it.

That *Turdus alpestris* is no special plumage, referable to sex, age, or season, is clear from the material at hand. There is first the specimen described and figured by Dresser. I have before me a beautiful specimen, nearly an exact counterpart of Dresser's plate, also obtained through W. Schlüter, and said to have come from Galicia. The label indicates that it is a young male, and there is nothing in the appearance of the bird to contradict this statement. The bird is evidently in its first winter plumage; the bill is entirely dusky; the collar is brownish and a little more distinct than in the bird figured by Dresser. This is U. S. Nat. Mus. No. 56308. But there are two more specimens in the same museum (Nos. 9664 and 106458), which are certainly *old birds in full summer plumage*. One was collected June 7, the other August 8; the former, an adult female, according to the label, browner; the latter, indicated as a male, blacker. Both have *yellow bills*, pure white collars, and the margins of the breast and abdominal feathers extremely broad, notwithstanding the season and the worn condition of the plumage; both have the central white spot to each feather, the whitish aspects of the upper surface of the wing, and the white under wing-coverts. In other words, they are true and typical adult *Turdus alpestris* in summer plumage. We have, consequently, a pair of young birds in the first winter, and a pair of adult ones in summer. This proves beyond question that we have not to do with a sexual or seasonal plumage of *Turdus torquatus* proper.

We will next have to prove that Brehm's *Merula alpestris* belongs here. He has described the bird three times, but inasmuch as his descriptions have been entirely overlooked, one of them, and that the most important and elaborate one, being, besides, rather inaccessible to most ornithologists, I take the liberty to present them in translation.

The name occurs for the first time in Isis, 1828, p. 1281, but without description, which was not supplied until 1831, when we find it in Brehm's Handbuch, p. 377. I need only quote the following to show that this is the bird meant:

> The breast and abdomen have a very variegated appearance, for each feather has, besides the light margin, a large white median spot interrupted by a blackish shaft stripe, the black consequently being forced towards the white margin. * * * This species inhabits the Alps of Tyrol. * * *

In the Isis for 1848, Brehm published some observations by the late Count von Gourcy Droitaumont on the song of several German birds,

accompanied by remarks by himself. Brehm's remarks accompanying the observation on the Ring-Ouzel's loud and penetrating song contains a parallel comparison of the two species (pp. 91–93), as follows:

THE NORTHERN RING-OUZEL.	THE ALPINE RING OUZEL.
Merula torquata auct.	*Merula alpestris Br.*
(Male in spring.)	
Bill yellow, with a more or less intensive dusky tinge.	
The entire bird, except the somewhat lighter-colored wings, black with a white semi-collar on the lower neck.	The upper surface black, rather pale or dull; under surface very spotted and varigated, all feathers below the white collar having white margins which never disappear and most of them possessing *white spots in the middle of the feathers*, which are most prominent in summer, and which are never seen in *Merula torquata*.
In autumn the male of this species also has white margins to the feathers; but they are narrow and disappear entirely in the spring. It has never white spots in the middle of the feathers.	In autumn the appearance of the male is very varigated, because the margins to the feathers are very broad, and the same is the case with the female. She also presents a very varigated aspect on account of the whitish margins and medial speculum to the feathers, and in autumn, especially in the first year, the margins are so broad grayish white that the bird shows more white than dusky. In the young plumage the bird is hardly recognizable. The entire upper surface is blackish brown, in the female more grayish black, with whitish yellow shaft streaks and light margins to the feathers, broadest on the wings, which thereby appear quite light; the whole under surface is spotted transversely yellowish white and black, the male often with nearly entirely white throat.
The female is more spotted than the male on account of the light margins being broader, although even in the autumn much less so than *Merula alpestris*, and assumes in summer, when these margins partly or entirely disappear, a brownish appearance, which is brought out in contrast with the grayish-white collar.	
The young plumage is unknown to me.	
It inhabits Northern Europe, migrating through Germany along the mountain chains. It is the only species occurring in Northern and Middle Germany. I can assert this with the greatest certainty, since all the specimens which I have obtained from Northern Germany, from the present region [Rentendorf], from the mountains of the Voigtland, and from the Thuringian Forest belong to the present species. This is the bird which Bechstein possessed, for he could get no other in Thuringia, as no other occurs there. It has the song described by him, the father of German ornithology, and not at all the loud whistle of its near relative.	It inhabits the southern Alps, especially those of Tyrol and Kaernthen, and goes as far as the Riesengebirge. Those which Gloger collected there, and all which I have obtained through my friends from Salzburg, Tyrol, Kaernthen, and Vienna, belong to this species. This is the bird which my collaborator [Count von Gourcy Droitaumont] had in his possession, and the only one which he could have had, for the northern species is not represented among the 18 specimens which I have received from the countries just mentioned. This is the bird that has the loud, penetrating song, which has been described above.

Finally, in Journal für Ornithologie, 1860, Brehm appended some remarks to a paper by Leon Olphe-Galliard on the birds of the Valley of Greyerz, Switzerland, which again emphasize the differences between the two species as follows (p. 239):

This Ring-Ouzel from Switzerland is remarkably like one of the subspecies from Kærnthen. All the Ring-Ouzels breeding in the Alps and in the Riesengebirge differ essentially from the northern ones. We possess 28 Ring-Ouzels from the most different localities, even from Norway and from Spain. These Ring-Ouzels from Central Europe differ essentially from the northern ones—

(1) By the much lighter coloration of the wings;

(2) By the broader light margins to the feathers of the lower surface; and

(3) By the white spots (speculum) in the middle of the pectoral and abdominal feathers.

They have besides so loud a voice that their song is quite intolerable in a room, while that of the northern ones is soft and pleasant.

The above quotations prove beyond question the identity of our birds with Brehm's *T. alpestris*.

It will be seen that Brehm obtained not less than 18 specimens of *alpestris* out of a total number of 28,* a number which in itself goes a long way to prove the existence of the species.

Brehm asserted most positively that *T. torquatus* is northern in its distribution, *T. alpestris* southern, and states that he got the latter only from the southern localities enumerated by him (see above). Against this assertion other collectors are certain to record a somewhat different experience, inasmuch as unquestionable typical *T. torquatus* are found in the collections from various parts of Southern Europe. Thus we have here a winter specimen from France, and Dresser (l. c.) figures a typical male in winter plumage (September 26) from Belgrad, Servia. But, so far as I have been able to ascertain the dates, all the true *T. torquatus* from the south are winter birds on their migration. In order to find out the true habitat of each of these species, however, it is necessary to trace their distribution *during the breeding season*, and it will then probably be found that *T. alpestris* belongs exclusively to the high mountains from southern Central Europe southward, including the Riesengebirge, the Carpathians, the Alps with all their branches, the Pyrenees, and Sierra Nevada. The Caucasian Ring-Thrushes are hardly referable to this species, for Radde (Ornis Caucasica, p. 270) speaks of their breeding plumage as entirely wanting the white margins, and says that the old males killed at the end of March had the white margins much narrower than specimens from Hungary (presumably *T. alpestris*) collected in May. Unfortunately he says nothing of the breeding pair shot July 2, at an altitude of 10,000 feet above sea-level, except that the plumage was very much worn.

*When C. L. Brehm died his collection is said to have contained 19 specimens referable to *T. torquatus* and 9 to *T. alpestris* (cf. A. E. Brehm's "Verzeichniss der nachgelassenen Sammlung (meist) europäischer Vögel von Dr. Ch. L. Brehm", 1866, p. 5). It is a thousand pities that this valuable collection is still inaccessible to ornithologists.

It seems pretty safe to assume that *T. alpestris* does not occur, at least regularly, anywhere in Northern Europe; otherwise it should hardly escape attention. The specimen figured by Dresser, however, is said to have come from Schleswig. Whether there has been a transposition of label, or Schleswig misread for Schlesien, is difficult to say. Too great stress cannot be laid upon a dealer's label, though, of course, very little can be said against the supposition that the bird was a straggler from Middle Germany.

At any rate, it will only be possible in the future to fix the limits of the two species, and for that reason their discrimination is very important. It can hardly be doubted that this question can be satisfactorily solved by the material already in the European collections. Ornithologists should be very careful, however, to base their conclusions solely upon *breeding* birds, the habitats of which are *unquestionable*.

SYNONYMY.

Turdus alpestris (BREHM).

1828.—*Merula alpestris* BREHM, Isis, 1828, p. 1281 (*nom. nud.*).—*Id.*, Handb. Vög. Deutschl., p. 377 (1831) (*descr.*).—*Id.*, Isis, 1848, p. 92.—*Id.*, Jour. f. Orn., 1856, p. 376.—*Id.*, *ibid.*, 1856, p. 446.—*Id.*, *ibid.*, 1860, p. 239.

1855.—*Merula vociferans* BREHM, Naumannia, 1855, p. 281 (*nom. nud.*).—*Id.*, Jour. f. Orn., 1856, p. 446.

1855.—*Merula maculata* BREHM, Naumannia, 1855, p. 281 (*nom. nud.*).—*Id.*, Jour. f. Orn., 1856, p. 446.

1856.—*Merula insignis* BREHM, Journ. f. Orn., 1856, p. 440 (*nom. nud.*).

Turdus torquatus et *Merula torquata* auct. mult. part. nec LINN.

FIGURES.

DRESSER, Birds of Europe, II, pl. 15, fig. læv.

DESCRIPTION.

♂ *ad.* (*U. S. Nat. Mus. No.* 106458; *Sweet Waters, Turkey; August* 8, 1877; *W. Pearce*). Whole upper surface dull brownish black, gradually fading towards the rump, each feather narrowly marginated with ochraceous gray, and considerably abraded; throat and upper part of fore neck similar, but the edges more whitish, and the chin nearly white; across the prepectus a broad, dirty-white semilune; the rest of the lower surface variegated of black and white, in nearly equal proportions, the individual feathers being white with a broad sub-marginal brownish-black V-shaped mark; upper surface of the wing of a ground color similar to that of the back, but lighter; the primaries narrowly edged with whitish-gray, slightly tinged with buff, while the secondaries and greater coverts are broadly edged, and the middle coverts broadly tipped with the same whitish color, making a large and conspicuous patch on the wing; lining of the wing and axillaries whitish, slightly mottled with dusky. Bill light, basal portion of upper mandible and tip dusky; feet horn-brown.

Compared with a specimen of typical *T. torquatus* in what appears to be exactly the corresponding plumage (♂ ad. No. 69969, Rostock, Germany) the differences are very great. The latter has the dark color of the upper surface more saturated, more uniform, and perceptibly browner, with light margins to the feathers; the throat is similarly uniform dark,

and the whole under surface behind the semilune is of the same blackish brown color, each feather very narrowly margined with whitish, the margins not being broader than those of the upper surface in the specimen of *T. alpestris* described. The upper surface of the wing is colored much as in the latter, but the light edges are very much narrower and their color much duller and grayer, while the median coverts are entirely different, being brownish black, very narrowly margined with light gray, like the feathers of the breast, and entirely without the broad white tips of *T. alpestris;* the lining of the wing is blackish-brown edged with light gray, the axillaries somewhat lighter and mottled with light grayish. This is the same plumage which is represented in Dresser's plate 14, Vol. II, foreground figure. In order to make a very good representation of *T. alpestris in summer plumage*, it is only necessary to take the same author's plate 15, right-hand figure, which is a *T. torquatus in winter dress*, and paint a white spot in the middle of each feather of the under side of the body, behind the semilune, similar to those of the figure to the left in the same plate, and to make the outer surface of the wing correspondingly white. That the specimen of *T. alpestris* described by me is not mislabeled, and that the bird is really in its summer plumage, is proven beyond a doubt by the yellow bill and the worn condition of the feathers.

♀ *ad.* (*U. S. Nat. Mus. No.* 9662; "*Europe*," *June* 7; *Baron v. Müller*). Nearly identical with the male, but the dark color browner and paler, especially on the upper side, on which, besides, the lighter margins are broader but less distinct and blending with the ground color, making the whole upper surface a nearly uniform grayish brown, which becomes decidedly gray on the lower back and rump;* the white tips to the median wing-coverts are more worn, but are plainly discernible; the whitish edgings to the throat-feathers are somewhat broader, and on the flanks the white speculum is often divided by a narrow blackish shaft stripe. Bill yellow; feet light horn brown.

For comparison I have a female (No. 18584) of the true *T. torquatus*, from Denmark, precisely in the corresponding plumage, with yellow bill, but perhaps a trifling less worn. The same differences exist as between the males, but the coloration of the back is even more different in the females, as in my *T. alpestris* ♀ it resembles that of a very worn female *T. pilaris* rather than that of *T. torquatus.* The large whitish wing-patch, the white under wing-coverts, the white streaked throat, and the speckled, V-marked under surface at once distinguish the female *T. alpestris.*

I have no *adult* winter specimens of the latter species, but it is safe to assume, that the distinguishing characters will be found to be still more pronounced, for the white margins are probably much broader. On the under surface of an adult *winter* male *T. torquatus* from Norway

* The central pair of tail-feathers is new, in fact have not yet grown out to the same length as the rest; like these they are uniform blackish brown; a few of the upper coverts are also new and just out; these are decidedly tinged with yellowish olive.

(No. 98003; Nov. 20) these margins are not half as broad as in the adult *summer* male of *T. alpestris*.

♂ *jun.* (*U. S. Nat. Mus. No.* 56308; *Galicia; W. Schlüter*).—The entire upper surface olive gray, of a tinge quite similar to that of the corresponding plumage of *T. musicus*, only that the feathers of the upper back show dusky centers; top of head and ear-coverts suffused with brown; chin, throat, and upper fore neck of a buffish white streaked with dusky along the shafts of the feathers, much after the fashion of *T. pilaris*; the prepectoral semilune of a light smoky gray, each feather terminated by a subapical brownish band and a buffish white margin; rest of under surface white, slightly suffused with buff on the sides and flanks, each feather with a submarginal, V-shaped, blackish brown mark, the feathers on the side of the breast having, in addition, a subapical blackish spot between the point of the V and the tip of the feather; on the under tail-coverts the dusky mark is more U-shaped: wings much as in the adults, but more suffused with buff, except the tips of the median coverts and the edges of the inner great coverts, which are nearly pure white. Bill horny blackish brown; feet light horn brown.

The differences between the specimen described above and a young male of *T. torquatus*, from Silesia (No. 56307), in a plumage exactly corresponding, are even greater than between the quite adult specimens of the two species. The specimen in question agrees very closely with Naumann's pl. 70, fig. 2, only that it is somewhat blacker and the margins on the back less distinct. The appearance of the smoky gray pectoral semilune is very curious; it is of exactly the same color in both specimens, though slightly lighter in *T. alpestris*, on account of the buffy margins being broader; but while in this bird it appears as a dark collar on the light under surface, it forms a similar, but light, patch on the dark under side of *T. torquatus*. It is unnecessary to carry the comparison any further, as anybody will understand who takes the trouble of placing Naumann's figure, quoted above, alongside the left-hand figure of Dresser's work (vol. II, pl. 15).

♂ *juv.* (*U. S. Nat. Mus. No.* 9661; "*Europe*," *July* 3, 1836; *Baron v. Müller*).—Upper surface dull brownish black, with brownish buff margins to the feathers, and sharp creamy white shaft-streaks, terminally edged with blackish on the scapulars, and on the small and median upper wing-coverts, while on top and sides of head similar, but darker, smaller, and less sharply defined streaks are found; chin and throat buffy white with only a few indistinct dusky spots; rest of under surface dusky with irregular whitish cross-bars, on breast and sides tinged with buff, each feather whitish with a terminal dusky margin and a U-shaped dusky mark, or dusky with a subapical whitish U-shaped spot and a subbasal whitish shaft-streak, the white gradually predominating backwards; the wings essentially as in the adults, except as regards the coverts already referred to, and the stronger tinge of buff to the outer webs; tail uniform brownish black slightly margined with buffy gray at the tips. Bill horn brown; feet of the same color, but lighter.

Notwithstanding the uncertainty as to the true locality of this specimen and the want of a typical *T. torquatus* in the corresponding plumage for actual comparison, I have but little doubt that it is a *T. alpestris* just out of the downy stage. If Keulemann's representation of a "young on leaving the nest" (Dresser, B. of Eur., vol. II, pl. 14) is only approximately correct, these birds are separable already in the first plumage by the much greater extent of the white on the

wing in *T. alpestris;* I also believe that it is lighter underneath, judging from Dresser's description. As to the locality of the specimen in question, there is reason to believe that it was collected at the same place as the adult female described above, and that it hails from some place in Upper Bavaria.

I append the following list of specimens examined by me and their measurements. It will be seen that there is practically no difference in size between the two species:

Measurements of TURDUS ALPESTRIS.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Remarks.
					mm.	*mm.*	*mm.*	
106458	W. Pearce ..	♂ ad..	Sweet Waters, Turkey	Aug. 8, 1877	142	110	18	Yellow bill.
108891	Schlüter	♂ ad..	Karpathian Mountains	May 21, 1884	139	107	18.5	Do.
9662	v. Müller ...	♀ ad..	"Europe"	June 7, —-	133	99	18	Do.
56308	Schlüter, 349	♂ jun	Galicia	.....	135	102	18	Dusky bill.
108892	Schlüter ..	Jun...	Karpathian Mountains	May 17, 1884	140	108	19	Yellowish bill.
9661	v. Müller ...	♂ juv.	"Europe"	July 3, 1836	126	83	15	Dusky bill.

Measurements of TURDUS TORQUATUS.

77766	Gätke	♂ ad.	Heligoland	Apr. —, 1878	139	111	19	Yellow bill.
98003	.....	♂ ad.	Bergen, Norway	Nov. 20, 1881	139	107	18	Dusky bill.
18944	Drouet	♂ ad.	France	.....	142	108	.....	Do.
69969	S. Burchard.	♂ ad.	Rostock, Germany....	.....	140	107	20	Yellow bill.
18584	.....	♀ ad.	Denmark	.....	143	112	19	Do.
56307	Schlüter, 346	♂ jun	Silesia, Germany.....	.....	138	104	20	Dusky bill.

For the sake of completeness I add the following synonymy of

Turdus torquatus LINN.

1758.—*Turdus torquatus* LINN., S. N., 10 ed., I, p. 170. *Id.*, S. N., 12 ed., I, p. 296.
1831.—*Merula montana* BREHM, Handb. Vög. Deutschl., p. 375.
1831.—*Merula collaris* BREHM, Handb. Vög. Deutschl., p. 376.

FIGURES.

NAUMANN, Naturg. Vög. Deutschl., II, pl. 70.—DRESSER, Birds of Europe, II, pl. 14 and pl. 15, fig. dextra.

SMITHSONIAN INSTITUTION, *March* 31, 1886.

NOTE.—Since the above was written I have received from Mr. W. Schlüter two more Ring-Thrushes which fully bear out the foregoing conclusions. I wrote to him to send me two *Turdus torquatus* from the Karpathian Mountains, and received two *T. alpestris!* They are now U. S. Nat. Mus. Nos. 108891 and 108892, and their dimensions have already been interpolated in the table above.

The first-mentioned specimen is an adult male, collected May 21, 1884. The bill is yellow and the collar white. The plumage is fresher in color

and less worn than that of No. 106458, described above, with which it otherwise agrees very well, except that the speculum is divided as in the female, No. 9662.

The other specimen is a younger bird, corresponding exactly to No. 56308, described on a previous page, but being collected May 17, it is in a more worn plumage and the bill is pale yellow. It is evidently a bird in its first spring.

I have, consequently, now before me the following series of *Turdus alpestris:* (1) young bird in nesting plumage; (2) young in the first winter; (3) young in the first spring; (4) old male in spring; (5) old male in autumn; (6) old female in breeding plumage.

Add thereto the different habitat and the difference in voice, as pointed out by Brehm, and there can be no room for doubt that there are two species of Ring-Thrushes in Europe.

SMITHSONIAN INSTITUTION, *May* 29, 1886.

REVIEW OF JAPANESE BIRDS.

BY LEONHARD STEJNEGER.

II.—TITS AND NUTHATCHES.

The present essay has the same aim and scope as the one treating of the Japanese Woodpeckers and published a short time ago in these Proceedings (see *antea* pp. 99–124). It embraces the family *Paridæ*, with which I associate the Nuthatches as a subfamily only. The introductory remarks accompanying the former article apply as well to this and the succeeding papers of the present series, which, I may repeat, is only a kind of a prodromus of a more extensive work, in order to call attention to doubtful points; to instigate investigation by others who possess material not accessible to me; in short, to ask information from fellow-ornithologists, which is hereby earnestly solicited, and for which due credit will be given.

SYNOPSIS OF THE JAPANESE GENERA OF *PARIDÆ*.

a^1. Bill short, from mouth angle to tip shorter than tarsus.

I. PARINÆ:

b^1. Culmen and gonys curved (PARIEÆ).

c^1. Tail scarcely longer than body; outer pair of tail-feathers more than five-sixths the length of the longest ..... *Parus.*

c^2. Tail nearly twice as long as the body; outer pair of tail-feathers less than half the length of the longest ..... *Egithalos.*

b^2. Culmen and gonys perfectly straight (REMIZEÆ) ..... *Remiza.*

a^2. Bill long, from mouth angle to tip longer than tarsus.

II. SITTINÆ ..... *Sitta.*

PARUS LINN.

1758.—*Parus* LINN., S. N., 10 ed., I, p. 189.

1829.—*Cyanistes* KAUP, Entw. Eur. Thierw., p. 99 (type *P. cyaneus*).

1829.—*Pœcile* KAUP, Entw. Eur. Thierw., p. 114 (type *P. palustris*) (nec *Pœcilus* BON., 1813).

1850.—*Pœcila* BONAPARTE, Consp. Av., I, p. 230 (emend.).

1850.—*Penthestes* REICHENBACH, Av. Syst. Nat. Trepidat., pl. lxii (type *P. lugubris*).

1862.—*Poikilis* BLASIUS, List B. Eur., p. 8 (emend.).

1872.—*Pœcilia* TACZANOWSKI, Journ. f. Orn., 1872, p. 443 (emend.) (nec BLOCH-SCHN., 1801; nec SCHRANK, 1802; nec HEIN., 1870).

1884.—*Sittiparus* SELYS-LONGCHAMPS, Bull. Soc. Zool. France, 1884 (p. 76) (type *P. varius*).

1884.—*Periparus* SELYS-LONGCHAMPS, Bull. Soc. Zool. France, 1884 (p. 76) (type *P. ater*).

SYNOPSIS OF THE JAPANESE SPECIES OF THE GENUS *PARUS*.

a^1. Forehead brownish white, crown black* (SITTIPARUS).

b^1. Larger; a large triangular rufous spot on the interscapilium ..... *P. varius.*

b^2. Smaller; only a narrow edge of rufous to the black of the nape.. *P. castaneoventris.*

a^2. Forehead black, like the crown.

b^1. Outer pair of tail-feathers to the greater extent pure white, the outer edge being black from the base (PARUS) ..... *P. minor.*

b^2. Outer pair of tail-feathers uniform dark gray, like the rest, with or without whitish margins.

c^1. With a whitish nuchal spot; great wing-coverts with white tips, forming two wing bands (PERIPARUS) ..... *P. ater* subsp.?

c^2. Upper neck without a light-colored spot; wing-coverts without white tips (PŒCILE).

d^1. Crown dull brownish black; longest tail-feathers averaging 52mm ..... *P. borealis.*

d^2. Crown deep black with bluish gloss; longest tail-feathers averaging 60mm. *P. brevirostris.*

Subgenus SITTIPARUS SELYS.

(218) **Parus varius** TEMM. & SCHL.

Japan Tit. Yama-gara.

1849.—*Parus varius* TEMM. & SCHLEG., Faun. Jap. Av. (p. 71, pl. XXXV).—BLAKIST., Ibis, 1863, p. 99.—*Id.*, Chrysanth., 1883, Febr., p. —.—*Id.*, Am. List B. Jap., p. 15 (1884).—SWINHOE, Ibis, 1874, p. 155.—BLAKIST. & PRYER, Ibis, 1878, p. 235.—*Iid*, Tr. As. Soc. Jap., VIII, 1880, p. 218.—*Iid.*, *ibid.*, X, 1882, p. 151.—SEEBOHM, Ibis, 1879, p. 33.—JOUY, Pr. U. S. Nat. Mus., VI, 1883, p. 286.

1862.—*Parus rubidus* BLAKISTON, Ibis, 1862, p. 321.

I am not aware that the young of this species has been described. The only reference to the young I can find is the remark by Messrs. Blakiston and Pryer (Ibis, 1878, p. 235) to the effect that it is "rather different from the adult, but does not otherwise vary" (?). Specimens of young in their first plumage are, therefore, a special desideratum.

Parus castaneoventris GOULD.

Formosa Tit.

1862.—*Parus castaneoventris* GOULD, P. Z. S., 1862, p. 280.

1863.—*Parus castaneiventris* SWINHOE, Ibis, 1863, p. 295.—*Id.*, P. Z. S., 1871, p. 361.

1883.—*Parus castaneiventer* GADOW, Cat. B. Brit. Mus., VIII, p. 37.

This species has recently been collected by Mr. M. Namiye, on Okinawa Shima (Liu Kiu), a discovery which will be treated of in detail in a special paper. It is smaller, and the chestnut mark behind the white nape spot is nearly absent.

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* *Parus* (*Cyanistes*) *cæruleus* LINN. with white forehead, azure-blue crown, and a white superciliary stripe, together with its conspecies and subspecies, is confined to the western portion of the Palæarctic Region. In Temminck's Manuel d'Ornithologie, 2d ed., III, p. 210 (1835), it is said to occur in Japan, probably on the authority of some drawing; but this is evidently a mistake. "Formosa," referred to under this species in Horsfield and Moore's Catalogue, is a place in England.

Subgenus PARUS.

(217) **Parus minor** TEMM. & SCHL.

Lesser Tit. Shi-jiñ-kara.

1835.—*Parus major* TEMM., Man. d'Orn., 2 ed., III, p. 209 (part) (*nec* LIN.).

1849.—*Parus minor* TEMM. & SCHLEG., Fauna Jap. Aves (p. 70, pl. xxxiii).—CASSIN, Pr. Phila. Acad., 1858, p. 192.—WHITELY, Ibis, 1867, p. 198.—SWINHOE, Ibis, 1874, p. 156.—BLAKIST & PRYER, Ibis, 1878, p. 235.—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 217.—*Id.*, *ibid.*, X, 1882, p. 150.—SEEBOHM, Ibis, 1879, p. 33.—BLAKIST., Chrysanth., 1883, Jan., p. 30.—*Id.*, *ibid.*, 1883, Febr., p. —.—*Id.*, Ann. List B. Jap., p. 15 (1884).—JOUY, Pr. U. S. Nat. Mus., VI, 1883, p. 286.

This may finally turn out to be so closely connected with *Parus cinereus* VIEILL.* by intermediate links that the specific validity cannot be maintained, in which case the Japan bird would have to stand as *Parus cinereus minor* [or eventually *P. nipalensis minor*]. Dr. Gadow (Cat. B. Brit. Mus., VIII, p. 17), under *P. cinereus*, takes pains to show that the two forms are specifically distinct, although two pages earlier he states in regard to *P. minor*, that in China "it gradually changes into *P. cinereus*." The intermediate specimens from China have been called, by Swinhoe, *Parus commixtus* (Ibis, 1868, p. 63). These are the eastern, somewhat faded, representatives of *Parus major* of Europe, which is quite like *P. minor* above, but has the white of the lower surface replaced by vivid yellow. It is interesting in this connection to note, that a brighter colored representative, *P. monticolus* VIGORS, is found in the mountains of Southeastern Asia, an apparent race of which, *Parus monticolus insperatus*,† was discovered by Mr. Swinhoe in southern Formosa.

Mr. JOUY discovered the young of *P. minor* in the first plumage at Fuji-Yama in the beginning of July. It is very interesting, inasmuch as it is distinguished from the young of *P. major* in the corresponding plumage by the same characters which separate the adults: it is smaller, and the under side is whiter.

♂ *jun., first plumage* (U. S. Nat. Mus. No. 88642; coll. P. L. Jouy, No. 383; Fuji-Yama, Hondo, July 2, 1882). Distribution of colors as in the adult, but the whitish nuchal spot apparently larger, and the dark throat patch smaller, and connected with the dark color on the upper neck by a narrow and scarcely continuous streak; on the breast only an indication of the dark middle streak, and none on the abdomen; the green of the back is very dull, and the ashy gray of the rump slightly suffused with olive; all the dark parts on head and neck are of a dull slate color slightly suffused with olive; the white portions are washed with a pale creamy yellow.

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* Nouv. Dict. d'Hist. Nat., XX, p. 316 (1818).—*Parus atriceps* HORSFIELD, Tr. Linn. Soc., XIII (p. 160) (1821).—*Parus nipalensis* HODGSON, Ind. Rev., 1838 (p. 31). I may mention here, however, that not all authors agree in uniting the Javan bird (true *cinereus*) with the Indian and Chinese representative (*nipalensis*). The former is said to have the white nuchal spot entirely surrounded by black, while in the latter it is only bordered in front and on the sides by that color. All the specimens of the latter which I have examined have the white spot immediately adjoining the gray of the back; but without typical specimens of *cinereus* I cannot decide.

† *Parus insperatus* SWINHOE, Ibis, 1866, p. 308.—*Id.*, P. Z. S., 1871, p. 361.

Subgenus PERIPARUS SELYS.

(215) **Parus ater** subsp.?

Coal Tit. Hi-gara.

1758.—*Parus ater* LINN., S. N. 10 ed., I, p. 190.—*Id.*, S. N., 12 ed., I, p. 341 (1766).—TEMM., Man. d'Orn., 2 ed., III, p. 209 (1835).—TEMM. & SCHL., Fauna Jap. Av. (p. 70) (1849).—BLAKIST., Ibis, 1862, p. 321.—*Id.*, Chrysanth., 1882, p. 522.—*Id.*, *ibid.*, Jan., 1883, p. 30.—*Id.*, *ibid.*, Feb., 1883, p.—.—*Id.*, Amend. List B. Jap., pp. 15, 50 (1884).—WHITELY, Ibis, 1867, p. 198.—SWINHOE, Ibis, 1870, p. 154.—*Id.*, *ibid.*, 1874, p. 155.—BLAKIST. & PRYER, Ibis, 1878, p. 235.—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 217.—*Id.*, *ibid.*, X, 1882, p. 149.—SEEBOHM, Ibis, 1879, p. 31.—*Id.*, *ibid.*, 1884, p. 37.—JOUY, Pr. U. S. Nat. Mus., VI, 1883, 285.

The Coal Tit of Japan is usually given as *Parus ater*, some authors asserting, however, that specimens occur in Japan which are intermediate between the typical form and *Parus pekinensis* DAVID* from China, the chief character of which is said to be the elongation of the occipital feathers into a distinct crest.

I have been considerably puzzled about this species, but have concluded to establish no new name in view of the insufficiency of my material, and shall, therefore, simply state what I have found in examining the specimens in the U. S. National Museum. As to *P. pekinensis* proper I shall express no opinion, having seen no specimen. I may state in regard to the alleged occurrence of that form in Japan, that none of the specimens before me exhibit the character by which it is said to differ from *ater*, viz, the elongation of the posterior black feathers of the crown into a crest.†

Speaking of the Japanese specimens before me in a general way, it may be said that they resemble typical *P. ater* on the upper surface, while underneath they agree with the English form, *P. ater britannicus*, except that the colors are purer and clearer. However, a specimen from the Vosges, France (U. S. Nat. Mus. No. 106465), agrees very well in color with the Japan birds, both above and beneath.

The two autumnal males from Tate Yama, Hondo, are nearly identical, except that No. 91347 has the ochraceous wash on the rump a little stronger. Compared with typical *P. ater*, from the continent of Europe, the gray of the back is of a somewhat different and more decided bluish hue. It appears to me that the black on the hind neck goes farther back, (though this *may* be caused by the make of the skin) but differs certainly in one point from that of the European specimens I have seen in entirely encircling the white nuchal spot and distinctly separating it from the gray of the back. It also looks as if the black of the throat

*Ibis, 1870, p. 155.

†A Japanese drawing, excellent and true to nature in every other respect, and by far superior to the excruciating figure accompanying the description of *P. pekinensis* (Nouv. Arch. Mus., VIII, pl. 5, fig. 1), shows a crest fully as long and pointed as that of the latter. But whether it is drawn from a Chinese or a Japanese specimen I cannot say.

goes farther down on the breast, especially on the sides of the latter, but, as above, the make of the skin may be the reason of it.

A female, collected by Jouy at Fuji, June 30, 1882, consequently in the height of the breeding season, is in an extremely worn plumage. The brownish buff tinge on the under side is considerably faded, but the relative extent of black and white is the same in this specimen as in the above ones, the white nape patch being very broadly limited behind by black, and the latter color extending far down on the sides of the breast—about 10mm farther than in the middle.

A female from Sapporo, Yesso, in the autumnal dress corresponding to that of the two specimens first mentioned, agrees very well with them, but the black on the breast apparently does not extend so far as in the Hondo specimens. On the hind neck the white patch is closed behind by black.

Whether this character is of any value can only be determined by a larger series of birds from both Europe and Japan than at present at my command. I may point to the fact, however, that a similar difference is said to obtain between *Parus cinereus* from Java and its representative form on the continent.

In regard to the measurements as given in the appended table, I may remark that they agree very well with those of *P. britannicus*, being considerably inferior to those of Central European specimens before me. But also in this respect the series must be considered insufficient.

Measurements.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.	Total length.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
88645	Jouy, 373	♀ ad.	Fuji, Hondo	June 30, 1882	58	43	8	15	13	.....
91347	Jouy, 683	♂ ad.	Tate Yama, Hondo	Oct. 3, 1882	59	44	8	16.5	.....	.....
81348	Jouy, 688	♀♂ ad.	..... do	Oct. 8, 1882	59	46	7.5	16	.....	.....
96143	Blak., 3012	♀ ad.	Sapporo, Yesso	Sept. 30, 1882	58	45	7	17	.....	110

Subgenus PŒCILE KAUP.

(216 *part.*) **Parus borealis** SELYS.

Boreal Marsh-tit. Ko-gara.

1829.—? *Parus cinereus montanus* BALDENSTEIN, Neue Alpina, II (p. 21).

1843.—*Parus borealis* SELYS-LONGCHAMPS, Bull. Ac. Bruxelles, 1843 (p. 2).

1882.—*Parus palustris japonicus*, BLAKIST. & PRYER, Tr. As. Soc. Jap., X, 1882, p. 150 (part).—BLAKIST., Chrysanth., 1883, Feb., p. —.— JOUY, Pr. U. S. Nat. Mus., VI, 1883, p. 286.

1880.—*Parus palustris* BLAKIST. & PRYER, Tr. As. Soc. Jap., VIII, 1880, p. 217 (part) (*nec* LIN.).

1883.—? *Parus japonicus* SEEBOHM, Brit. B. Eggs, I, p. 477 (*nec* 1879 ?) (*nec* STEPH., 1817).

The Marsh-tits of Europe have been for nearly half a century the subject of much controversy, and the ornithologists there seem not to

have yet arrived at a conclusion satisfactory to all concerned. It is, therefore, less to be wondered at that the eastern forms are still in a state of considerable confusion. In this group extensive series of specimens are indispensable, and as my material is quite scanty I can throw only little light on the subject; but, so far as it goes, it has some bearings; and, as for the rest, I can only formulate the questions and ask my fellow-workers to furnish me with more material.

I have four birds from Japan before me. Two of these are October birds collected by Mr. Jouy in Hondo—consequently, south of "Blakiston's Line"; the other two are from the island north of it, one an October specimen from Sapporo, Yesso, the other from "the Kurils," and probably collected somewhat earlier.

The two birds composing each set are identical *inter se*, but the birds of the north differ from those of the south in the following particulars:

The *northern* birds are slightly larger, but the bill and feet are of the same size as in the southern birds.

The tail is proportionately longer and more rounded; the middle pair of rectrices is longer than that following.

The black of the cap does not extend so far backwards as in the southern birds, and is of a deep black, strongly glossed with blue.

The margins of the remiges and rectrices are broader and lighter.

The under side is slightly washed with pale brownish buff, the flanks and abdomen scarcely contrasted.

The *southern* birds are slightly smaller, but bill and feet are equal in size to the corresponding parts in the northern birds.

The tail is proportionately shorter and less rounded; the middle pair of rectrices perceptibly shorter than that following.

The black of the head extends farther back between the shoulders, being of a rather dull brownish black, without any bluish gloss whatever.

The margins of the remiges and rectrices narrower and duller.

The under side pure white, the flanks washed with pale brownish buff a shade deeper than in the northern birds and pretty well contrasted with the pure white of the middle portion.*

It should be noted here, that Messrs. Blakiston and Pryer have already pointed to the difference of the black cap in specimens from the Main Island and Yesso (Tr. As. Soc. Jap., x, 1882, p. 150). This, they say, may be attributable to season. Such is hardly the case, however, since the specimens compared above are of nearly exactly the same date; and, as they are quite adult, no argument can be derived from difference in age, the more so since it would be very strange that only young birds should have been collected in Yesso, and old ones in Hondo. Moreover, we know that a similar difference exists between *Parus borealis* and *P. palustris* in Europe.

By now comparing the Japanese birds with others, I find that the southern birds are nearly identical with typical specimens of *P. borealis*, both in size, color, and proportions, and with the present material, at

* Since the above was set in type I have received another Hondo specimen (U. S. Nat. Mus. No. 109355), the dimensions of which have been incorporated in the table below. It agrees with the other southern specimens in every particular.

least, I should regard it very unwise to apply any other name to the Hondo form.

Mr. Seebohm, who in 1879 named a Marsh-tit *P. palustris japonicus*, has determined the very two specimens from Yesso and the Kurils, mentioned above, as *P. palustris brevirostris* (Ibis, 1884, p. 37). Without having typical examples of the latter, I cannot deny nor verify this determination; but, judging from the literature, I believe he is right, though, if such be the case, his prior diagnosis of *brevirostris* (Brit. Birds and Eggs, I, p. 477) is completely misleading, since the tails of the specimens in question are very strongly rounded, and not "nearly even," as in the diagnostic table alluded to. I shall, however, adopt his nomenclature, at least provisionally, and call the two Japanese forms of the Marsh-tit, *Parus borealis* and *Parus brevirostris*.

Mr. Jouy, in July, 1882, collected two young,* though fully grown, birds at Fuji Yama. They agree pretty well with the autumnal specimens from Tate Yama, and I think there is but little danger in referring them to the same form, though their bills are perceptibly larger. This is said with some reserve, however. The dimensions will be found in the table below.

To which of the two Japanese forms Seebohm's *P. japonicus* should be referred is impossible to say without comparison of the typical specimens. The probability that he based the name upon Blakiston's and Whitely's specimens from Hakodate does not necessarily indicate that it is a synonym of *brevirostris*, since we know that two forms of Marsh-tits may occur in the same locality, at certain seasons of the year at least. On the contrary, if the measurements which he gives as diagnostic of *P. japonicus* are taken from the typical specimens (Br. B. Eggs, I, p. 477), his *japonicus* most probably belongs to the form which we have here called *borealis*.†

The indications are, however, that *borealis* breeds south of "Blakiston's Line," *brevirostris* north of it, a distribution corresponding to the relative range of the two forms in other countries.

It has been observed in Scandinavia, where two forms occur together, that they present considerable difference in their habits and in their

* In Jouy's paper (Proc. U. S. Nat. Mus., VI, 1883, p. 286) these specimens are referred to as adults, but that is certainly a mistake, as they show every sign of immaturity.

†It should be remarked, however, that the name *Parus japonicus* is preoccupied. It was given by Stephens, in 1817 (Shaw's Gen. Zool., X, i, p. 55), to a bird originally described by Latham as a variety of the Marsh-tit from specimens in Sir Joseph Bank's collection, said to have been taken off the coast of Japan. A correct identification is now hardly possible, inasmuch as Latham seems to have had two different species, neither of which are described sufficiently to allow recognition, and, besides, the description by Stephens differs radically from that of Latham. The latter had evidently no idea of the true relation of *P. ater* and *palustris*, for he suspected the latter of being the female, or only a variety of the former, and the reference of the specimens here in question, which he describes as having light nuchal spot, to the Marsh-tit, does, therefore, not prevent their greater resemblance to *P. ater*, or to *P.*

voice. It would, therefore, be a very interesting question for Japanese field-ornithologists to solve, whether something similar takes place in the two forms considered in the present paper.

Measurements.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	*	Tarsus.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
91349	Jouy, 690	♂ ad.	Tate Yama, Hondo	Oct. 9, 1882	62	53	8	4	16
91350	Jouy, 791	♀ ad.	do	Oct. 17, 1882	59	52	7	4	16
88644	Jouy, 545	♂jun.	Fuji, Hondo	July 18, 1882	59	51	9	5	.....
88643	Jouy, 609	♂jun.	do	July 27, 1882	61	53	9	5	.....
109355	.....	♂ ad.	Musashi, Hondo	Nov. 18, 1883	60	51	9	.....	16

* Distance between longest and shortest tail-feathers.

(216 *part.*) ? **Parus brevirostris** (TACZAN.).

Long-tailed Marsh-tit. Ko-gara.

1856.—*Parus kamtschatkensis* CASSIN, Pr. Acad. Phila., 1858, p. 193 (nec BP.).—BLAKIST., Ibis, 1862, p. 321 (*nec* BP.).—WHITELY, Ibis, 1867, p. 198.

1872.—? *Pœcilia brevirostris* TACZANOWSKI, Journ. f. Orn., 1872, p. 444.—*Parus b.* SEEBOHM, Brit. B. Eggs, I, p. 477.

1874.—*Parus borealis* SWINHOE, Ibis, 1874, p. 156 (*nec* SELYS).—BLAKIST. & PRYER, Ibis, 1878, p. 234.

1879.—*Parus palustris* subsp. *japonicus* SEEBOHM, Ibis, 1879, p. 32 (*nec P. japonicus* STEPH., 1817).—BLAKIST. & PRYER, Tr. As. Soc. Jap., X, 1882, p. 150 (part).—BLAKIST., Chrysanth., 1882, p. 522.—*Id.*, *ibid.*, 1883, p. 30.—*Id.*, Am. List B. Jap., p. 50 (1884).

1880.—*Parus palustris* BLAKIST. & PRYER, Tr. As. Soc. Jap., VIII, 1880, p. 217 (part) (*nec* LIN.).—SEEBOHM, Ibis, 1884, p. 37.

1881.—*Parus japonicus* WALLACE, Island Life, p. 63.

1884.—*Parus palustris* var. *brevirostris* SEEBOHM, Ibis, 1884, p. 37.

It is a very difficult task to locate properly the different quotations pertaining to the Japanese Marsh-tits, without access to the specimens upon which they are based. The above synonymies, therefore, do not claim to be absolutely correct, and may in time require to be consider-

minor, for that matter. Latham (Synops. II, ii, p. 542) describes his birds as "*not having a black chin*, all the under parts being white. One sex had the whole head black, with a band of white across the hind head: in the other, only the top of the head was black, and the nape yellowish." The Latin description in the subsequent "Index Ornith." (II, p. 566) is substantially to the same effect. Stephens, on the other hand (*l. c.*), in his diagnosis of *Parus japonicus*, says: "Titmouse with a *black* head and *throat*," and in the description: "differs chiefly in having a *black chin* and colored nape; all *the rest* of the under parts of the body *white*." Had Stephens's description been based upon the specimens themselves, there might have been reasons for supposing the bird to be *P. minor;* but as it appears that he has only made a slip in rendering Latham's description, the name must remain unidentified.

At any rate, Seebohm's *Parus japonicus* will have to be renamed, should it later on be found necessary to keep the bird, separated by him, apart from the true *borealis*.

ably modified. In preparing them, I have had to suppose that all references to Marsh-tits from Yesso belong to *brevirostris*, and those from Hondo to *borealis*, but it is quite probable that both forms may be found together in both islands, though the distribution of the great bulk of each form may be as indicated. The uncertainty is caused by the following circumstances:

When Seebohm, in 1879, named *P. japonicus*, I believe that he had only Yesso specimens before him. If only the long-tailed form occurs on that island, *P. japonicus* is only a synonym of *P. brevirostris*. But in another place (Brit. B. Eggs, I, p. 477) the same author speaks of his *P. japonicus* as differing from *brevirostris* in having a shorter tail.

Measurements.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	*	Tarsus.	Total length.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
96144	Blak., 3131	♂ ad.	Sapporo, Yesso ..	Oct. 12, 1882	67	62	7.5	6	16	170
96145	Snow; B., 2799	ad.	Kurils	.....	66	†59	8	†5	16	.....

* Distance between longest and shortest tail-feathers. † Tail molting.

The present form in its proportions closely agrees with *Parus kamtschatkensis* (Bp.)*, which only occurs on the Kamtschatkan Peninsula, but the latter is easy distinguishable at the first glance by having the whole back nearly white. It is a very distinct species, and no intergradation with the other species of this group is at all likely to be found, Mr. Seebohm to the contrary. This is not the same as the form which, in Dresser's "Birds of Europe," is figured and described as *P. kamtschatkensis*. Dresser's bird is *P. baicalensis* Swinh.

AEGITHALOS† Herm.

= 1804.—*Aegithalos* Hermann, Obs. Zool., I, p. 214 (type *Pipra europæa* Herm.).
= 1816.—*Mecistura* Leach, Syst. Cat. M. B. Brit. Mus., p. 17 (same type, *M. vagans* Leach = *P. europ.* Herm.).
= 1816.—*Acredula* Koch, Bayr. Zool., I, p. 199 (type *A. caudata* Koch).
< 1822.—*Aegithalus* Boie, Isis, 1822, p. 556 (type *Ae. pendulinus*).
< 1826.—*Aegythalus* Boie, Isis, 1826, p. 975 (emend.).
= 1828.—*Paroides* Brehm, Isis, 1828, p. 1284 (type *P. caudatus*).
= 1841.—*Orites* Gray, List. Gen. B., p. 32 (same type) (nec Keys. & Blas., 1840).
= 1846.—*Megistura* Agassiz, Nom. Zool. Ind. Univ., p. 227 (emend.).
= 1849.—*Megisturus* Temm. & Schl., Faun. Jap. Aves, p. — (emend.).

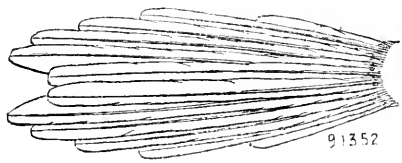
When Boie, in 1822, combined *Parus caudatus* and *pendulinus* to the genus *Aegithalus*, that name had already been applied to the former of these two species by Hermann in 1804. This gentleman in his "Observationes Zoologicæ" described a bird, which was caught in the mount-

* *Poecile k.* Bonaparte, Consp. Av., I, p. 230 (1850).—*Parus k.* Stejneger, Ord. Expl. Kamtsch., p. 297 (1885).

† Αιγιθαλος, a titmouse.

ains of Switzerland, as "*Pipra ? europæa*, NOBIS," and after having stated the structural characters, he says: "Si novum genus mereatur, *Aegithalos* vocari poterit," *i. e.:* If deserving to form a new genus, it may be called *Aegithalos*. I have seen no attempt to identify this "*Pipra ? europæa*," which may be considered rather strange, since the name evidently belongs to a European bird, but there can be no doubt, in my mind, that his specimen was a Long-tailed Tit of the form usually called *Acredula rosea* or *Mecistura vagans*, which, therefore, in the future should stand as *Aegithalos europæus*.

The following is the essential part of his diagnosis and description in translation: "Black, crown of head and underneath white, tail forked (*forficata*), with the lateral rectrices shorter, their outer margin white. The bill is neither that of a Fringilla, nor that of a Motacilla, nor indeed that of a Parus, but agrees more with that of a Pipra. Not so, however, the feet, which are not gressorial. The tail is forked (*forficata*), the outer rectrix very short, the following short, the third longer, these three with the outer margin white, but more obscurely so in the third. Size of a *Motacilla* [Phyllopseustes] *trochilus*. Feet somewhat high. ..... Also the anterior [exterior] margin of the secondaries is white, the broader and clearer so the farther behind and nearer the back." The description of the tail is an exact description of that of the Long-tailed Tit. It sounds like a contradiction when he describes it as forked, saying at the same time that the three outer pairs are graduated, but he evidently only means to say, that the middle pair is shorter than the following, and it is just the peculiarity of the tail of this species, that it is, so to speak, forked and graduated at the same time (see the accompanying cut). He also mentions the peculiar shape of the bill,



and the comparatively great length of the tarsus. The coloration of the wings is accurately described, and so is that of the body, though he does not mention the red of the shoulders, it being therefore probable that the specimen he described was a young bird in which this color is absent. To verify the identification it is only necessary to compare it with fig. 6, taf. 95 of Naumann's "Naturgeschichte der Vögel Deutschlands," Vol. IV, and there cannot be the slightest doubt as to the accuracy and applicability of Hermann's description.

(219) **Aegithalos trivirgatus** (Temm. & Schl.).

Japanese Long-tailed Tit. Ō-naga.

1835.—*Parus caudatus* Temm., Man. d'Orn. 2 ed., III, p. 214 (*nec* Lin.).

1849.—*Parus trivirgatus* Temm. & Schl., Fauna Jap. Av., (p. 60, pl. xxxiv).—*O. trivirgatus* Swinhoe, Ibis, 1874, p. 156.—*Acredula trivirgata* Blakist. & Pryer, Ibis, 1878, p. 235.—*Id.*, Tr. As. Soc. Jap., VIII, 1880, p. 218.—*Id.*, *ibid.*, X, 1882, p. 151.—Blakist., Chrysanth., 1883, Feb., p. —. —Jouy, Pr. U. S. Nat. Mus., VI, 1883, p. 285.

1883.—*Acredula rosea a trivirgata* Gadow, Cat. B. Brit. Mus., VIII, pp. ix + 62.—Blakist., Amend. List B. Jap., p. 50 (1884).

1884.—*Acredula rosea* Seebohm, Ibis, 1884, p. 37.

It is hardly correct to say that "the only claim of *Æ. trivirgatus* to rank as a distinct species rests on the fact that in the majority of skins, though not in all, the black supercilium passes across the lores to the base of the bill,"* for there are other differences, which, in the case of specimens like that quoted by Mr. Seebohm (Ibis, 1884, p. 37), most likely would show them to be true *Æ. trivirgatus*. A glance at the tables of measurements appended below shows that the Japanese bird has a comparatively shorter tail and a longer bill than the West European *Ægithalos europæus* (Herm.)†; the bill is also perceptibly thicker and stouter. In regard to colors, those of the Japanese bird are purer and clearer, and the vinous tinge on the under parts perceptibly lighter; the white edges of the tertiaries and inner secondaries are purer and broader in *Æ. trivirgatus* than in *Æ. europæus*, and hardly differing from some specimens of true *Æ. caudatus;* the superciliary stripe is more solid and more intensive and shining black, besides, as already remarked by earlier writers, as a general rule extending to the bill. As on the loral region the blackish color seems restricted to the tips of the feathers it wears off easily, and as some British specimens have the loral feathers similarly, though less extensively, tipped with dusky, this character alone may not always be sufficient for distinguishing specimens from the extreme west or east of the Eurasian Continent. In view of the many other characters separating the two forms, which have not been mentioned by the authors claiming to have examined intermediate specimens, I refuse to use a trinominal designation for the Japanese Bottle-tit.

The present species is restricted to the Japanese Islands south of "Blakiston's Line," north of which *Æ. caudatus* is found. The adults of the two species are very easily distinguished, inasmuch as the former has a very distinct and broad black superciliary stripe which posteriorly is connected with the black of the back, thus encircling the white

* Cf. Seebohm, Brit. B. Eggs., I, p. 487.

† 1804.—*Pipra? europæa* Hermann, Obs. Zool., p. 214.
1816.—*Mecistura vagans* Leach, Syst. Cat. Mam. B. Br. Mus., p. 17 (*nom. nud.*).
1836.—*Mecistura rosea* Blyth, ed. White's Nat. Hist. Selborne (p. 111).
1839.—*Mecistura longicaudata* Macgillivray, Hist. Brit. B., II, p. 454.

crown and nape, while in the northern bird the whole head is pure and uniform white.*

The young ones, on the other hand, may be rather difficult to distinguish, even more so than the young ones of the corresponding European species, since in the two Japanese forms the amount of white on the tertiaries and secondaries is about the same. Having only a very faded specimen of a young European *Æ. caudatus*, I am unable to point out with certainty any character beyond the relative size; but as seen from the tables, the difference in that respect between the adults is apparently very slim, and an attempt to determine a young bird by means of the comparative measurements would probably prove futile. I am inclined to think, however, that the very distinct black spot above the eye, as distinguished from the brownish color of the rest of the superciliary stripe, shown in the three specimens of young *Æ. trivirgatus* before me, may be a distinctive character, to which I, therefore, call the attention of Japanese ornithologists.

The young of *Æ. trivirgatus* may be described as follows:

♂ *juv.* (*U. S. Nat. Mus.* No. 88647; *Fuji, July* 11, 1882; *coll.* P. L. Jouy, No. 487.) Wings and tail as in the adults; back, dark sepia with a slight vinaceous tinge; hind neck, ear coverts, and superciliary stripe similar, but lighter and more brownish; above the eye a distinct deep black spot in the superciliary stripe: cheeks, chin, and throat pure white, the rest of the under parts, top of head, and scapulars white, the ends of the feathers faintly soiled with a dusky wash, which behind the throat is so pronounced as to form a rather distinct but narrow band across the breast; crissum and under tail-coverts fawn-colored, slightly suffused with vinaceous. According to Jouy (Pr. U. S. Nat. Mus. VI, 1883, p. 285) the iris of the young birds is "black," and the eyelids of a "brilliant orange color."

Measurements of ÆGITHALOS TRIVIRGATUS.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Bill, from nostril.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
91352	Jouy, 837	♂ ad.	Tate Yama, Hondo	Dec. 4, 1882	58	80	4.5	16	.....
91353	Jouy, 838	♀ ad.	do	Dec. 4, 1882	60	78	4.5	16.5	13
91351	Jouy, 790	♀ ad.	do	Nov. 11, 1882	61	83	4	17	.....
88649	Jouy, 485	♂ ad.	Fuji Yama, Hondo	July 11, 1882	60	(†)	5	17.5	.....
109356	.....	♀ ad.	Iwaki, Hondo	Feb. 4, 1886	60	81	4.5	17	12.5
109357	.....	♂ ad.	do	Feb. 4, 1886	59	77	5	18	13
	Average measurements of six adults				60	80	4.5	17	13
88647	Jouy, 487	♂ juv.	Fuji Yama	July 11, 1882	55	82	4.5	16	12.5
88648	Jouy, 477	♂ juv.	do	July 11, 1882	56	80	5	16	.....
88646	Jouy, 464	♂ juv.	do	July 10, 1882	54	79	5	17	13

* It may be noted as a curiosity, that Dr. Gadow, in the "Key to the Species" (Cat. B. Brit. Mus., VIII, pp. 54–55), includes *Æ. caudatus* in the group of species which have the "centre of crown, from nostrils to nape, pale, either fawn-colored or white," *as distinguished from those with* the "crown uniformly colored."

† Molting.

In order to facilitate comparison the following table of measurements of the true *Ægithalos europæus* in the collection of the museum has been prepared.

Measurements of ÆGITHALOS EUROPÆUS.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Bill, from nostril.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
18770	.....	♂ ad.	England	.....	59	84	4	17	.....
95218	.....	♂ ad.	.....do.....	.....	62	86	4	18	.....
18777	.....	♀ ad.	.....do.....	.....	60	*75	4.5	18	.....
95219	.....	♀ ad.	.....do.....	.....	58	82	4	19	12.5
96553	Whitely	ad.	.....do.....	.....	62	89	4	.....	.....
98167	.....	ad.	.....do.....	.....	61	83	4	.....	12
Average measurements of six adults					60	85	4	18	12

* Very worn.

(220) Aegithalos caudatus (LINN.).

Long-tailed Tit. Shima-o-naga.

1758.—*Parus caudatus* LINN., S. N. 10 ed. I, 190.—*Id.*, S. N., 12 ed. I. p. 342 (1766).—*Aegithalus caudatus* BOIE, Isis, 1822, p. 556.—*Acredula c.* SWINHOE, Ibis, 1874, p. 156.—BLAKIST. & PRYER, Ibis, 1878, p. 236.—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, p. 218.—*Iid.*, *ibid*, X, 1884, p. 151.—BLAKIST., Chrysanth., 1883, Jan., p. 30.—*Id.*, Amend. List B. Japs., p. 28 (1884).

1761.—*Lanius biarmicus* LINN., Fauna Suec. 2 ed. (p. 29, tab. I).

1831.—*Paroides longicaudus* BREHM, Handb. Vög. Deutschl., p. 470.

1855.—*Mecistura pinetorum* BREHM, Naumannia, 1855 (p. 285).

The white-headed Bottle-tit which in Japan only occurs in Yesso, regularly at least, is identical with the typical European *Æ. caudatus.* If anything, the tail is shorter than in the European form, and the amount of white on secondaries and rectrices is not greater; consequently it is different from the Siberian form *Æ. caudatus macrurus.** I should mention, however, that the vinous color on the flanks is slightly paler in the Japanese birds before me.

Measurements.

U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Bill from nostril.	Tarsus.	Middle toe, with claw.	Total length.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
96147	Blakist., 3206	♂? ad.	Sapporo, Yesso.	Oct. 23, 1882	61	81	4.5	17	.	"140"
91549	Blakist., 3207	ad.	.. do	Oct. 23, 1882	62	85	4.5	18	13	.....

The material, as will be seen, is rather scanty, and I would be very glad to receive additional specimens from Yesso, especially young ones,

* *A*[*credula*] *macrura* SEEBOHM, Brit. B. Eggs., I, p. 487 (1883).

in order to be enabled to establish the difference, if any, between the young ones of the two Japanese species.

The following table is compiled from Captain Blakiston's manuscript notes, and is especially valuable for the measurements of the total length:

Measurements by Capt. Th. Blakiston.

Museum and No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Total length.	Remarks.
					mm.	*mm.*	
	Blakiston, 1122	.....	Hakodadi, Yesso	Feb. 3, 1873	63	140	To Swinh.
	Blakiston, 2163	♂	...do	Feb. 12, 1877	65	147	
Hak. M., 295	Blakiston, 2164	♀	...do	Feb. 12, 1877	62	136	To Pryer.
Hak. M., 296	Blakiston, 2165	♀	...do	Feb. 12, 1877	62	136	
	Blakiston, 2314	♂	do	Apr. 11, 1877	65	140	
Hak. M., 299	Blakiston, 2380	♀	Sapporo, Yesso ...	May 5, 1877	60	140	
Hak. M., 300	Blakiston, 2381	♂	.. do	Apr. 21, 1877	65	145	
	Blakiston, 2382	.....	... do	Oct. 28, 1877	65	142	
	Blakiston, 3133	.....	....do	Oct. 12, 1882	60	143	
U. S., 96147	Blakiston, 3206	.....	....do	Oct. 23, 1882	60	140	
Average measurements of ten specimens					63	141	

The young birds differ from the adults in having a dusky superciliary stripe after the fashion of the foregoing species, to which the reader is referred for further remarks on the characters of the young ones. *Æ. caudatus*, from Yesso, in first plumage, is on our list of desiderata.

REMIZA* STEJNEGER.

<1822.—*Aegithalus* BOIE, Isis, 1822, p. 556 (type *P. pendulinus*) (*nec* HERM. 1804).
<1826.—*Xanthornus* PALLAS, Zoog. Ross. As., I, p. 428 (*nec* SCOP. 1777).
=1828.—*Pendulinus* BREHM, Isis, 1828, p. 1284 (type *P. polonicus* = *P. pendulinus* L.) (*nec* VIEILL., 1816).
=1835.—*Paroides* REIDER & HAHN, Fauna Boica, p. — (nec BREHM, 1828).

From the above synonymy it will be seen that all the generic names usually applied to the Penduline Tit-mice are preoccupied, and as a new one has become necessary, I have "latinized" the vernacular Polish name by which the typical species *Parus pendulinus* LIN. is most extensively known. Mr. G. R. Gray, in 1842 (App. List Gen. B., p. 8), quotes "PAROÏDES *Koch* (1816)," but this is a mistake, and Gray, in his Handlist, dropped it from the synonymy altogether.

(221) **Remiza consobrina**† (SWINH.).

Eastern Penduline Tit.

1863.—?*Aegithalus pendulinus* RADDE, Reis. Süden Ost-Sibir., II (p. 195) (*nec* LIN.).—SEEBOHM, Ibis, 1879, p. 33.

* *Remiz* said to be the Polish vernacular name; also used in French and other languages.

†*Consobrina*, Lat. = a cousin.

1870.—*Ægithalus consobrinus* SWINHOE, P. Z. S., 1870, p. 133.—SEEBOHM, Ibis, 1879, p. 33.—*Id., ibid.*, 1884, p. 37.—BLAKIST. & PRYER, Tr. As. Soc. Jap., VIII, 1880, p. 218.—*Id., ibid.*, x, 1882, p. 152.—BLAKIST., Amend. List B. Jap., pp. 26 and 51.

The only birds of this species yet taken in Japan, so far as I am aware, are the three specimens which were collected by Mr. F. Ringer at Nagasaki, in February, 1877, two of which are now before me, viz, the same two, to which Seebohm's remarks, in Ibis, 1884, p. 37, refer.* In regard to the third one, we have the assurance that it is a male, "identical" with the male of our collection (cf. Blakiston, Ibis, 1879, p. 33), and "that it agrees exactly with the type [of *Æ. consobrinus*] in the Swinhoe collection from China" (Seebohm, *l. c.*). This specimen is now, probably, in Mr. Seebohm's collection.

The history of the present species is yet involved in considerable doubt. It was originally described by Swinhoe, in 1870, from Chinese examples. Seebohm, in 1879, doubted not only its specific validity, but even its subspecific distinctness, and was inclined to pronounce the skin from Japan and Swinhoe's type of *Æ. consobrinus* to be females, or not fully adult males, of *Æ. pendulinus*, "as they are scarcely to be distinguished from a skin of a female in my collection from Asia Minor, and another from Piedmont, in Dresser's collection;" Dr. Gadow, in 1883 (Cat. B. Brit. Mus., VIII, p. 67), makes it an unconditional synonym of *R. pendulina*, but, in 1884, Mr. Seebohm recedes from his former position, after having seen the specimens now before me, and states that they "appear to prove that this species * * * is a good one."

The Penduline Tit has a winter plumage considerably different from the summer dress, but, like the other members of the family, the molt is simple, taking place during the autumn. The different appearance of the breeding plumage, therefore, is caused by the buff-colored margins of the autumnal dress dropping off, thereby exposing the more basal portion of the feather; consequently, if this portion is colored differently from the margins, the plumage will change color accordingly.

When, therefore, in the European species, the buffy margins drop off in spring, the whole upper side of the head becomes nearly pure white, the whole upper back changes to a rich rusty chestnut brown, and the breast becomes marked with chestnut. In the eastern birds the changes will be less, because the feathers of the back, except a narrow chestnut collar, and those of the breast, are uniformly colored, the former darker, the latter lighter, ochraceous, and as the centers of the feathers covering the crown and hind neck are ashy gray, these parts in spring will assume the last-mentioned color.

If Swinhoe's Chinese type and Blakiston's two males are correctly sexed, the eastern birds are still more different from the European species, for the black ear-patch is much smaller, the black frontal band much narrower, the chestnut spot on the forehead quite absent; the supercilia of *R.*

*These are also the same birds to which Messrs. Blakiston and Pryer refer (Tr. As. Soc. Jap., x, 1882, p. 152) as being in the Hakodadi Museum.

consobrina are pure white in marked contrast with the gray of the crown, and without a trace of black, and a distinct white mustachial stripe separates the black of the cheeks and ears from the ochraceous of the chin and throat. The females from China and Japan may be correctly sexed, but are probably birds of the year, since their general style of coloration is that of the young *R. pendulina*, and it would hardly be justifiable to presume that the adult female of the eastern species should differ from the male in having no black ear-patch, while the two sexes of the European species in that respect are nearly alike.

In regard to size *R. consobrina* seems to be somewhat smaller than its European cousin, for three specimens of the latter in very abraded plumage average, wing 56^{mm}, and tail-feathers 47^{mm}, with which compare the following:

Measurements of REMIZA CONSOBRINA.

U. S. Nat. Mus. No.	Collector and original number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
96148	Ringer; B., 2543 ..	♂ ad.	Nagasaki, Kinshiu ..	Feb. 12, 1877	53	42	9	14	.....
96149	Ringer; B., 2544 ..	♀	.....do	Feb. 25, 1877	52	40	8	14	13

I am strongly convinced that Mr. Seebohm is perfectly justified in pronouncing *R. consobrina* a good species.

This interesting bird ought to attract the attention of the Japanese ornithologists especially, and no efforts should be spared in order to find out whether it breeds in the southern parts of the empire or not. I am not aware that the high summer plumage of the present species has been yet obtained and described, and specimens taken during that season would be a great prize. The bird must be looked for in marshy districts near water, where the Penduline Tit builds its elegantly woven retort-shaped nest, suspending it from some reed or thin willow twig. Its habits during the breeding season are exceedingly retired, and the bird may breed in the immediate neighborhood without anybody knowing it. In mild climates it is a resident throughout the year.

SITTA LINN.

1758.—*Sitta* LINN., S. N., 10 ed., I, p. 115 (type *S. europæa*).

Mr. Seebohm has already pronounced the Nuthatches from Hondo *Sitta amurensis*, and those from Yesso different and "almost *uralensis*." I agree to the former being *amurensis* and to the latter being different, but I must dissent from calling them *uralensis* or even "almost *uralensis*." Mr. L. Taczanowski, in a paper in the Bulletin de la Société Zoologique de France (1882, p. 385), has pointed out very nicely the characters which separate the Eastern Asiatic Nuthatches from *S. europæa* and *S. uralensis*, viz, the general smaller size of the eastern birds, and

particularly their smaller and slenderer bill, and the greater straightness of the culmen. The eastern species he divides into three different forms:

(1) *Sitta baicalensis* TACZAN., similar in coloration to *S. europæa*, having the flanks strongly marked with deep chestnut brown; from the surroundings of Irkutsk, Lake Baikal, and Dauria.

(2) *Sitta amurensis* SWINH., distinguished from the foregoing form by the ochraceous color occupying the whole surface of the abdomen in strong contrast with the pure and silky white of the breast and fore neck; it occurs from Amur throughout Ussuri and Northern China.

(3) *Sitta albifrons* TACZAN., characterized by a white forehead, a broad white superciliary stripe, a white band across the wing; by the flanks being pure white with hardly any trace of chestnut; and by the greater extent of the white spot on the tail; this form inhabits the peninsula of Kamtschatka.

As already intimated, the Hondo Nuthatch agrees with typical *S. amurensis*. The Yesso bird, on the other hand, does not agree with *S. baicalensis*, nor with *S. albifrons*. It lacks the chestnut flanks of the former, but has instead a faint ochraceous tinge on the abdomen and flanks, and there are only faint indications of the positive characters distinctive of its Kamtschatkan relative. I have, therefore, concluded to give it a separate name, in order to better keep these nearly allied forms apart. Finally, I have before me a specimen from the "Kuril Islands," which in all essential features is a pretty typical *S. albifrons* TACZAN. Further remarks are to be found later on under the heading of each separate form. Those occurring in Japan may be distinguished by the following

SYNOPSIS.

a^1 Flanks tinged with buff.

b^1 Flanks rufescent buff with a strongly marked chestnut patch; buff extending to the lower breast ..... *S. amurensis.*

b^2 Flanks pale creamy buff, without a distinct chestnut patch; buff not extending beyond the abdomen ..... *S. a. clara.*

a^2 Flanks white ..... *S. a. albifrons.*

From the measurements to be given further on, it will be seen that the three Japanese forms do not differ materially *inter se*. Another character which they seem to possess in common is that all the superficial frontal feathers which are directed forward and conceal the nostrils are white, even in the southern examples.

(222 *part.*) **Sitta amurensis** SWINH.

Hondo Nuthatch. Ki-mawari.

1850.—? ? *Sitta roseilia* BONAPARTE, Consp. Av., I, p. 227.

1871.—*Sitta amurensis* SWINHOE, P. Z. S., 1871, p. 350.—SEEBOHM, Brit. B. Eggs, I, p. 525 (1883).—BLAKIST., Amend. List B. Jap., p. 51 (1884).

1878.—*Sitta europæa* BLAKISTON & PRYER, Ibis, 1878, p. 236 (*part*) (*nec* LINN.).—*Iid.* Tr. As. Soc. Jap., VIII, 1880, p. 219 (*part*).—BLAKIST., Chrysanth., Feb., 1883, p. —.—JOUY, Pr. U. S. Nat. Mus., VI, 1883, p. 287.

1882.—*Sitta europæa* subsp. *uralensis* BLAKISTON & PRYER, Tr. As. Soc. Jap., X, 1882, p. 152 (*part*).—BLAKIST., Am. List B. Jap., p. 51 (*part*) (1884).

This form may, or may not, be Bonaparte's *Sitta roseilia*. He only gives the following description: "*S. roseilia, Bp. ex Japonia. Subtus*

alba, lateribus crissoque pulchre castaneo-roseis!" As he indicates no specimen the probability is, that he has only named the *Sitta* mentioned in Temminck and Schlegel's Fauna Japonica, which was inserted upon the authority of a native drawing. The name may safely be passed over as absolutely indeterminable; in fact, so far as the description is concerned, it fits better Taczanowski's *S. baicalensis*.

As already remarked, there seems to be no reason to doubt this bird being identical with true *S. amurensis*. I may mention, however, that a specimen from Amur (U. S. Nat. Mus. No. 98531), the only one at my command, has the nasal feathers entirely black, and no trace of a whitish edge to the tips of the greater wing-coverts, while in the Japanese birds, the superficial nasal plumes are pure white, and a narrow white streak runs across the wing. As the Amur specimen, however, is in a somewhat abraded plumage these differences may be insignificant, but I should like to get information as to these features in typical birds in fresh plumage. The specimen mentioned agrees very well with the Japanese birds in regard to dimensions.

Measurements.

U. S. Nat. Mus. No.	Collector and original number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
96151	Pryer, B., 2679	ad.	Nikko, Hondo	Aug., 1879	80	41	16	19	22
91355	Jouy, 633	♂ ad.	Chiusenji Lake, Hondo.	Aug. 29, 1882	83	44	15	20	22
91356	Jouy, 663	♂ ad.	do	Sept. 4, 1882	79	41	15	19	21
91357	Jouy, 671	♂ ad.	do	Sept. 6, 1882	82	43	16	19	21
91358	Jouy, 745	♂ ad.*	Tata Yama, Hondo	Oct 31, 1882	77	39	14.5	18.5	21
109358		♂ ad.	Suruga, Hondo	Nov. 21, 1884	79	42	16	18	.....
109359		♂ ad.	do	Nov. 23, 1884	77	40	14	20	22
	Average measurements of seven specimens				80	41	15.2	19	21.5

* No 91358, judging from the colors of the under tail-coverts, and the measurements, is probably wrongly sexed.

In order to substantiate what has been said above concerning the difference of the eastern forms from true *Sitta europæa* the following table of dimensions is appended for comparison:

Measurements of typical S. EUROPÆA.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
107473	Stejn., 183	♂ ad.	Bergen, Norway	Apr. 10, 1876	87	47	17	20	23
107474	Stejn., 431	♂ ad.	do	Nov. 14, 1880	83	44	18	20	22.5
107472	Stejn., 286	♂ ad.	do	Dec. 2, 1878	84	45	19	20	.....
107475	Stejn., 30	♂ ad.	Christiania, Norway	Oct. 18, 1872	88	49	18	.....	.....
56745	Schlüter, 564	♂ ad.	Sweden		89	47	18	.....	.....
	Average measurements of five specimens				86	46	18	20	23

(222 *part.*) **Sitta amurensis clara** subsp. nov.

Yesso Nuthatch. Ki-mawari.

1858.—*Sitta sibirica* CASSIN, Pr. Philada. Acad., 1858, p. 195 (*nec* BREHM, 1855).

1862.—*Sitta roseilia* BLAKISTON, Ibis, 1862, p. 322 (*nec* BONAP., 1850?).—*Id., ibid.*, 1863, p. 99.

1863.—*Sitta uralensis* BLAKISTON, Ibis, 1863, p. 89 (*nec* LICHT., 1834).

1867.—*Sitta europæa* WHITELY, Ibis, 1867, p. 196 (*nec* LINN.).—SWINHOE, Ibis, 1874, p. 152.—BLAKIST. & PRYER, Ibis, 1878, p. 236(*part*).—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, p. 218 (*part*).—SEEBOHM, Ibis, 1879, p. 34.—BLAKIST., Chrysanth., Jan., 1883, p. 30.

1882.—*Sitta europæa* subsp. *uralensis* BLAKISTON & PRYER, Tr. As. Soc. Jap., X, 1882, p. 152 (*part*).—BLAKIST., Chrysanth., Oct., 1882, p. 522.—*Id.*, Am. List. B. Jap., p. 51 (*part*) (1884).

DIAGN.—Similar to *Sitta amurensis*, but with the whole breast white, and the abdomen and flanks only faintly suffused with a creamy buff.

HAB.—Yesso, Japan.

TYPE.—U. S. Nat. Mus., No. 91547.

The specimens before me are apparently all females, and male birds from Yesso are, therefore, very desirable. In addition to the character indicated in the diagnosis these females are noteworthy for the nearly complete absence of chestnut on the flanks and the paleness of the brown edges of the under tail-coverts. Probably, the males will show more of the chestnut color, but judging from analogy I think it safe to say that the amount will be perceptibly less than in the Hondo birds.

This, of course, is only a slight northern modification of *S. amurensis*, the white color of which has increased to a perceptible extent. In consequence the trace of white at the frontal line, the white superciliary line, the white line across the wing formed by the ends of the great coverts, and the white band across the external tail-feathers, are more distinct or broader, features still more pronounced in the next form.

Measurements.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.	Total length.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
96153	Blakist., 2929	♀ ad.	Sapporo, Yesso ...	June 12, 1882	77	41	16	19	21	.....
91547	Blakist., 3167	ad.	.....do.....	Oct. 17, 1882	78	40	15	19	21	"136"
96154	Blakist., 1548	♀ ad.	Nemoro, Yesso....	Oct. 6, 1874	76	40	15.5	18	21	"130"
Average measurements of 3 specimens					77	40	15.5	19	21	.....

The following table is compiled from Captain Blakiston's notes and gives the total length of 17 specimens as measured by him.

Measurements by Captain Blakiston.

Blakiston's No.	Sex.	Locality.	Date.	Total length.
				mm.
755	♂	Hakodadi, Yesso	Oct. 20, 1861	134
1109	♂	do	Feb. 1, 1873	128
1153	....	do	Mar. 29, 1873	128
1381	....	do	Apr. 6, 1874	128
1382	♂	Shiribets R., Yesso	Oct. 29, 1873	132
1548	♀	Nemoro, Yesso	Oct. 6, 1874	130
1550	♀	Sapporo, Yesso	Nov. 12, 1874	136
1887	♀	do	Oct. 29, 1875	132
2383	♂	do	Apr. 21, 1877	130
2384	♀	do	May 2, 1877	130
2385	♂	do	May 5, 1877	130
2386	♂	do	May 26, 1877	130
3166	♂	do	Oct. 17, 1882	138
3167	....	do	Oct. 17, 1882	136
3168	....	do	Oct. 17, 1882	140
3169	....	do	Oct. 17, 1882	137
3170	♂	do	Oct. 15, 1882	138
		Average total length of 17 specimens		133

Sitta amurensis albifrons (TACZAN.).

Kamtschatkan Nuthatch.

1840.—*Sitta sericea* TEMMINCK, Man. d'Orn. 2 ed., IV, p. 645 (*part*).
1858.—*Sitta uralensis* KITTLITZ. Denkwürd. Reise, I, p. 321.
1882.—*Sitta albifrons* TACZANOWSKI. Bull. Soc. Zool. France, 1882, p. 385.

The specimen from the Kuril Islands, collected by Mr. Snow, which I have referred to the form recently described by Mr. Taczanowski as *Sitta albifrons*, the type of which came from Kamtschatka, agrees so precisely with the description given by the latter gentleman, that I have no doubt as to the correctness of the identification. Compared with the North European Nuthatch it presents differences which would make it an excellent species; but alongside the two other Japanese forms it proves itself only the northern link of the continuous chain which we call *S. amurensis*. It differs as much, and in the same manner from the subspecies of the latter called *S. clara*, as does the latter from the supposed typical bird which inhabits Hondo.

"Kuril Islands" is a rather vague locality, and it is to be hoped that we may soon get more precise information in regard to the exact habitat. More specimens are highly desirable.

Measurements.

U. S. Nat. Mus. No.	Collector and original number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
96150	Snow; B., 2798....	ad.	"Kuril Islands"		79	43	14.5	18	21

APPENDIX TO THE MARSH-TITS (see *antea*, pp. 378–382).

Since the above was written and transmitted for publication I have had an opportunity of examining some additional and very valuable material, which Mr. Henry Seebohm has had the kindness to send me for inspection, a courtesy for which I hereby render my sincere thanks.

Besides two specimens of *Parus songarus* SEVERZ., which present the appearance of a very marked *species*, and a specimen of a Marsh-tit from Pekin, collected by Mr. R. Swinhoe, which is very much like the European forms *P. palustris* and *dresseri*, though lighter and clearer than both, and differing from them in about the same degree as does *P. baicalensis* from *P. borealis*, the collection sent by Mr. Seebohm contains two typical *P. borealis*, two *P. baicalensis* from Krasnoyarsk, two *P. brevirostris* from Amur, and two specimens from Yesso, which appear to be the types upon which, in 1879, Mr. Seebohm based his *P. japonicus*. One of these is Whitely's No. 97*a*, the other Blakiston's No. 1121.

These two specimens confirm the opinion expressed by me, that the name *P. japonicus* belongs to the Yesso bird. They agree in every respect with the two northern specimens in the National Museum (Nos. 96144 and 96145) not only in coloration, but also in the size of bill and tail. The two *P. brevirostris* of Mr. Seebohm's collection (♂ and ♀, collected in April; without numbers) differ only in having a much shorter bill; in other respects they are identical with the Yesso birds; but from our experience with the European forms we are not inclined to lay much stress upon this apparent difference, and unless large series of specimens from the two countries should prove the size of the bills to be a feature generally separating them, the Japanese form will have to stand as *Parus brevirostris*.

The Japanese birds agree with *P. baicalensis* in regard to the size of the bill, but the latter is considerably grayer on the back, and the black cap is more brownish.

I take the opportunity to present a new table of measurements of *Parus brevirostris* including Seebohm's specimens from Yesso and Amur.

Measurements.

Museum and number.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.
					mm.	*mm.*	*mm.*	*mm.*
U.S.Nat., 96144.	Blakist., 3131.	♂ ad.	Sapporo, Yesso	Oct. 12, 1882	67	62	7.5	16
Do., 96145 ..	Snow; B., 2799	ad.	"Kurils"	.....	66	59*	8	16
Seebohm.....	Whitely, 97*a* ..	♂ ad.	Hakodadi, Yesso.....	Nov. 22, 1865	66	(†)	8.5	16
Do.....	Blakist., 1121..	ad.	..... do	Jan. 23, 1873	63	57†	8	16
Do.....	Dybow.....	♂ ad.	Amur.....	Apr. —, ——	67	64	7	16
Do.....	....do	♀ ad.	.....do	Apr. —, ——	63	62	6.7	16

* Tail molting. † Tail defective.

REVIEW OF JAPANESE BIRDS.

By LEONHARD STEJNEGER.

III.—RAILS, GALLINULES, AND COOTS.

Only seven species belonging to the family *Rallidæ* have hitherto been recorded as found in Japan. It is pretty safe, however, to predict that members of this group will be found among the additions which are sure to be made to the Japanese avifauna. In the following synopsis, therefore, I have included some forms which may be expected to turn up in the southern parts of the empire, but to avoid confusion they are given in brackets.

The habits of the *Rallidæ* are skulking and solitary, and the localities they frequent mostly very difficult of access. Hence their presence is often unknown to the inhabitants of the nearest neighborhood, and they belong to the rarest birds in museums, few collections having really good series which are not less necessary in this than in other groups.

The material at my command is, therefore, very scanty, and this fact, in connection with our general imperfect knowledge of these birds, induces me to publish the following remarks in spite of their fragmentary character, hoping that they may be of some use in clearing up many obscure points. By the aid of the synoptical tables it is thought that ornithologists and sportsmen in the field will be enabled to determine the known species, thus being in position to discover at once whether the specimen they may have secured be new to the fauna or not.

It need hardly be added that additional observations and specimens will be very welcome, and due credit given.

SYNOPSIS OF THE JAPANESE GENERA OF THE FAMILY *RALLIDÆ*.

a^1. Base of culmen normal. (RALLEÆ.)

b^1. Exposed culmen much shorter than inner toe without claw; hind toe with claw longer than the distance from the tip of the chin feathering to the tip of the bill ..... *Porzana.*

b^2. Exposed culmen much longer than the inner toe with claw; hind toe with claw much shorter than the distance from the tip of the chin feathering to the tip of the bill ..... *Rallus.*

a^2. Culmen at base widened to at least three times the width at nostrils, or into a broad plate which often covers the whole forehead like a bony shield.

b^1. Toes without broad scalloped lobes (GALLINULEÆ).

c^1. No trace of cutaneous margins along the toes.

d^1. Hind toe with claw considerably longer than bill from loral apex; frontal shield very large, pointed behind, not carinated ..... *Gallicrex*

[d^2. Hind toe with claw considerably shorter than bill from loral apex; frontal shield very small, truncated behind, and carinated ..... *Amaurornis.*]

c^2. Toes with a narrow cutaneous margin along the sides ..... *Gallinula.*

b^2. Toes with broad scalloped lobes (FULICEÆ) ..... *Fulica.*

PORZANA Vieill.

1816.—*Porzana* Vieillot, Analyse, p. 61 (type *R. porzana* L.).
1816.—*Zapornia* Leach, Syst. Cat. M. B. Br. Mus., p. 34 (type *Z. minuta* Leach).
1817.—*Zaporina* Forster, Synopt. Cat. Br. B., p. 59 (emend.).
1829.—*Phalaridion* Kaup, Entw. Eur. Thierw., p. 173 (types *Gallinula pusilla* et *pygmæa*).
1845.—*Rallites* Pucheran, Rev. Zool., 1845, p. 277 (type *R. pusillus*).
1846.—*Phalaridium* Agassiz, Ind. Univers., p. 283 (emend.).
1856.—*Coturnicops* Bonaparte, Compt. Rend., xliii, p. 599 (type *F. noveboracensis* Gm.).
1856.—*Creciscus* Cabanis, Journ. f. Orn., 1856, p. 428 (type *R. jamaicensis* Gm.).
1856.—*Corethrura* Cassin, Perry's Jap. Exp., ii, p. 229 (*nec* Reichenb., 1849).
1872.—*Limnobœnus* Sundevall, Meth. Nat. Av., p. 130 (type *Gallinula rubiginosa* Temm.).

SYNOPSIS OF THE JAPANESE SPECIES OF THE GENUS *PORZANA*.

a^1 Wings without a large white patch, the rectrices being uniform blackish brown, or with only a few small white spots on the secondaries; axillaries and lining of wing barred or mottled with dark gray and white.

b^1 Tibial feathers gray, mottled, or barred with whitish; upper wing coverts without transversal white markings (or the white markings longitudinal, if present).

c^1 Back and upper wing coverts brown, with black and white longitudinal markings; outer web of first primary edged with white (*Zapornia*) *P. intermedia.*

c^2 Back and upper wing coverts uniform olive brown, without any kind of markings; outer web of first primary dusky (*Limnobœnus*) *P. erythrothorax.*

[b^2 Tibial feathers pure white; upper wing coverts with transverse white bands, or waves of white..... *P. paykulii*].

a^2 Wings with a large white patch, the terminal half of the inner secondaries being white; axillaries uniform white; lining of wing for the greater part whitish (*Coturnicops*)..... *P. undulata.*

Subgenus ZAPORNIA Leach.

(148) Porzana intermedia (Herm.).

Baillon's Crake. Hime-kuina.

1776.—*?Rallus pusillus* [or *minutus?*] Pallas, Reise Russ. R., iii, App. (p. 700).
1804.—*Rallus intermedius* Hermann. Observ. Zool., i, p. 198.
18 .—*Crex pygmæa* Naumann, ubi?—*Porzana p.* Blakist. & Pryer, Ibis, 1878, p. 225.—*Id.*, Tr. As. Soc. Jap., viii, 1880, p. 202.—*Id.*, *ibid.*, x, 1882, p. 123.
1819.—*Rallus bailloni* Vieillot, N. Dict. d'Hist. Nat., xxviii, p. 548.—Seebohm, Ibis, 1884, p. 35.—*Gallinula b.* Temminck, Man. d'Orn., 2 ed., iv, p. 440 (1840).—*Porzana b.* Blakist., Chrysanth., April, 1883, p.—.—*Id.*, Amend. List B. Jap., p. 42 (1884).
1820.—*Gallinula stellaris* Temminck, Man. d'Orn., 2 ed., ii, p. 693.
1826.—*? Rallus minutus* Pallas, Zoogr. Ross. Asiat., ii, p. 155 (*nec* Gmel., 1788).
1836.—*Crex foljambei* Eyton, Cat. Br. B., p. 46 (*nec* Mont., 1813).

As to the proper systematic name of Baillon's Crake I am in considerable doubt, because I have no access to Pallas's original description of *R. pusillus* or *minutus*, and cannot even find out with certainty which of the two names is used by Pallas on p. 700, vol. iii of his Reise, since both are quoted by different authors. Usually we find quoted *R. pusillus* Pallas, 1776. He himself, however, quotes *minutus*. At any rate

the latter must have been published before 1826 (or 1811), for Hermann, Obs. Zool., I, p. 199, as early as 1804, asks, in speaking of his *Rallus paludosus* (which is *P. parva* ♀): "An *Rallus minutus*, Pallasii?" However, Professor Bogdanow has proved to my satisfaction (Consp. Av. Imp. Ross., I, pp. 54–56) that *pusillus* is not the bird which formerly was so called (now *P. parva* Scop.). But, on the other hand, I cannot recognize Baillon's Crake in Pallas's description in his Zoographia. Taczanowski's conjecture (Bull. Soc. Zool. France, 1876, p. 260) that Pallas had before him *Porzana undulata* is much less tenable. Altogether I am inclined to reject Pallas's name for the present, and to adopt, at least provisionally, the first name of undoubted pertinency.

Were we to follow the *plurimorum-auctorum*-principle we should be in a very bad dilemma whether to choose *P. bailloni* of Vieillot or *P. pygmæa* of Naumann, for we would be able to cite very long lists of authors in defense of both. But even when applying the rule of priority we meet with some difficulty in regard to these names. Vieillot's was given in 1819; Naumann's is usually quoted as dating from 1838, but he asserts (Naturg. Deutschl., IX, p. 567) that he was the first author to recognize it as a distinct species, and that he described and published it under the above name "more than twenty years ago," consequently before 1818. It is also probable that he is right, for, in 1824, Brehm (Lehrb. Eur. Vög., II, p. 641) quotes "*Gallinula pygmæa* Naum.," and Temminck, in 1820, says that Naumann was the first to distinguish the species, but he does not give any reference. I have, however, been unable to find Naumann's original publication.

Fortunately there is an older name, the pertinency of which cannot be doubted in the least, for in 1804 Hermann described the bird in unmistakable terms as *Rallus intermedius*. In order to substantiate this assertion I give the following abstracts from his description (Observ. Zool., I, 1804, p. 198):

Supra fuscus, infra cinereus, dorso, crisso, *hypochondriisque nigris cum apice tectricum fuscarum albo maculatis.*

Intermedium dixi ob colorem ralli aquatici, rostrum autem ralli porzanae.

Captus fine Aprilis 1782. Argentorati; tum iterum 1789. vere.

Multo minor porzana, licet rostrum aeque longum et crassum eademque forma. Color jugnli, pectoris abdominisque cinereus ut in rallo aquatico, sed clarior et magis coerulescens. Hypochondria uti in isto albo striata, quod in crissi usque apicem continuatur. *Dorsi cum aquatico color idem, nisi quod in medio nigrum sit, sparsasque maculas habeat, quæ quoque sunt in tectricibus, nigro irregulariter circumdatas.*

It will be seen that we have here an excellent description of the male of Baillon's Crake. If Pallas's description does not apply to the present bird no reason can be given for rejecting Hermann's name under the existing rules of zoological nomenclature.

Measurements.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
95978	Blakist., 2717.....	jun.	Yokohama	.....	83	44	17	30	40
77004	... ...	♀ ad.	Philippines?	.....	90	46	16	27	34
95220	Saunders, 1243 ...	♂ ad.	Valencia, Spain	Nov. 4, 1872	88	43	17	30	38

Subgenus LIMNOBÆNUS SUNDEV.

(147) **Porzana erythrothorax** (TEMM. & SCHL.).

Red-breasted Crake. Hi-kuina.

1849.—*Gallinula erythrothorax* TEMM. & SCHLEG., Fauna Jap. Av., (p. 121, pl. lxxviii), (*nec* RADDE, 1863, quæ *P. mandarina*).—*Corethrura e.* CASSIN, Perry's Jap. Exped., II, p. 229 (1856).—*Porzana e.* SWINHOE, Ibis, 1861, p. 57.—*Id., ibid.*, 1874, p. 163.—BLAKIST., Ibis, 1862, p. 331.—*Id.*, Amend. List B. Jap., p. 13 (1884).—BLAKIST. & PRYER, Ibis, 1878, p. 225.—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, p. 202.—*Iid., ibid.*, X, 1882, p. 123.

There seems to be the same confusion in regard to *Porzana fusca* and its allies as in the case of *Rallus striatus* (cf. Stejneger, Pr. U. S. Nat. Mus., 1886, pp. 362–364); but, unfortunately, my material is very scanty, so that my conclusions are only to be regarded as provisional.

Porzana fusca (*Rallus fuscus* LINN., S. N., 12 ed., 1766, I, p. 262) was orginally based upon a specimen from the Philippines, and Brisson's excellent description (Orn., V, 1760, p. 173) agrees perfectly with a specimen before me (U. S. Nat. Mus. No. 77007) from the same locality. It is a small bird of very saturated coloration, without white chin and throat, as testified by Brisson's description, by my specimen, and by the figure, in Pl. Enlum., pl. 773, which, on the whole, is a tolerably good representation of the bird. The vinous color of the breast pervades the whole under parts, except the flanks, which are like the back, so that the dusky of the abdomen and tibiæ and the black of the under tail-coverts are strongly tinged with vinous.

Of *P. rubiginosa*, which Temminck described from Java (*Gallinula rubiginosa*, Pl. Color., livr. 60, 1825, pl. 357), I have no specimens at hand. Judging from Schlegel's measurements (Mus. P. B. Ralli, 1865, p. 20), however, it is of the same size as the true *P. fusca*, but seems to have a well-marked white chin and throat, and the color of the lower abdomen and under tail-coverts seems to differ in being decidedly olivaceous. The Indian bird (*P. fusca* Jerdon, B of Ind., III, 1864, p. 724) with the wing $3\frac{3}{4}$ inches (95mm) long, the "lower abdomen, vent, and under tail-coverts dark olivaceous with white bars," and which is "albescent on the chin and throat," probably belongs here.

Schlegel (*tom. cit.*, p. 21) characterizes *P. erythrothorax*, from Japan, as "absolutely similar to *Rallina fusca*, but of a much larger size," and Lord Tweeddale (Tr. Z. S., IX, 1875, p. 230; Orn. Works, p. 393) says that it "only differs in being considerably larger." Swinhoe (P. Z. S., 1871, p. 414) states that the "pectoral red does not extend so low down as in *P. fusca*," a character which Lord Tweeddale says is "a sign of immaturity in the South-Asiatic form." Swinhoe's remarks evidently refer to Chinese and Formosa examples, and agree perfectly with two specimens before me, one, a male, from Shanghai (U. S. Nat. Mus. No. 85754), the other, a female, from near Hong-Kong (No. 86135), both obtained by Mr. Jouy; but these birds certainly show no sign of immaturity. The two Japanese specimens before me are certainly also quite adult, and agree exactly with those from China. I consequently consider the fact of the entire abdomen up to the breast being gray, slightly washed with brownish, as a good character of the present form. The colors are less saturated than in the Philippine specimens; chin and throat are distinctly and definitely white, and the under tail-coverts are pure blackish gray barred with white. As will be seen from the subjoined measurements, the Chinese and Japanese birds are considerably larger. The Japanese specimens agree precisely with those from China in regard to coloration, and although the wings in the two specimens in question are a trifle shorter, there can be no general difference in regard to size, for the average length of the wing of seven Hakodadi males, as measured by Captain Blakiston and noted in his MSS., is 115^{mm}, or exactly the same as in the two Chinese specimens. The average total length of the same number of Japanese birds I find to be 236^{mm}. It will be seen that the species is not subject to so great variation in regard to size as is usually reported. It should in this connection be borne in mind that the larger specimens said to have been collected at the Amur by Professor Radde, and which are referred to by Mr. Schlegel and Lord Tweeddale, do not really belong to the present species, but to the widely different *P. paykulli*, as shown by Professor Bogdanow.

Measurements.

1. PORZANA ERYTHROTHORAX.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
85754*	Ferguson	♂ ad.	Shanghai, China	May 10, 1881	115	54	22	39	46
86135	Jouy, 198	♀ ad.	Hong-Kong, China	Oct. 30, 1881	115	54	22	36	41
109437		♂ ad.	Tokio, Japan	May, 1884	111	51	22	35	42
109438		♀ ad.	do	May, 1884	113	51	22	36	44

* Total length, 9 inches (229^{mm}). Eyes red.

2. PORZANA FUSCA.

77007		ad.	Philippines		94	51	19	32	36

[Porzana paykulli (Ljungh).]

1813.—*Rallus paykulli* LJUNGH, Sv. Vet. Akad. Handl., 1813 (p. 258).—*Rallina p.* HUME, Stray Feathers, VIII, 1879, p. 406.

1863.—*Crex erythrothorax* RADDE, Reise Süd. Ost- Sib., II (p. 309) (*nec* TEMM. & SCHL.).—*Rallina e.* TACZAN., Bull. Soc. Zool. France, 1876, p. 260.

1870.—*Porzana mandarina* SWINHOE, Ann. Mag. Nat. Hist., 4th ser., v, p. 173.

This species has been found in China by Swinhoe and David; in Malacca by Hume, and the British Museum is said to possess specimens both from Batavia—whence came the type of *paykulli*—and Malacca. In the north it has been collected in Ussuri and Dauria by the Russian travelers. It is therefore probable that some day it will be found in Japan also.

As to the name, I refer to Hume's paper in "Stray Feathers," quoted above. It is very important, however, that Malacca specimens should be compared with northern ones.

Professor Bogdanow (Consp. Av. Imp. Ross., I, p. 52) states that this species is nearly related to the European *Crex crex* (*Crex pratensis* BECHST.) and refers it to that genus. Having no access to specimens, I have left it in the genus in which it is most generally placed.*

For the same reason I here reproduce the original description by Mr. R. Swinhoe (Ann. Mag. Nat. Hist., 4th ser., v, pp. 173–174):

♂ *ad.—Canton River, China; collected by Mr. S. Bligh, in spring.*—Crown, hind neck, and upper parts deep brownish olive, ruddy on the forehead. Throat pure white. Eyebrow, the whole face, neck, and breast to the middle of the belly ferruginous chestnut, mixed on the last with white. Belly, axillaries, and under tail-coverts light black banded with white; tibial feathers pure white. Quills and tail olive-brown, the outer feathers of the former with its outer web white; feathers of the wing-coverts marked with narrow waves of white with brown lower edgings. Bill olive-green, yellow at tip of lower mandible. Irides light brownish crimson. Legs ochreous yellow tinged with green; claws browner.

Length about 9 inches [229mm]; wing 5.1 [130mm]; tail 2.4 [61mm] of eight soft slightly graduated feathers; bill to gape 1.2 [30mm], to forehead .9 [23mm], depth at base .35 [9mm]; bare part of tibia .5 [13mm]; tarse 1.6 [41mm]; middle toe 1.6 [41mm], its claw .3 [8mm].

Later on Mr. Swinhoe himself obtained several fresh specimens at Chefoo during May and June, of which he gives the following description (Ibis, 1875, p. 136):

Adult male.—Bill bluish gray, blackish on culmen and about tip, pea-green about base; inside of mouth flesh-color; iris crimson, eyelid red; legs and toes salmon-color, brownish on under surface of tarse, on the toes and on their soles. Tibia bare for .8 inch [20mm]; tarsi 1.6 [41mm]; middle toe and claw 1.75 [44mm]; bill in front 1 [25.4mm], to gape 1.12 [28mm], depth at base .48 [12mm]. Total length 9.25 [235mm]; wing 5 [127mm], .5 [13mm] longer than tertiaries, .8 [20mm] from tip of tail; first quill 1 in. [25.4mm] shorter than the second and third, which are equal and longest; tail 2 [51mm], rounded, often soft-ish feathers, outer rectrix .4 [10mm] the shortest; under tail-coverts .1 [2.5mm] short of tail-tip, upper tail-coverts .8 [20mm] short of same.

*I would remark, however, that it appears from the measurements given by Swinhoe, that the proportions of the two birds are somewhat different. *Crex* has the middle toe with claw shorter than tarsus, while in the present species the tarsus is shorter than the middle toe with claw.

A second male is smaller, has shorter toes, and many more white bands and markings on its lesser wing-coverts. Testes large and swollen. Females and junior males are smaller in their proportions, have white throats and white wavy marks on the upper wing-coverts. In old males the throat is as red as the breast, and the wing-coverts have few white marks. The living birds in the cage uttered suppressed notes sounding like "block, block." On the 4th October I procured a bird of the year, which possibly was bred in our neighborhood.

Immature.—Bill light purplish flesh-color, deep brown on culmen, and greenish on base of both mandibles; inside of mouth pale flesh-color; iris kidney-brown; legs purplish brown, upper parts olive-brown; upper wing-coverts tipped with black and white bars; throat white; sides of neck, breast, and sides of belly cream-buff, the rest whitish, obscurely barred on breast, but deeply and distinctly on belly, flanks, and axillaries, with blackish; tail colored like the back.

Subgenus COTURNICOPS BONAP.

(149) **Porzana undulata** TACZ.

Button Crake.

1868.—*Crex erythrothorax* DYBOWSKI & PARVEX, Journ. f. Orn., 1868, p. 338 (*nec* TEMM. & SCHLEG., 1849, *nec* RADDE, 1863).—*Porzana e.* TACZANOWSKI, Journ. f. Orn., 1873, p. 107.

1870.—*Ortygometra* n. sp. PRZEWALSKI, Putesch. Ussur. (n. 143).

1874.—*Porzana undulata* TACZANOWSKI, Journ. f. Orn., 1874, p. 333 (descript. *ibid.*, 1873, p. 107).

1875.—*Porzana exquisita* SWINHOE, Ibis, 1875, p. 135, pl. iii.—*Id.*, *ibid.*, 1876, p. 335.—BLAKIST. & PRYER, Ibis, 1878, p. 225.—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, p. 202.—*Iid.*, *ibid.*, x, 1882, p. 123.—BLAKIST., Amend. List B. Jap., p. 13, (1884).

The name *P. undulata* was published by Taczanowski a year before Swinhoe's *P. exquisita*. It was not accompanied by a description, it is true, but the appellation referred to the description *previously* given. There was evidently no reason for reprinting the description in connection with the new name, as he expressly quoted the diagnosis already given.

This exquisite little Crake is especially interesting on account of the very close resemblance it bears to a North American species, viz, *P. noveboracensis*, belonging as it does to the same sub-genus, and exhibiting the same peculiarities of coloration.

The present species is confined to Southeastern Siberia (Dauria and Ussuri), Northeastern China, and Japan.

Measurements.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
95979	Blakist., 1846.....	♂ ad.	Yubuts, Yesso.....	Aug. 4, 1875	*mm.* 76	*mm.* 29	*mm.* 12	*mm.* 24	*mm.* 29

RALLUS Linn.

1758.—*Rallus* Linn., S. N., 10 ed., I, p. 153 (type *R. aquaticus* L.).
1852.—*Hypotænidia* Reichenbach, Syst. Av., p. xxiii (type *Rallus pectoralis* Gould).
1871.—*Aramus* Gray, Handb. B., III, p. 58 (part).

The tropical eastern spotted and banded Rails have been separated as an independent genus, *Hypotænidia*, but I can find no structural characters upon which to establish it. The species included in it form a well marked color group which seems to be quite natural. No *Hypotænidia* has been found in Japan, but inasmuch as representative forms of the Philippine *R. striatus* are known from China and Formosa, it may not be unreasonable to expect it to turn up somewhere in the southern part of the Japanese Empire. I have therefore given the general characters of the *R. striatus* group without venturing to express any opinion as to what special form may be likely to be found. In regard to the forms already known, I refer to a special paper on *Rallus striatus* and its allies, already published on a previous page of these Proceedings.

Any species of the *R. striatus* group may be easily distinguished from the typical Water Rail as follows:

a^1 Back without white spots; remiges uniform dusky without white markings (Rallus) ..... *R. indicus.*
a^2 Back speckled densely with white spots; remiges with narrow white cross-bars (Hypotænidia) ..... [*R. striatus.**]

(146) Rallus indicus Blyth.

Eastern Water Rail. Kuina.

1849.—*Rallus aquaticus* Temm. & Schleg., Fauna Jap. Av., (p. 122).—Swinhoe, P. Z. S., 1863, p. 322.—Schleg., Mus. P. B., Ralli, p. 10 (1865).—Whitely, Ibis, 1867, p. 206.—Finsch, Verh. k. k. Zool.-bot. Ges. Wien, 1872, p. 267.—Martens, Preuss. Exp. Ost-As., Zool. Theil, I, p. 371 (1876).
1849.—*Rallus indicus* Blyth, Journ. As. Soc. Beng., xviii (p. 820). (nec Reichenb., 1851).—*Id.*, Ibis, 1867, p. 172.—*Id., ibid.*, 1870, p. 176.—Swinhoe, Ibis, 1874, p. 163.—Blakist. & Pryer, Ibis, 1878, p. 225.—*Iid.*, Tr. As. Soc. Jap., viii, 1880, p. 202.—*Iid., ibid.*, x, 1882, p. 122.—Scully, Ibis, 1881, p. 591.—Blakist., Chrysanth., 1882, p. 523.—*Id., ibid.*, Jan., 1883, p. 28.—*Id., ibid.*, Feb., 1883, p. —.—*Id.*, Amend. List B. Jap., p. 13 (1884).—Jouy, Pr. U. S. Nat. Mus., vi, 1883, p. 317.
1856.—*Rallus aquaticus* b *japonicus* Bonaparte, Compt. Rend., 1856, xliii, p. 598 (*nom. nud.*).
1856.—*Rallus aquaticus* c *indicus* Bonaparte, Compt. Rend., 1856, xliii, p. 598.
1878.—? *Rallus japonicus* Dresser, B. of Eur., vii, p. 261.

Mr. Dresser (l. c.), in recognizing *R. japonicus* as a distinct species, states that he found in the Japanese specimens that "the barring on the abdomen extends quite to the end of the under tail-coverts, there

* See "Description of *Rallus jouyi*, with Remarks on *R. striatus* and *R. gularis*." By Leonhard Stejneger. <Proc. U. S. Nat. Mus., ix, 1886, p. 362.

being no buffy red and no white patch, as in *Rallus aquaticus*," and adds that he had examined several examples. I hardly know how to explain the statement, for, certainly, the four specimens before me from Japan, and the one from Shanghai, China, agree exactly with three birds from Europe (England and Germany) so far as the color of the abdomen is concerned, it being in all of them of a reddish buff, through which the grayish ground-color is more or less visible, but without even an indication of barring, and the anal buffy patch is even more pronounced and more intensive in color than in the European specimens. Mr. Dresser, farther on, says that the Indian form is described as having "the lower abdomen reddish brown as in the European bird, which is not the case with *Rallus japonicus*," and because of the absence of the barring on the lower abdomen he regards the Indian and European birds conspecific and different from the Japanese. Is it possible that there is another form of *Rallus* in Japan, having the abdomen barred? This does not seem quite probable, although Mr. Dresser's description certainly indicates such a possibility. At any rate, it will be well to be on the lookout for this mysterious bird.

While thus the Japanese Water Rails before me agree with their European representatives in the color of the abdomen, there are other characters which clearly separate the two forms. I find the following differences:

(1) In the eastern form the under tail-coverts (*not the crissum which is barred with black in both forms*) are all heavily spotted with black, so as to externally show more black than white, while in *R. aquaticus* proper the under tail-coverts are entirely white, sometimes with a few concealed black spots.

(2) In the eastern birds the dusky color of the lores is deeper, nearly black, extends farther down and behind, forming a distinct subocular streak, and joining a well-defined brown auricular patch slightly mottled with dusky and clearly set off from the surrounding gray of the sides of the head.

(3) This form also has the breast strongly suffused with brown, of which but slight traces are seen in the European bird, and on the flanks and axillaries the white bands appear narrower, and the black spaces between them, consequently, broader.

There is no appreciable difference in size as evidenced by the subjoined table of measurements.

The specimen from China (No. 85753) agrees so minutely with those from Japan that there can be no doubt as to their identity, and the descriptions of the Indian birds by Blyth and Jerdon indicate a form which has all the features by which the Japanese is distinguishable from the European form. In further corroboration of the correctness of identifying the Japanese birds as *R. indicus* I may remark that Blyth himself referred specimens in the Leyden Museum, from Japan, to the

species described by him (see Ibis, 1870, p. 176). Mr. Scully also compared Japanese, Chinese, and Indian examples, and found them to be *R. indicus* (Ibis, 1881, p. 591).

Measurements of RALLUS INDICUS.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
91505	Jouy, 954	♂ ad.	Tokio, Japan	Jan. 21, 1883	125	53	39	40	45
91481	Jouy, 928	♀ ad.	Yokohama, Japan	Jan. 5, 1883	120	55	39	40	45
91402	Jouy, 880	♂ ad.	Matsumoto, Japan	Dec. 21, 1882	123	54	42	38	48
9405		ad.	"Japan"		120	...	37	39	45
85753	Jouy, 71	♂	Shanghai, China	Apr. —, 1876	130	55	.....	43	.....

Measurements of RALLUS AQUATICUS.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
96528	Blakist., T 205	♂	Leadenhall Market, England.	Oct. —, ——	123	61	40	42	50
57041	Schlüter, 1061	♂	Germany	.....	121	55	42	.....	.....
69978	Burchard	♀	Rostock, Germany	.....	118	52	41	.....	.....

GALLICREX BLYTH.

1849.—*Gallicrex* BLYTH, Cat. B. As. Soc. (p. 283) (type *G. cristatus* LATH.).
1852.—*Hypnodes* REICHENBACH, Syst. Av., p. xxiii (type *Gallinula lugubris* HORSF.).
1854.—*Gallinulopha* BONAPARTE, Ann. Sc. Nat., 4 ser., I, No. 2, p, 150.

This genus bears a considerable resemblance to *Gallinula*, but has much larger and stouter feet, with no trace of a lateral membrane to the toes; the frontal plate is pointed behind and not truncate or rounded as in the Moorhen.

(149½) Gallicrex cinerea (GM.).

Water-cock.

1788.—*Fulica cinerea* GMELIN, S. N., I, ii, p. 702.—*Gallicrex c.* HUME, Nest Eggs Ind. B., I, p. 596 (1873).
1790.—*Gallinula cristata* LATHAM, Ind. Orn., II, p. 773.—*Gallicrex c.* BLAKIST. & PRYER, Tr. As. Soc. Jap., X, 1882, p. 123.—BLAKIST., Amend. List B. Jap., p. 42.—SEEBOHM, Ibis, 1884, p. 178.
1817.—*Gallinula plumbea* VIEILLOT, N. Dict. d'Hist. Nat., XII, p. 404.
1822.—*Gallinula lugubris* HORSFIELD, Tr. Linn. Soc., XIII (p. 195).
1822.—*Gallinula gularis* HORSFIELD, Tr. Linn. Soc., XIII (p. 195).
1831.—*Gallinula porphyrioides* LESSON, Tr. d'Orn., p. 534.
1831.—*Gallinula nævia* LESSON, Tr. d'Orn., p. 534 (*nec* GM., 1788).
1840.—*Rallus rufescens* JERDON, Madras J. L. and Sc., XII (p. 205).

In default of genuine Japanese specimens of the present species I add the following measurements of two Chinese examples:

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Bill from loral apex.	Tarsus.	Middle toe with claw.	Total length.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*	
96430	Blak., T 203 ..	ad.	Yangtse R., China	May —, ——	187	75	32	68	80	381 mm
85750	Jouy, 75	jun.	Shanghai, China ..	Oct. 11, 1880	210	76	36	73	84	406mm*

* "Total length 16 inches. Eyes yellow."

[AMAURORNIS REICHB.]

1852.—*Amaurornis* REICHENBACH, Syst. Av., p. xxi (type *Gallinula olivacea* MEYEN).
1852.—*Erythra* REICHENBACH, Syst. Nat., p. xxi (type *G. phœnicura* LATH.) (nec *Erythrus* WALK., 1829).

(For name and synonymy, compare Salvadori, Atti Acad. Sc. Torino, XIV, 1879, p. 914.)

[Amaurornis phoenicurus (PENN.).]

White-breasted Water-hen.

? 1769.—*Gallinula phœnicurus* PENNANT, Ind. Zool. (p. 10, pl. ix) (fide A. Newton, Stray Feath., VIII, 1879, p. 415).—SWINHOE, Ibis, 1863, p. 427.—*Id., ibid.*, 1870, p. 364.
1781.—*Rallus phœnicurus* FORSTER, Zool. Ind. (p. 19, pl. ix).
1783.—*Fulica chinensis* BODDAERT, Tabl. Pl. Enl., p. 54.
?——.—*Gallinula erythrina* BECHSTEIN, (ubi?).
1822.—*Gallinula javanica* HORSFIELD, Tr. Linn. Soc., XIII (p. 196).
1822.—? *Rallus sumatranus* RAFFLES, Tr. Linn. Soc., XIII (p. 328).
1875.—*Gallinula erythrura* MARTENS, Preuss. Exp. Ost. Asien, Zool., I, p. 371.

The White-breasted Water-hen has a wide range, occurring as it does in India and Ceylon, in the Malayan Peninsula, Sumatra, Java, Borneo, and Celebes; it is also found in the Philippine Islands, South China, Hainan, and Formosa. Its occurrence in some of the southern islands belonging to the Japanese Empire is, therefore, by no means unlikely. In order to facilitate the determination of this easily recognizable bird we add the following description from a Chinese specimen:

♀ *ad.* (*U. S. Nat. Mus. No.* 91801. *Hong-Kong, Feb.* 26, 1882. *P. L. Jouy, No.* 241).—Upper surface of body, except forehead and sides of breast, dark bluish slate, more or less washed with olive, especially on the interscapulars, becoming more brownish backward, rump and upper tail-coverts being olive brown; forehead, sides of head, including supercilia, throat and breast anteriorly and upper part of abdomen white; the lower part of the latter and tibiæ white washed with cinnamon, sides of belly, crissum, and under tail-coverts light buffy cinnamon; from the ear-coverts downward a broad, somewhat ill-defined black band separates the dark color of the upper parts from the white of the under surface, disappearing on the sides of the breast; axillaries and under wing-coverts slaty black, the latter tipped with white.

Wardlaw Ramsay gives the following description of the naked parts of the fresh bird as quoted by Lord Walden (Ibis, 1874, p. 147):

S. Andaman: March 10, April 4, ♀, iris reddish brown, legs greenish yellow, bill pale green, red at base of upper mandible; May 7, ♀.

R. Swinhoe remarks in regard to its occurrence in Formosa (Ibis, 1863, p. 427): "These birds were not uncommon about Taiwanfoo in summer, and at Tamsuy I procured several examples in March; but I cannot be sure as to their spending the winter in Formosa. In South China they are, I believe, birds of passage. Their eggs vary in shade of cream ground-color, and are spotted and blotched, in some cases only freckled, with cinnamon-red and light purplish grey. Length 1.65 in. [42mm]; breadth 1.15 [29mm]."

Measurements.

U. S. Nat. Mus. No.	Collector and number.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Bill from loral apex.	Tarsus.	Middle toe with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
91801	Jouy, 241	♀ ad.	Hong-Kong	Feb. 26, 1882	165	61	32	59	63

GALLINULA Briss.

1760.—*Gallinula* Brisson, Ornith., VI, p. 2 (type *Fulica chloropus* L.).
1801.—*Hydrogallina* Lacépède, Mem. de l'Inst., III (p. 518).
1830.—*Stagnicola* Brehm, Isis, 1830 (p. 992).

(150) Gallinula chloropus (Lin.).

Moorhen. Ban.

1758.—*Fulica chloropus* Linn., S. N., 10 ed. I, p. 152.—*Id.*, S. N., 12 ed., I, p. 258 (1766).—Temminck, Man. d'Orn., 2 ed., III, p. liii (1835); IV, p. 411 (1840).—Cassin, Perry's Exp. Jap., II, p. 245 (1856).—Schlegel, Mus. P. B. Ralli, p. 45 (1865).—Martens, Preuss. Exped. Ost. Asien, Zool. I, p. 107 (1866); p. 372 (1876).—Swinhoe, Ibis, 1876, p. 335.—Blakist. & Pryer, Ibis, 1878, p. 225.—*Id.*, Tr. As. Soc. Jap., VII, 1880, p. 202.—*Iid, ibid.*, X, 1882, p. 124.—Blakist., Chrysanth., 1882, p. 523.—*Id.*, Amend. List B. Jap., p. 42 (1884).—Seebohm, Ibis, 1884, p. 178.
1766.—*Fulica fusca* Linn., S. N., 12 ed., I, p. 257.
1831.—*Stagnicola septentrionalis* Brehm, Handb. Vög. Deutschl., p. 704.
1831.—*Stagnicola minor* Brehm, Handb. Vög. Deutschl., p. 706.

Having no Japanese specimens of the Moorhen, I shall express no opinion as to the correctness of referring it to the typical European species. There seem to be some differences, judging from the following quotations:

Temminck (Man. d'Orn., 2 ed., IV, p. 442) says: "The Japanese Moorhen does not differ from that of Europe except by the isabella-color of the lateral under tail-coverts; in our European variety they are white."

To this may be remarked, that while it is true that in European specimens white lateral tail-coverts are the rule, it is by no means without exceptions. I have before me a specimen (U. S. Nat. Mus. No. 96530, obtained in the Leadenhall Market, in October) in which nearly all the feathers in question are strongly tinged with creamy buff. It should, on the other hand, also be noted, that Mr. Blakiston compared the Japanese specimens he collected with this very skin, which does not represent the general style of coloration of the European form so far as this character is concerned.

Schlegel (Mus. P. B. Ralli, p. 47) makes the following remarks, based on a material consisting of two adults, two in not fully developed plumage, and one skeleton: "Specimens from Japan. Absolutely similar to those from Europe; they are conspicuous, however, for a somewhat longer bill. Wing, 6 inches 3 lines [pied de roi; = 169mm] to 6 inches 8 lines [180mm]; tail, 2 inches 7 lines [70mm] to 2 inches 11 lines [79mm]; bill, 14 to 16 lines [32 to 36mm]; width of frontal plate, 3 to 4 lines [6.8 to 9mm]; tarsus, 20 to 22 lines [45 to 50mm]; naked part of tibia 9 lines [20mm]; middle toe, 24 to 26 lines [54 to 59mm]."

The length of bill in European examples he gives as "12 to 13 lines" [27 to 29mm].

In confirmation of the above differences in regard to dimensions, I may add, that in Mr. Blakiston's MSS. I find a remark to the effect that he found "some differences in size." A few measurements are contained in his MSS., which I reproduce as follows:

	Sex.	Locality.	Date.	Total length.	Wing.
				mm.	*mm.*
Blakist., No. 2299	♀	Hakodadi	Sept. 8, 1877	308	155
Blakist., No. 1943	♀	do	May 15, 1876	302	156
Blakist., No. 1428	♀	do	Sept. 13, 1873	302	159

The British specimen alluded to above measures as follows:

U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Bill from loral apex.	Tarsus.	Middle toe.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
96530	Blakist., T 202	♂ ad.	Leadenhall Market	Oct. —, —	168	64	26	52	68

During the U. S. Exploring Expedition to Japan a number of living Moorhens were presented to Commodore Perry while he was staying at the Liu-Kiu Island, August, 1854. Mr. Cassin (*l. c.*), in commenting on these, quotes as a synonym Blyth's *Gallinula parvifrons*, and remarks that they are "not distinguishable from the common European Gallinule, except that the frontal plate is apparently smaller than is usually seen." A close comparison between southern and northern Japanese specimens is therefore very desirable.

FULICA Linn.

1758.—*Fulica* Linn., S. N., 10 ed., I, p. 152 (type *F. atra* L.).
1852.—*Phalaria* Reichenbach, Syst. Av., p. xxi (type *F. gigas* Eyd. & Soul.).
1852.—*Lysca* Reichenbach, Syst. Av., p. xxi (type *F. ardesiacea* Tschudi).
1852.—*Lupha* Reichenbach, Syst. Av., p. xxi (type *F. cristata* L.).

(151) Fulica atra Linn.

Coot. Ō-ban.

1758.—*Fulica atra* Linn., S. N., 10 ed., I, p. 152.—*Id.*, S. N., 12 ed., I, p. 257 (1766).—Temminck, Man. d'Orn, 2 ed., III, p. liii (1835); IV, p. 444 (1840).—Schlegel, Mus. P. B. Ralli, p. 60 (1865).—Blakist. & Pryer, Ibis, 1878, p. 225.—*Iid.*, Tr. As. Soc. Jap., VIII, 1880, p. 202.—*Iid., ibid.*, X, 1882, p. 124.—Blakist., Amend. List B. Jap., p. 42 (1884).—Seebohm, Ibis, 1884, p. 178.
1766.—*Fulica aterrima* Linn., S. N., 12 ed., I, p. 258.
1769.—*Fulica fuliginosa* Scopoli, Ann. I Hist. Nat., p. 104.
1786.—*Fulica leucoryx* Sparrmann, Mus. Carlson. (pl. xii).
1786.—*Fulica æthiops* Sparrmann, Mus. Carlson. (pl. xiii).
1826.—*Fulica atrata* Pallas, Zoogr. Ross. As., II, p. 158.
1826.—*Fulica pullata* Pallas, Zoogr. Ross. As., II, p. 159.
1831.—*Fulica platyuros* Brehm, Handb. Vög. Deutschl., p. 711.
1849.—*Fulica atra japonica* Temm. & Schl., Fauna Jap. Av. (p. 120, pl. lxxvii).—Blakist., Ibis, 1862, p. 331.

Also in this case I have to deplore the lack of Japanese specimens, the more so, since it seems that nobody has had a sufficiently large series for comparison. Schlegel had only two Japanese specimens and Seebohm the same number, while Dresser had none. The question whether the Japanese Coot is to be regarded as a local race is, therefore, still an open one.

I translate Schlegel's remarks on his Japanese specimen (Mus. P. B. Ralli, p. 61) as follows:

"Still very like those from Europe. Wing, 7 inches [190mm] to 7 inches 6 lines [203mm]; tail, 23 to 24 lines [52 to 54mm]; bill, 13½ to 14½ lines [30 to 33mm]; width of frontal plate, 3 to 5 lines [6.8 to 11mm]; tarsus, 23 to 24 lines [52 to 54mm]; naked part of tibia, 7 lines [16mm]; middle toe, 2 inches 8 lines to 2 inches 9 lines [72 to 74mm]."

The bills of 9 European specimens range, according to the same author, between 14½ and 16½ lines [33 and 37mm], consequently the opposite of what takes place in *Gallinula chloropus*.

I add the following measurements from a Chinese specimen:

Measurements.

U. S. Nat. Mus. No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Bill from loral apex.	Tarsus.	Middle toe, with claw.
					mm.	*mm.*	*mm.*	*mm.*	*mm.*
85755	Compton	♀ ad.	Wen Chow, China ...	Jan. 6, 1881	220	61	27	62	92

A NEW STUDY OF THE GENUS DIPODOMYS.

By FREDERICK W. TRUE.

(Read before the Biological Society of Washington, November 28, 1885.)

The genus *Dipodomys* was introduced into the literature by Dr. J. E. Gray in 1841. He described the typical species under the name of *D. phillipii* (afterward changed to *D. phillipsii*) from Mexican specimens (Ann. & Mag. N. H., vii, 1841, p. 521).

In 1846 Wagner described the same genus under the name of *Macrocolus halticus*, and gave an account of the skeleton. His specimens were also from Mexico (Arch. für Naturgesch., 1846, i, 176).

In 1848 Dr. William Gambel described a new species, under the name of *D. agilis*, from specimens from the Pueblo de los Angeles, California. (Proc. Acad. Nat. Sci. Phila., 1848, p. 77).

In 1853 another species, called *D. Ordii*, was added to the list by Dr. S. W. Woodhouse, who discovered it at El Paso, on the Rio Grande. (Sitgreave's Exped. to the Zuñi and Colorado Rivers, 1853, p. 50, pl. 4.)

In the same year Dr. Le Conte revised the genus and added two species, viz, *D. Heermanni* and *D. Wagneri* (Proc. Acad. Nat. Sci. Phila., 1853, p. 224).

In 1855 Professor Baird made known a sixth species, *D. montanus* from Fort Massachusetts.

Two years later the genus was revised a second time by Professor Baird, who placed the *M. halticus* of Wagner, with a mark of interrogation, under the *D. phillipsii* of Gray, regarded his own *D. montanus* as questionably synonymous with the *D. Ordii* of Woodhouse, recognized *D. agilis* as a distinct species, and dismissed *D. Heermani* and *D. Wagneri* with the remark that he knew nothing of them. (Rept. U. S. Pacific R. R. Survey, 1857, 406 *et seq.*)

In 1875 the genus was again reviewed by Dr. Coues, who united all the species under the *D. phillipsi* of Gray, but recognized a variety of the same, which he styled *D. phillipsi ordi* (Proc. Acad. Nat. Sci. Phila., 1875, p. 305 *et seq.*).

After so much elaboration, it would seem as if the subject of the taxonomy of this genus must be exhausted, and I should owe an apology for again calling attention to it were it not that I have discovered, upon examination of the series of specimens in the National Museum, a character, which appears to have been hitherto overlooked, and by which it becomes possible to divide the genus into two very distinct sections.

This character relates to the number of hind toes. In one series of specimens the hallux, though reduced in size, is perfectly formed and bears a rounded claw. In the other series the hallux, including the metatarsal, is entirely absent, and the hind foot has, therefore, but four toes.

In the original descriptions of the various species the references to this character are as follows:

Species.	Number of hind toes.	Locality.
D. phillipsii Gray	4	Mexico.
M. halticus Wagner	4	Do.
D. agilis Gambel	5	California.
D. Ordii Woodhouse	*4	Rio Grande.
D. Heermanni Le Conte	(†)	Sierra Nevada.
D. Wagneri Le Conte	(†)	
D. montanus Baird	(†)	Fort Massachusetts.

* In the figure. † Not mentioned.

The only remark regarding the toes in Gray's original diagnosis of the genus is as follows: "Toes, 5–4."

Wagner, on the other hand, enters more into detail. Speaking of the hind feet he says: "Die Daumenzehe fehlt zugleich mit ihrem Mittelfussknochen; jede der 4 andern Zehen hat ihre gewöhnlichen Phalangen."*

Again, on comparing his new genus with *Dipus*, *Scirtetes*, and *Jaculus*, he writes: "Von diesen allen unterscheidet ihn schon die Beschaffenheit seines Gebisses; von letzterem überdies der Umstand, dass die Hinterfüsse nur 4 zehig und der Schwanz dichter behaart ist."† Finally among his generic characters is the following: "Pedes posteriores 4 dactyli."‡

Gambel, in his description of *D. agilis*, dismisses the character with a single phrase, as follows: "Both hind and fore feet with four toes and the rudiment of a fifth." §

Of the monographers of North American mammals who have written since 1848, Audubon & Bachman (who had access to and figured Gray's type) give the genus four hind toes, while Professor Baird and Dr. Coues give it five hind toes. The discrepancy seems not to have been hitherto detected.

It will be conceded, I believe, that the presence or absence of the hallux is a character of more importance than those relating to the proportions of the feet and tail and the variation of color.‖ If it be accorded specific rank, the two species resulting from the division of the genus must, I am persuaded, stand in the nomenclature hereafter under the names of *D. phillipsii* Gray, and *D. agilis* Gambel, the former, with four hind toes, being the type of the genus; and the latter, the first of the subsequently described species in which the possession of five hind toes is distinctly recognized.

* Wiegman's Archiv, 1846, i, p. 175.

† L. c.

‡ Op. cit., p. 276.

§ Proc. Acad. Nat. Sci., 1848, p. 78.

‖ The absence of the thumb has, indeed, been employed as a negative character of generic value, but Dr. Dobson has recently pointed out the inadvisability of such a course.

Having adopted these two species, it becomes desirable to ascertain in how far they are commensurate with the *Dipodomys phillipsi* (*typicus*)* and *Dipodomys ordi* of Dr. Coues, the latest writer upon the genus.

To this end I have remeasured the entire alcoholic series of *Dipodomys* in the collection of the National Museum.

Specimens having 5 toes on the hind foot.

Number.	Locality.	Dr. Coues' identification.	Sex.	Length of head and body.	Length of head.	Length of tail vertebræ.	Nose to eye.	Nose to ear.	Length of eye.	Height of ear.	Length of fore foot (with claw).	Length of hind foot (with claw).
				mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
9478	Washington Territory		♂	97	40	136	24	35	6	12	12.5	41
7345	Crossing Little, Colo		♂	106	41	127	23	36	8	15	13	41
			♂	114	43	*170	24	41	8	17	12.5	44
2621	Coahuila, Mexico		♂	99	38	133	22	35	7	13	10	36
7344	Platte Valley, Nebraska		♀	105	39	151	23	37	8	13	11	40
4871	Cimarron, N. Mex		♀	105	41	130	25	38	7	11	13	40
10722	No locality		♀	101	39	.....	23	35	8	14	10	39
2625	San Francisco, Cal		♀	97	38	156	22	35	7	15	12	42
7348	Fort Tejon, Cal	D. phillipsi	♀	109	46	174	25	42	9	17	13	45
4870	Fort Laramie, Wyo		♀	100	40.5	148	22	35	7.5	13	14	41
14064	Fort Walla Walla, Wash		♀	103	40	144	22	35	7	13	12	39
	Averages			103.4	40.5	†141.1	23.2	36.7	7.4	13.8	12.05	40.7
	Percentages			100	39.2	‡138.5	22.4	35.5	7.2	13.5	11.65	39.4

Dipodomys phillipsi (*4 hind toes*).

4922	Mohave village		♀	90	37	131	23	34	7.5	12.5	10	38
4922	do		♀	90	37	145	22	33	7	12.5	9.2	38
4970	Cape Saint Lucas	D. phillipsi	♀	93	38	148	23	36	8	11.5	9	36
4970	do	D. phillipsi	♂	92	38	*117	23	35	7.5	13.5	9.5	36
4970	do	D. phillipsi	♀	89	36	135	22.5	33	7	12	10	36
4970	do	D. phillipsi	♂	93	38	147	23	36	7	13	9	36
15109	No locality		♂	87	37	159	23	33	7.5	11.5	11	39
12408	Rocky Mountains		♀	109	42	187	.....	40	.....	15	.....	43
2627	Fort Reading, California	D. phillipsi	♂	80	33	148	20	31	7	13	11	40
2626	do	D. phillipsi	♂	82	37	149	21.5	32	7	15	11	40
	Averages			90.5	37.3	†150	†22.3	34.3	†7.27	12.9	†9.9	38.2
	Percentages			100	41.2	‡184.5	‡27.4	37.9	‡8.9	14.2	‡12.2	42.2

* Broken. † Average for 9 specimens. ‡ Percentage for 9 specimens.

It will be perceived upon examination of these tables that the four-toed specimens have relatively longer tails, ears, and feet than the five-toed series. In respect to each of these characters the former series agrees with the series which Dr. Coues called *D. phillipsi* (*typicus*). I quote from his monograph, page 539: "The western animal averages smaller and of more slender build, with larger ears and longer limbs, and especially longer tail." These differences hold good for my four-toed series. The portion of Dr. Coues' diagnosis of his *D. phillipsi ordi* bearing on these characters is as follows: "Larger: rather over than under 4 inches in length of head and body, with (comparatively) stout shape, small ears, short limbs, and short tail." (p. 541.)

* I add this subspecific name in order to prevent confusion in the remarks I have to make upon the two varieties recognized by Dr. Coues.

This diagnosis, which is the converse of that given for *D. phillipsi* (*typicus*), is applicable throughout to my five-toed series, although it includes a specimen (No. 7348) coming under Dr. Coues' *D. phillipsi* (*typicus*).

It is also to be observed that the proportion of the tail to the head and body, which Dr. Coues places at 150:100 for *D. phillipsi* (*typicus*), rises to 184:100 in my four-toed series.

In addition, the eyes and ears are relatively larger and further removed from the extremity of the snout in the four-toed series than in the five-toed specimens.

The differences of color which Dr. Coues places among the "observed matters of fact, not open to question," I am unable to appreciate in the material at command. I cannot picture in my mind the difference between mouse-brown lightened with tawny, or fulvous, on the one hand, and tawny, or fulvous, deepened with mouse-brown, on the other. In the series of skins as a whole I find only—so far as color is concerned—that insensible blending of differences which Dr. Coues insists upon. I believe that it would be impossible to classify subspecifically any single specimen by its color alone.

The localities from which the specimens having, respectively, four toes and five toes on the hind foot were derived are as follows:

D. PHILLIPSI (4 toes).	D. AGILIS (5 toes).
4970. Cape St. Lucas, Lower California. (Alc.)	7347. Running Water, Nebraska. (Alc.)
2628. Southern California. (Alc.)	14064. Fort Walla Walla, Wash. Ter. (Alc.)
4922. Mohave village, Arizona. (Alc.)	2625. San Francisco, California. (Alc.)
4923. Mohave village, Arizona (juv.). (Alc.)	7344. Platte Valley, Nebraska. (Alc.)
2626. Fort Reading, California. (Alc.)	9478. Washington Territory. (Alc.)
12408. Rocky Mountains. (Alc.)	7345. Crossing Little, Colorado. (Alc.)
12730. New Mexico. (Alc.)	7348. Fort Tejon, California. (Alc.)
1741. Pecos, New Mexico. (Skin.)	4870. Fort Laramie, Wyoming. (Alc.)
1742. Pecos, New Mexico. (Skin.)	15110. Arizona. (Alc.)
491. Llano Estacado. (Skin.)	4871. Cimarron, New Mexico. (Alc.)
7182. Fort Mohave, Colorado River. (Skin.)	8436. Fort Whipple, Arizona. (Skin.)
14641. Fort Cummings, New Mexico. (Mounted.)	1739. Pecos, Texas. (Skin.)
4015. Pecos River, Texas. (Mounted.)	9282. Fort Cobb, Arkansas. (Skin.)
8855. Camp Grant, Arizona. (Skin.)	8437. Fort Whipple, Arizona. (Skin.)
8856. Camp Grant, Arizona. (Skin.)	143. Sonora. (Skin.)
12382. Fort McRae, New Mexico. (Skin.)	7825. Bill Williams Mountains, Arizona. (Skin.)
13585. San José, Lower California. (Skin).	3046. Three hundred miles from Fort Riley.
14640. Fort Cummings, New Mexico. (Skin.)	n. n. South Platte River. (Skin.)
n. n. Eastern Mexico. (Skin.)	995. Fort Walla Walla, Wash. Ter. (Skin.)
n. n. Eastern Mexico. (Skin.)	943. ♀ Los Angeles, California. (Skin.)
4170. ♀ Fort Crook, California. (Skin.)	1062. San Diego, California. (Skin.)
	7181. California. (Skin.)
	1063. San Diego, California. (Skin.)
	3159. Fort Laramie, Wyoming. (Skin.)
	11661. Pompey's Pillar, Yellowstone R. (Skin.)
	11663. Mouth of Powder River, Montana. (Skin.)
	3771. Camp Floyd, Utah. (Skin.)
	n. n. Powder River, Montana. (Skin.)
	11662. Mouth of Powder River, Montana. (Skin.)
	14805. Trego County, Kansas. (Skin.)
	21658. Trego County, Kansas. (Skeleton.)
	14009. Lee's Ferry, Colorado River, Ariz. (Skin.)
	13572. (2) Fort Defiance. (Skin.)
	9608. Don Carlos, Colorado. (Skin.)
	12668. Camp Harney, Oregon. (Skin.)
	12441. San Diego, California. (Skin.)
	489. ? Monterey, California. (Skin.)
	473. Posa Creek, California. (Mounted.)
	472. Posa Creek, California. (Mounted.)
	442. Huerfano River, New Mexico. (Mounted.)
	1044. Mesilla Valley, New Mexico. (Mounted.)
	2621. Coahuila, Mexico. (Alc.)
	372. Durango, Mexico. (Mounted.)

Upon marking the localities of *D. phillipsi* on a map of the United States in Mercator's projection, I find that with one exception they lie upon or *south* of a line running approximately northwest and southeast between Fort Reading, California, and Fort McRae, New Mexico. Specimen No. 1742 came from Pecos, New Mexico, near Santa Fé, which is considerably north of this line. On the other hand, all the five-toed specimens came from localities lying upon or *north* of this line, except seven.

Five of these are skins from the following localities:

San Francisco, California.
Posa Creek, Cal.
San Diego, Cal.
? Monterey, Cal.
Fort Tejon, Cal.

It will be perceived that all these specimens are from the coast of Southern California and west of the coast range. The type of *D. agilis* came from Los Angeles, which is also in this section.

A sixth specimen, No. 2621, is from Coahuila, Mexico, and according to Professor Baird, probably from near Santa Catarina, a village a few miles west of Monterey, Mexico. This specimen is, therefore, from further south than any other of the representatives of *D. agilis* except the next.

This seventh specimen, No. 372, is labeled Durango, Mexico. If the record is correct (and there seems to be no reason to doubt that it is) it appears that the range of the species extends far into Mexico.

From the material at command the boundaries of the ranges of the two species are approximately as follows:

D. phillipsi Gray. Fort Reading, California, on the west; Pecos River, Texas, on the east; Fort Reading, California, and Pecos, N. Mex., on the north; and Reale del Monte, near Mexico City, Mexico (Gray), on the south.

D. agilis Gambel. San Francisco, Cal., on the west; Fort Cobb, Arkansas, on the east; Fort Walla Walla, Wash. Ter., and Powder River, Montana, on the north; and Durango, Mexico, on the south.

D. phillipsi extends farthest south and west, *D. agilis* farthest north and east, but the ranges of the two species interdigitate extensively.

A REVISION OF THE LEPIDOPTEROUS FAMILY SATURNIIDÆ.

By JOHN B. SMITH.

(With three plates.)

The family *Saturniidæ* as limited by me is sharply separated from all the other Lepidoptera by the structure of the antennæ. These organs are always pectinated in the males, and usually also in the females. The branches or pectinations are arranged on each side of the middle of the joints, and there are, in the males always and the females usually, two on each side, or four branches to each antennal joint—a character found in only one other family, the *Ceratocampidæ*. The latter family is sharply separated from the present by having the pectinations extending only half the length of the antennæ, while here they extend to the tip. In life habits they are also very distinct, for while the *Saturniid* larvæ are all spinners and make more or less perfect cocoons, the *Ceratocampid* larvæ all go under ground to pupate. The habitus is also an entirely different one, and thus, though closely allied, the family is abundantly separated from the one here considered. In addition to the distinctive antennal character, the species placed here agree in the retracted head, obsolete tongue (sometimes barely a discernible rudiment), small, often aborted palpi, want of ocelli, no frenelum, no spines to the tarsi, legs sub-equal, the hind pair with small terminal spurs to the tibia only—median tibia usually without spurs. The venation varies somewhat, as do also the male genitalia, and these afford good bases for subdivisions.

As defined above, the family is a very natural one, and includes the species classed in Mr. Grote's most recent list as *Attaci*, and part of those placed as *Hemileucini*.

Most if not all the characters above enumerated apply as well to the *Ceratocampidæ*, and including them, the Lepidoptera with doubly pectinated antennæ are separable as follows:

Pectinations of antennæ extending to the tip.....SATURNIIDÆ.
Discal cell of both wings open.....*sub-family* ATTACINÆ.
Discal cell of both wings closed.....*sub-family* SATURNIINÆ.
Pectinations of the antennæ extending to the middle only, simple or serrate beyond, CERATOCAMPIDÆ.

The *Attacinæ* and *Saturniinæ* are also very sharply separated by the venation of the wings, and it would hardly be doing violence to systematic entomology to rank both as distinct families. Mr. Grote places part of my *Saturniinæ* with his "*Attaci*," while he places another series in his "*Hemileucini*." All of his *Attaci* belong to the *Saturniidæ* as here limited, while of his *Hemileucini*, *Hyperchiria*, and *Coloradia* also belong here. Of the remaining genera *Quadrina* seems to be a *Cossid*, and does not differ very much in structure from *Gloveria*—in fact, this latter

genus has strong Cossid tendencies and in any natural arrangement must stand very close to them. *Hemileuca* is very closely related to *Clisiocampa*, and so also seems *Pseudohazis: Euleucophœus* I have seen, and it has simply pectinated antennæ—what its venation is I do not know.

The material from which this revision was made is principally my own collection, in which most of the species are represented. The museum collection furnished a large amount of material for comparison, while Messrs. Hy. Edwards and B. Neumoegen, of New York, kindly loaned me typical examples of some species from their collections, and Prof. Hy. Snow, of Lawrence, Kans., brought with him on a recent visit to Washington some rarities for examination, including *Quadrina*, *Gloveria* and *Coloradia*, the precise position of which could not have been otherwise determined. As some of the insects included in this revision are of the most interesting and largest of our species of night-flying Lepidoptera, they have been figured and described in almost every work on insects and in almost every treatise on economic entomology. The literature of the species has thus become an enormous one and I have not pretended in this paper to do more than cite the most important or most accessible works. The male genitalia have been examined in almost every species, and figures of the parts are given; but, though the drawings and descriptions are accurate so far as they go, there are yet some structures of importance that have been left untouched simply because our knowledge of these structures in the Lepidoptera is so imperfect that I have not been able to give proper value to them and preferred to omit their consideration here altogether.

ATTACINÆ.

The *Attacinæ* express perhaps the highest point in Bombycid development. The imago is absolutely incapable of feeding, and the procreation of the species seems the only point looked to; in consequence the body of the ♀ is very stout and heavy, and filled to its utmost capacity with ova. The insects are strictly nocturnal, and despite the fact that they are usually common, are not often found as imagoes. The larvæ are all spinners, and all make strong double cocoons.

In addition to the family and sub-family characters heretofore mentioned, none of the species have more than 11 veins to primaries, and most have only 10; the accessory cell is always wanting. Briefly the venation is as follows: Primaries, one internal vein, median three branched (v. 2, 3, and 4), 5 and 6 from the end of the sub-costal, 7 and 8 on a long stalk from middle or outer 3d of sub-costal; 9 when present out of 8 at variable points, 10 sometimes from the sub-costal and sometimes out of 8; 12 as usual, from the base. Minor agreements and differences will be noted in treating of the species.

The ♂ genitalia agree in this important particular: all the supra-anal plates are strongly furcate at tip, with the possible exception of *calleto* and *splendidus*, the latter seeming to lack the plate entirely.

Messrs. Packard and Grote have made numerous genera out of the American species, based on differences in wing shape and the course of the veins; but after careful comparisons of large series of all the species I have come to the conclusion that the separation is not maintainable, and two genera only are recognized separated as follows:

Abdomen untufted..... ATTACUS.
Abdomen tufted..... SAMIA.

To the latter genus I refer *cynthia* only, which differs also in the more extended secondaries from all the others of our species, but in no further important particulars.

The Linnean species *atlas* is taken as typical of the genus, and *splendidus* is its nearest North American ally. A number of the species described from Mexico and South America have been examined and confirm the views expressed as to the generic identity of our species. It is somewhat remarkable that whereas our North American species vary comparatively little and are rather sharply defined, the Mexican and South American species vary exceedingly, and the limits of and validity of many of the species described in the British Museum Catalogue are still very uncertain.

SAMIA Hb.

The only real distinguishing characters have been pointed out. The structure of the head and thorax is shown at plate xiv, fig. 12, and need not be more fully discussed, as the structure of the same parts in the other species of the sub-family is alike. The primaries have ten veins only, the 9th apparently not united to any other, but free from the space between 8 and 10, as shown in the figure. In the specimens the veins are contiguous, but in the figure they are enough separated to indicate their course.

The single species is—

S. cynthia Dru., ii, pl. vi, f. 2 (*Phalæna Attacus*); Cram. Ex. i, 62, pl. 39, f. A (*Phalæna Attacus*); Oliv. Enc. Méth., v, 30, 26 (*Bombyx*); Westw. Ed. Dru., ii, 12, pl. 6, f. 2 (*Saturnia*); Hb. Verz., p. 156, 1629 (*Samia*); Wlk. Cat. B. M., v., 1220 (*Attacus*); Riley 4th Mo. Rept., 112 (Life Hist); Hulst. Bkln. Bull., i, 91 (food plant); Nostrand Bkln. Bull., ii, 75 (food plants).

Wings dull luteo-fuscous, primaries with basal space brighter yellowish and space beyond the outer transverse line bright yellow, densely powdered with black atoms; margin luteous gray. A strongly angulated white band, shaded with lilac at base, outwardly shaded with black, the outer angle touching the vitreous lunule. At the outer third the wing is crossed by another, narrower white line, also tinged with pale lilac, and with a broad shade of the same color outwardly. Inwardly it is margined with black. As a whole the line is straight, out-

wardly bent over the lunule. This lunule consists of a narrow vitreous crescent obliquely crossing the median cell, its horns touching the transverse lines. The convex upper margin is black, the concave portion is broadly shaded with yellow. At the apex is a large irregular lilac blotch, outwardly limited by a narrow irregular white line, at the lower end of which is a large round black spot, with a narrow whitish lunule near the inner edge and a few yellow and lilac atoms. Through the luteous-gray outer margin runs a fine dark line, black nearest to apex, fuscous below. Secondaries with an inwardly convex whitish lilac band at base, which at the costal margin connects with a rather acute curve, with an outer band of the same color, and which runs from the middle of the costal margin in two gentle curves to the hind angle. The band is shaded similarly to those of primaries. A strongly curved lunule crosses the cell at the end, its outer upper horn touching the outer band. The space beyond the posterior transverse line is not so bright in color as in the primaries, and is outwardly limited by a narrow, somewhat irregular yellow line, followed by a broad irregular dusky band, and then by two narrow dusky lines, the outer one at base of the fringes. Beneath, the maculation of the upper side is reproduced, save that the basal pale bands are lacking and the color is somewhat paler. Head and thorax like primaries. Head with a white tuft between and at sides of antennæ. Thorax with a narrow white line on collar and a broad white band at base. Abdomen yellow, with a basal white band, a crest of white hair on dorsum, a row of white tufts on each side of the middle; a geminate white line, margined with black, inclosing the stigmata, and two ventral white lines; last segment all white. The body and legs are also white marked. The palpi are small, scarcely reaching the front. The ♀ antennæ with the pectinations even to the tip, but not ciliate, the branches well separated at the joints. The supra-anal plate of the ♂ is broad at base, narrowing toward the tip, and then divided into two divaricate prongs.

The larva of this species has been well described by Riley and figured in the 4th Mo. Rept., and the caterpillar is so well known that it is hardly worth while to describe it again. Its natural food plant is *Ailanthus glandulosa*, but it feeds also on *Ricinus* and "will feed and flourish on lettuce, chicory, willow, and teasel" (Riley). Other recorded food plants are tulip tree (Hulst), sheep berry, wild cherry, and bittersweet (Van Nostrand).

The color characters above given are not absolute. An average specimen is described, but the species varies from a bright, almost ocher yellow to a pale greenish-clay color. The violet or lilac is also variably intense, and the lines vary somewhat. The insect is, however, so characteristic that there is no mistaking it. The cocoon is spun in a leaf and fastened to the twigs which in *Ailanthus* drop in the fall. The moths emerge in the latitude of New York late in June or early

in July—in Washington two to three weeks earlier. There are two annual broods in these latitudes.

Since the date of its introduction into this country (1861) this insect has undergone a considerable change in color and wing form, quite marked when compared with specimens from China. It is larger, deeper in color, and the wings are much broader and more rounded, much less excavated below the apex.

ATTACUS Linn.

This genus, to which I refer all the other American species belonging to this subfamily, is an extensive one, and yet so characteristic in each case that there is no difficulty in recognizing it at a glance. The definition of the family and subfamily contains all the characters of this genus, and it differs from *Samia* only in the untufted abdomen and in not having the hind angle so distinctly produced. The genera based upon wing shape and on the characters of the front appear to me invalid. They are *Callosamia* Pack. and *Platysamia* Grt. All our strictly North American species agree in having the supra anal plate divided into two divaricate hooks at tip. *Splendida* appears to lack the plate altogether, if my specimen was normal—I had only one ♂ that I could dissect—while *calleto* shows an apparently abnormal structure, which I have figured as I saw it, though I believe the figure incorrect. The venation varies in the species and will be separately described and figured. Two rather sharply defined groups can be recognized. The first, containing *splendidus*, *orizaba*, and *cinctus*, have on both wings a large, trigonate, vitreous spot, and they are all subtropical forms. Except *cinctus*, indeed, the question of their occurrence in the United States is yet uncertain. *Splendidus* makes the nearest approach to the type of the genus in wing form and in general habits and maculation: *orizaba* approaches it so closely in the male that they have been considered identical, while *cinctus*, which is undoubtedly distinct from either, has the typical maculation of *orizaba* and the wing form of *cecropia*.

The other group lacks the vitreous spots, though their place is taken by angulated or lunate spots or marks of a light color. *Calleto* (*polyommata* Tepper), *promethea*, and *angulifera* differ from the others of the group by having the sexes more or less dissimilar in color and wing form. The males are very close in wing form to *splendida*, while the females are like *cecropia* or *columbia*. The pale mark in the primaries is here angular, and the abdomen is not banded, but has a stigmatal pale band, including black spots. In this feature these species agree with the *splendidus* group, which has the abdomen maculate in the same way.

Columbia, *gloveri*, *ceanothi*, and *cecropia* have the sexes similar in maculation and nearly alike in wing form. The abdomen lacks the lateral spots and is furnished with white bands.

There are here three groups or sections, corresponding with *Attacus*, *Callosamia*, and *Platysamia*, and those with a penchant for numerous genera can use those names. They indicate actual divisions, but the lines are so slight and so superficial that I do not care to use them myself.

In synoptic form the scheme above outlined would be as follows:

Both wings with trigonate vitreous spots.
  Size large: spots on both wings acutely triangular: the base concave or straight. SPLENDIDUS.
  Size large: spots on both wings rather rounded at angles: base on the primaries straight, on secondaries spot more elliptic, apex indenting the t. p. line. ORIZABA.
  Size smaller, spots smaller, not or rarely touching and never indenting the t. p. line, shape much as in orizaba ..... CINCTUS.
Wings without vitreous spots, but with a lunate or angulated pale or white spot.
  Male with subfalcate wings, dissimilar in color to ♀: spots angular.
    Abdomen of ♀ not banded, a pale lateral stripe including black spots.
      Both sexes very dark, with a very distinct broad white t. p. line on both wings. Angular marks in ♂ distinct ..... CALLETO.
      Male blackish, with the transverse lines very faint, the white marks obsolete; ♀ reddish fulvous, the abdomen obsoletely banded ..... PROMETHEA.
      Male more like ♀ than usual, fulvo-fuliginous, the t. p. line and strongly angulated mark distinct, primaries less falcate than in *promethea* ... ANGULIFERA.
  Sexes similar in color and maculation, and but little difference in wing shape; abdomen of both sexes banded pale marks lunate. Size small; spots unusually small; male antennæ moderate; white band not or narrowly edged with pink. COLUMBIA.
    Larger; spots larger and narrower, more lunate, color deep carmine brown: ♂ antennæ very large ..... GLOVERI.
    Similar to the preceding but much lighter pinkish or rust red in color, t. a. line angulated instead of rounded ..... CEANOTHI.
    Largest, the t. p. line red, or with a broad red outer margin dark smoky brown in color ..... CECROPIA.

Attacus splendidus De B., Ins. Afr. et Am., p. 133, pl. 22, f. 1, 2 (*Bombyx*): Clem., Pr. Ac. N. Sc. Phil., 1860, p. 160 (*Attacus*): Morris, Syn. Lep., 228, 1862 (*Attacus*).

Prevailing color dull reddish brown varying in intensity and shade from a rich deep purple brown to a sordid luteous brown. Thorax with a white band on collar and another at base. Abdomen with a stigmatal white band, margined with black and inclosing red brown spots. Primaries with a white basal transverse band, strongly angulated outwardly on the median vein; outwardly bordered with black, inwardly by a brighter orange red shade. At outer third is a similar transverse band, interrupted by the large triangular vitreous spot, above which it is straight and below which it is wavy. The vitreous patch is trigonate, the base extending across the cell near its end and the apex strongly indenting the transverse posterior line. Beyond this band is a pinkish or lilac shade strongly dusted with black scales, irregular in outline and variable in extent and intensity of color. Beyond this the wing is of a deeper luteous or buff color inwardly powdered with black scales,

outwardly limited by a series of ochreous spots beyond which is a margin of luteous gray, and superiorly invaded by a large pale lilac patch which is outwardly bounded by an angulated white line. Between veins 6 and 7 near the margin is a large, somewhat irregular black spot, sometimes divided into three. The line separating the grayish margin from the series of ochreous spots sometimes becomes darker, or more rarely black. Occasionally the vitreous spot does not indent the transverse posterior line, and in fact all the features of maculation are inconstant. Secondaries with the basal band continued along the costal margin so as to connect with the outer band which is similar to and a continuation of the t. p. band on the primaries. The vitreous patch is similar in shape and occupies relatively a similar position. The space beyond the band is similar in color and maculation to the primaries, but the ochreous spots within the gray margin have each an ovate or elongate deep brown center. Beneath, the maculation of the upper side is reproduced except that the basal band is wanting and the color is much lighter—washed out.

Expands 4–6 inches. *Hab.* Mexico, Texas (?).

It is decidedly questionable whether this insect really occurs within our territory; but it is common on the other side of the border, and Mr. Grote has given it a place in his latest catalogue. The sexes differ decidedly in wing form. In the ♂ the apex of primaries is distinctly produced, the outer margin strongly excavated beneath. The secondaries are much prolonged and the outer margin is somewhat incurved, while in the ♂ the margin is rounded and the wing much shorter and proportionately broader. The primaries of the ♀ are hardly excavate beneath the apex. The ♂ of this species makes the nearest approach of any of our North American species to the Chinese *atlas*, in wing form. The variations in color and in maculation are great, and though I have had over a dozen specimens under examination, hardly two have been alike. The characteristic feature is the vitreous spot which is constant so far as I have observed. It is more than likely that some of the species in the catalogue of the B. M. will prove synonymous with this species, but the material in my hands will not permit a decision at present. In venation this species is distinctive—it has but 9 veins to the primaries, and veins 8 and 9 are connected near the apex by a small cross vein. The venation is alike in all specimens examined by me. Otherwise the venation is as in *cinctus*. The ♂ genitalia are figured at pl. xiv, fig. 1, and the figures will explain themselves. The supra-anal plate differs from that of the other North American species (except *calleto*) in that the forks are scarcely divaricate and hardly even separated at the tip. The side pieces are well enough figured to show the method of their fixture to the segments. The larva of this species is not known to me and no description (if such indeed exists) is accessible to me. Señor Aguillero, of the Mexican Geographical Survey, informs

me that the larvæ are sometimes so abundant as to defoliate the trees of some of their cities, and he speaks of them as a very large green, spinous caterpillar.

A. orizaba Westw., Ann. Nat. Hist., 2nd ser., xv, 294 (*Saturnia*) Wlk., C. B. M., v, 1201 (*Attacus*).

This species resembles *splendida* very closely in color and maculation—so closely indeed, that it is a matter of some difficulty to find any distinctive features. No male that was available for purposes of dissection was at hand, though I had several beautiful specimens under examination. The venation is exactly like that of *splendida*. The only permanent or apparently constant differences that I can find, are that the primaries of the ♂ are not so distinctly falcate, and the secondaries are not so lengthily extended; and that the vitreous spots are shorter and broader on primaries and do not indent the t. p. line, and on secondaries are more nearly obovate, the base being rounded or convex instead of straight. M. Neumoegen claims (Ent. Am., i, p. 80) that the species is identical with *splendidus*, but I should hesitate to declare it so without a little more positive evidence. Other characters that are more or less inconstant are that the black spot near the apex is always divided into three—the line through the pale terminal space is always distinctly black, and the secondaries have the spots within this line much longer and deep black, often maculate also with deep carmine.

This form has not to my knowledge been found within our borders, and is introduced merely because of its close resemblance to the preceding, and because it has been suggested that it was identical with *cinctus*.

A. cinctus Tepper, Bull. Bkln. Ent. Soc., v, 65, pl. figs. 1 and 2.

This species has the same colors and essentially the same markings as *orizaba* or *splendidus*, but is decidedly distinct. It is a much smaller species, expanding not more than 4½ inches, and the wings are not so produced in the ♂. The white band is broader, more conspicuously lunulate, that on the anterior wing somewhat curved outwardly, and the lunations extend to the costa, whereas in *orizaba* they do not extend above the vitreous spot. The vitreous spots themselves are smaller, not reaching the white band on the primaries, and they are there in shape most nearly like an equilateral triangle—they are rather broadly edged with white and beyond that with black. The vitreous spot of secondaries is obovate in shape, very like that of *orizaba* but the white margin is heavier. I have seen all the specimens known of this species, and find these differences constant. However, there is yet one other character that I count as decisive. The primaries have 10 veins instead of 9. Vein 8 forks just before the apex, and there is no connection between 8 and 10 (9 in *orizaba*). This feature is constant, and of specific value. I have had no males that I could examine closely enough

to describe the genital structure, but I should imagine it to resemble *splendidus* rather than *cecropia* in this respect.

The larva of this species is not known, but the cocoon and pupæ are described by Mr. Tepper (*l. c. supra*).

The specimens thus far known are all from Southern Arizona.

A. calleta Westw., Ann. Nat. Hist., 2d ser., xv, 297. (*Saturnia*) Wlk. C. B. M., v, 1225 (*Samia*).

polyommata Tepper, Bkln. Bull., v, 66 (*Platysamia*).

Male: Black or smoky; a whitish band on collar and at base of thorax. Abdomen with a pale stigmatal band inclosing darker spots. Primaries with a creamy white basal band, outwardly curved and angulated on the median vein. An angular whitish mark at the end of and extending across the discal cell. A broad, even white band, outwardly edged with ferruginous and dotted with black scales. The outer margin is yellowish gray, brightening inwardly to a creamy white where it is limited by a sinuate black line, which extends from vein 6 to the hind angle. Within this line is a light yellow shade interrupted by the black veins, and between each vein by a spur from the lunate black spot which bounds the ferruginous space beyond the white line. Of these spots the 3d, 4th, and 5th from hind angle have centers of bluish scales, the centers increasing in size upwardly. In the apical region beyond the white band is a pearly blue shade in which is between veins 6 and 7 a large round black spot, preceded by a black cresent which is margined with blue scales, and succeeded by an irregular deep red brown blotch which extends to the pale outer space. Between veins 7 and 8 is a 3-shaped white mark, the central part of which touches a pyriform deep brown spot. Secondaries with a pale crescent at the end of cell; a broad white outer band, similar to and joining that of the primaries, followed by a ferruginous shade which is irrorate with light blue and black scales. Beyond, is a mouse-gray marginal space which is crossed by a lunate black line, within which is a series of oval black spots.

Female: "Head and thorax dull black, collar pinkish white; a tuft of red hairs at base of thorax; abdomen dull black with a double row of lateral red stripes inclosing small black spots; legs dull black. Wings dull black, with the costa on primaries slightly inclining to gray; no basal bands, nor light abdominal margin to secondaries; the spots in the median fields are small, and plain white with no edging; on primaries, they form a triangle, and on secondaries simply a bar. A wide band of white near the outer margin runs through both wings and makes a decided curve toward the apex on primaries, where it is tinged with pale fulvous; beyond this band, outwardly, the color on primaries is grayish black, lighter toward the outer margin; the apical spot is black, surrounded by dark gray, then bordered inwardly by a bluish crescent edged with black, and outwardly by a dull reddish shading; between each of the veins below the apical spot, and bordering closely on the white band, is a bluish crescent corresponding to the apical one, filled

in gray, and bordered outwardly by a sharp triangle of black; there are five of these extra spots, which diminish in size and clearness as they approach the inner margin. The dark gray ground is outwardly scalloped with a narrow black line, somewhat as in *cecropia;* the borders to primaries are gray shaded with whitish inwardly, especially toward apical area; at apex a zigzag white line connects with the first blue crescent, and between this line and the outer margin is a dull red spot. Beyond the white band on secondaries the color is blackish, with dark gray borders and a scalloped black line, enclosing inwardly a row of black spots, two between each vein. The underside is a reproduction of the upper side with the colors more subdued—no light costal band to secondaries."

Hab.—Southern Arizona, Mexico. Expands 3–4 inches ♂, 5 inches ♀.

In wing shape the ♂ of this species closely resembles *promethea*, while the ♀ has the wing form of *cecropia*. The primaries have but 9 veins, very closely resembling in that respect the typical *Attacus*. The figure will more clearly show the course of the veins. The genitalia are somewhat peculiar and also more nearly resemble *splendidus* than *promethea*, to which group this species undoubtedly belongs. The supra-anal plate has a distinct suture through the center, and the forks at tip are short and not divaricate. My figure is probably not accurate, as I could not dissect out the part from the only ♂ specimen I had at hand. This species does not appear to be common.

A. promethea Dru., ii, pl. xi, f. 1, 2 ♂; pl. xii, f. 1, 2 ♀ (*Attacus*) 1773; Cram. Pap. Ex., 1, 118, pl. 75 f. A. B. ♀; pl. 76, f. A. B. ♂ (*Attacus*), Fabr. Syst. Ent., 558–7 (*Bombyx*); Sp. Ins. ii, 168, 8 (*Bombyx*); Mant. Ins., ii, 108, 9 (*Bombyx*); Ent. Syst., iii, 1, 411, 12 (*Bombyx*); Oliv., Enc. Méth., v, 27, 12 (*Bombyx*); Gmel. Ed. Linn. S. N., 2403, No. 464 (*Attacus*); Beauv., Ins. Afr. et Am. Lep., pl. 21 (*Attacus*); A. & S. Ins. Ga. i. t. 46, 1797 (*Phalaena*); Westw. Ed. Dru., ii, 20; pl. 11, f. 1, 2; pl. 12, f. 1, 2, 1837 (*Saturnia*); Hb. Verz., 1816, 156, 1631 (*Samia*); Geyer Samml., pl. ii, f. 3, 4, 1832 (*Samia*); Harris, Cat. Ins., Mass., 1835, p. 72 (*Attacus*); Rept. Ins. Mass., 1841, p. 281; Inj. Ins. (First Ed.), 390 f. 186 ♂, 187 ♀, 1862 (*Attacus*); Duncan, Nat. Lib., 32, p. 134, pl. 12, 1852 (*Hyalophora*); Wlk. C. B. M. v., 1223, 1855 (*Samia*); Fitch 3d Rep., p. 59, 1856 (*Attacus*); Morr. Syn. 224 (1862) (*Attacus*); Pack. Pr. E. S. Ph., iii, 1864, 379 (*Callosamia*); Minton, Can. Ent., ii, 100 (list of food plants); Riley 4th Mo. Rept., 1872, 121, ff. 43–46 (life hist.); Packard, Guide, 1878 (6th ed.), 298 (*Callosamia*).

The above bibliography, voluminous as it is, is far from complete, for in almost every American publication in which Lepidoptera are mentioned at all this species is described. Being so well known no detailed description of any of its stages will be attempted, and reference is made to the works of Harris and Riley for figures and detailed descriptions.

The primaries are 11-veined, vein 8 forking just before the apex. The figures will show the agreements in the sexes. The supra-anal plate of the ♂ is deeply furcate, the points widely divaricate; the side

pieces are, while retaining the chief features of the group, still strongly characteristic, and are best described by a reference to the figures.

Expands 3–4 inches. *Hab.*—United States, east of Rocky Mountains.

A. angulifera Wlk., C. B. M. v., 1224, 1855 (*Samia*); Morris, Syn., 1862, 227 (*Samia*); Pack. Pr. E. S. Ph., 1864, iii, 380 (*Callosamia*); Riley, 4th Mo. Rept., 122, note; Suppl. 55 = *promethea*.

Allied to *promethea*, of which it has been considered a variety. There are, however, abundant characters separating them, an enumeration of which will suffice for a description. The specimens known to me are uniformly larger, the male and female are similar in wing form, and the wings are more rounded than in *promethea*. The male, though darker in color than the ♀, has essentially the same markings, and is only a little smaller. The angular mark is much larger, more angular, and more distinct in the male of this species than in that of its ally. The maculation is essentially that of the ♀ *promethea*, with the colors less bright, and with a more luteous cast. In venation the two species agree exactly. The supra anal plate is like that of *promethea;* but the side pieces are very distinct, as a comparison of the figures will show. No comparative descriptions of the larva have yet been made to my knowledge, and the food plants seem to be as in *promethea*.

A. columbia Smith, Pr. B. S. N. H., ix, p. 343, Mar., 1863 (*Samia*); Pack., Pr. E. S. Ph., iii, 1864, 380 (*Samia*); Wlk., Suppl., v, 1934 (1866); Hagen, Buff. Bull., ii, 201, 1875; Strk., Lep., i, 103, pl. xii, fig. 3 ♂; Beth. Can. Ent., i, 44 (46); Bowles, Can. Ent., iii, 201, f. 37 (*larva*); Brodie, Pap., ii, 79 (food-plants); Strk., Pr. Dav. Ac. N. Sc., ii, 277, 1878 (*larva*).

This species has been supposed by some to be merely a local variety of *cecropia*, and it has been compared with that species, from which it seems to me very clearly distinct. I am not, however, able to separate it very satisfactorily from *gloveri*. The venation is the same, the genitalia are the same, and but for some slight differences in maculation which are not constant and the fact that the ♂ antennæ are not so disproportionate, the entire insect seems the same. In size it is uniformly somewhat smaller, but I am at a loss to find any other sharp defining feature. I believe it to be another of those cases where a western form has found its way along some isothermal or other natural line, to the northeast, and has become somewhat modified by the changed conditions. The home of this species is Maine and Canada, and Maine especially, offers a number of parallel cases where typically western forms of Noctuidæ there occur in a slightly modified form. The larvæ of both *columbia* and *gloveri* have been described, and Mr. Strecker has pointed out the differences, which consist in the color of the tubercles on the anterior segments; that of *columbia* is known to vary (see Ent. Am., ii, 18), and there seems little reason for doubt that the two forms are identical. I have seen large series of both *columbia* and *gloveri*, and yet hesitate to refer them as synonymous until new regions can be heard from, because I have not been able to fill the gap in the size of specimens, and also

because of the larval differences. All my *columbia* are smaller than any *gloveri* I have ever seen, but all my *columbia* are from Maine, where the species has undergone its greatest changes. The description of *gloveri* will be sufficient for this species also, and the larval differences will be more fully pointed out there.

A. gloveri Strk., Lep. Rhop. et Het. 1, p. 1, pl. 1, fig. 1 ♂, 2 ♀, Jan'y, 1872—(*Platysamia*), id., p. 128, pl. 14, fig. 8, aberr.; larva, Strk., Pr. Dav. Ac. Sci., ii, 276, 1878; Graef., Bkln. Bull., 1, 75 (cocoon).

Deep carmine or crimson brown, varying, however, in depth of color. Primaries with a broad outwardly curved white band, shaded on each side with black, near base; a similar broad white band, inwardly black margined, extends straight, or but little sinuate, across the outer third of wing. In the space included between these bands, at the end of the discal cell, is a lunate white spot margined with black, varying very greatly in size and form and sometimes almost obsolete. Beyond the outer band the wing is dull luteous gray to the fine black submarginal line, and beyond that the margin is still paler. For more than half its width this pale space is densely powdered with black scales, and in the interspaces outwardly are a series of large black spots of variable size and distinctness, sometimes obsolete. Crowning this series is a large, round, deep black, apical spot with a blue crescent, from which a zigzag white line runs to an apical black mark. Within this line is the usual large, irregular, pale lilac patch. The outer narrow black line is very irregular and very variable, occasionally with but a single deep indentation, and again with a deep sinus in each interspace. One difference may be here noted between this species and *columbia* in the course of the outer transverse line—in this species it is straight or merely sinuate; in *columbia* it is outwardly curved and does not so accurately meet the corresponding line on the secondaries. The secondaries have the extreme base white, outwardly margined with black; at the end of the cell is a lunate white patch variable in size and shape, but always larger than that of the primaries. The space between the outer white band and the margin is very similar in color to that of the primaries; but there is an interrupted blackish band and a series of long spots within the fine dark sub-terminal line. Beneath, the maculation is a slightly fainter reproduction of the upper side, with the basal white band wanting. The primaries have 10 veins, the origin of 9 somewhat obscure, and apparently independent of but contiguous to 8, not far from its inception. The form of the genitalia is well given in the figures of plate xiv.

Expands 4½, 5 inches. *Hab.*—Utah and Arizona.

Mr. Strecker describes the larva of this species in vol. ii, p. 277, of the Pr. Davenport Ac. N. Sci., and thus states the differences between it and allied forms:

"I would briefly state the difference between the larva of this and the three allied species, *columbia* S. I. Smith, *cecropia* L, and *ceanothi* Behr., which consists principally in the dorsal tubercles.

"*Columbia* has three pair of coral red ones, situated on the third, fourth, and fifth segments; the remaining six pair, as well as the single one of the last segment, are yellow. Lateral tubercles whitish.

"*Cecropia* has two pair of coral-red tubercles; these are on the third and fourth segments; the remaining dorsal ones are yellow as in the preceding. Lateral ones pale blue.

"*Gloveri* has the same tubercles in number and form as the two species above alluded to, but, as I have shown, these are all yellowish; lateral ones bluish white.

"*Ceanothi* has three pair of dorsal yellow tubercles. These are on the third, fourth, and fifth segments; the sixth segment has merely faint white raised spots in place of tubercles, and the remaining segments are without either tubercles or spots dorsally, with the exception of the twelfth, which has the usual single yellow tubercle. This species differs from all the others in the absence of dorsal tubercles on all the segments except the third, fourth, and fifth. It is also devoid of lateral tubercles, these being only represented on the third segment by white spots, and on the fourth to eighth by mere black points; the ninth, tenth, and eleventh segments are devoid of all spots whatever.

"Thus it will be seen that *gloveri* differs from *columbia* and *ceanothi* in having *all* the tubercles yellow, and from *ceanothi* in having dorsal and lateral tubercles on *all* segments (excepting, of course, the first and second), while the latter has these appendages only on the third, fourth, and fifth segments, besides the single one on the twelfth."

It will be seen thus that the color of three of the pairs of dorsal tubercles makes the distinguishing feature of the larva, and must prevent the union of this species with *columbia* until further breeding has established the validity or invalidity of this character.

A. ceanothi Behr., Pr. Cal. Ac. N. Sci., 1, 47, 1855 (*Saturnia*); Strk., Lep., 1, 102, pl. xii, f. 2, 1875 (*Samia*); id., p. 120, 1876; Pr. Dav. Ac. Sci., ii, 277, 1878 (*Samia*); Morris Cat., p. 21, 1860; Wlk., C. B. M., xxxii, p. 525, 1865 (*Samia*); Hulst., Bkln. Bull. iv, 57 (hybrid of); Hy. Edw., Pr. Cal. Ac. Sc. (life hist. and food plants).

californica Grt., Pr. E. S. Ph., v, 229, 1865, note.

euryalus Bd.. Ann. Soc. Ent. Fr., iii, 2d ser., xxxii, 1855; (not desc.) Pack., Pr. E. S. Ph., iii, 380, 1864 (*Samia euryale*); Guide, 298, 1878 (6th ed.) (*Platysamia*).

Pale, somewhat rusty red brown, with a slight crimson tint, the vestiture of wings very thin, still further diluting the color and making it difficult of definition. The body vestiture is more brick red. A white collar and basal band on thorax. Primaries with the usual white bands, similar in shape to those of *gloveri*, except that the basal one is more angulated and is not inwardly black margined. Beyond the outer band the shade is a very light rosy crimson to the outer pale luteous-gray space. The outer fine dark line and the lilac patch and apical black spot are as usual. There are no black spots in the interspaces at

the margin of the pale space. The secondaries are as in *gloveri*, except that the colors are as in the corresponding parts of the primaries.

Expands 4–4¾ inches. *Hab.*, California.

In venation and genital structure this species corresponds closely with *gloveri*, so that indeed no differences are observable. The antennæ of the male are unusually large and disproportionate, and the wings are very thinly scaled, an effect heightened by the peculiar color of the insect. It seems not uncommon in California, and is further removed from *cecropia* than either of the other species of the same subgroup, though placed nearer to it in the synopsis.

A. cecropia Linn., S. N., ed. x, 496, No. 3 (*Bombyx*); ed. xii, ii, p. 809, No. 3, 1767 (*Attacus*); Mus. Lud. Ulr., 368 (*Attacus*); Gmel. ed. Linn., S. N., 2401, No. 3 (*Attacus*); Fabr., Syst. Ent., 575, 3; Sp. Ins., ii, 167, 3; Mant. Ins., ii, 108, 4; Ent. Syst., iii, 1, 408 (*Bombyx*); Oliv. Enc. Méth. Ins., v, 25, 5, pl. 69, f. 3 (*Bombyx*); Clerck., Icon. Ins., pl. 49, f. 1 (*Bombyx*); Cram., Pap. Ex., iv, 66, pl. 42, f. A. B (*Phalæna*); A. & S., Ins. Ga., pl. 45 (*Phalæna*), Dru., i, pl. 18, f. 2; Westw. ed., i, 32, pl. 18, f. 2 (*Saturnia*); Catesby, Carol., ii, 86, pl. 86; Hb. Verz. 156, No. 1630, 1816 (*Samia*); Wlk., C. B. M., v. 1224, 1855 (*Samia*); Fitch, 3d Rep., 363, 1856 (*Attacus*); Morris, Syn. Lep., 1862, p. 223 (*Attacus*); Duncan, Nat. Lib., 32, p. 132, pl. 11, 1852 (*Hyalophora*); Harr., Cat. Ins. Mass., 1835, 72 (*Attacus*); Rept. 1841, 279 (*Attacus*); Inj. Ins., Flint ed., 385, ff. 182 to 185 Sprague, Can. Ent., ii, 82; Minot, Can. Ent., ii, 100; Saund., Can. Ent. iii, 149, f. 31–33 (life hist.) Hulst., Bklu. Bull., iv, 54 (hybrid of); Brodie, Pap., ii, 32 (list of 49 food plants); Riley, 4th Rept., 103, ff, 33–36, 1872 (*Attacus*); Pack. Guide, 6th ed., 298, 1878 (*Platysamia*).

Few moths have been more often figured and described in one or more stages than this species, and I shall not add to the number here, but refer the student to Harris for a very accurate figure. The primaries have 10 veins, as shown in the figure, vein 9 having no distinct point of origin. It seems almost to arise from the membrane, and I cannot trace any distinct connection with 8. Genitalia differ in some slight particulars from those of the species heretofore described, but these differences I shall leave to be explained by the figures, and shall not waste words over them.

SATURNIINÆ.

The *Saturniinæ* differ at once from the *Attacinæ* and are sharply separated from them by the closed discal cell on both wings. There is a peculiarity of habitus common to them all, and a distinct tendency to the other Bombycid families. The male antennæ are always pectinated to the tip as is usual, the joints each with two branches. The ♀ ♀ may have the antennæ either simple, serrate, singly pectinate, or, as in the *Attacinæ*, similar to those of the ♂, but somewhat slighter; in some genera the upper branch of the joint is shorter than the lower, the pectinations still extending to the tip. The venation is very similar in the subfamily, ten being usual, and but one or two species having nine veins

only. This feature will be treated in detail under the different generic heads. The ♂ genitalia also differ somewhat, retaining usually the bilobed supra anal plate, but in some genera having it prolonged into a simple flattened hook. There is much more structural variation here than in the *Attacinæ*, and less can be said under the general subfamily definition. There is a difficulty, too, in deciding as to the correct generic term for the species. Genera are here in abundance, but they have been created on superficial characters, and it is not certain but that some of the terms may have to be altered when a study of the exotic members of this subfamily enables the typical species to be properly placed. For the present I retain the names used in Mr. Grote's most recent list, and find myself reluctantly compelled to add a new generic term to the already long list.

The European genus *Saturnia* needs revision in the light of my views, and I think is too heterogeneous to be retained in its present form.

As separated by me the following table will serve to identify the genera:

Antennæ in both sexes pectinated to the tip, each joint with two branches to each side.
  Antennæ of the ♂ with the joints equal; female with the upper joint shorter than the lower.
    Secondaries tailed.....ACTIAS.
    Secondaries rounded.....TELEA.
  Antennæ with the joints equal in both sexes, that of the ♀ slighter....SATURNIA.
Antennæ of the male equally bipectinate; of the ♀ with a single pectination to each joint.....CALOSATURNIA.
Antennæ of the ♂ with upper branch shorter than the lower; of ♀ simple or serrate; primaries with acute tip and excavated outer margin; secondaries ocellated .....HYPERCHIRIA.
Antennæ of ♂ with the upper branch shorter than the lower; of ♀ simple; primaries with outer margin obliquely rounded; secondaries not ocellated. COLORADIA.

ACTIAS LEACH.

This genus is easily recognized by the greenish color of the species, as well as by the tailed secondaries. The primaries have ten veins, distributed as shown in the figure. Veins 7, 8, and 9 are from one stalk, vein 9 out of 8 just before the apex. The secondaries have 8 veins as usual, of which 1 to 4, inclusive, run into the tail, leaving a long marginal space between 4 and 5, while 1 to 4 are closely crowded. The head, body, and genital structure are shown at figs. 11 and 12 of plate xiii.

The supra anal plate here is bifurcate, the forks short and broad with acute tips. The side pieces are better shown in the figure than they can be described, and the structure of the body is also left to the figure for explanation. The antenna of the female is like that of the male except that the upper branch of each joint is shorter than the lower, making an alternate long and short branch.

The only North American species is—

A. luna Linn., Syst. Nat., ed. x, 496 No. 5 (*Bombyx*); ed. xii, ii, 810, 1767 (*Attacus*); ed. xiii (Gmel.), 2404, No. 5 (*Attacus*); Mus. L. U., 370 (*Attacus*); Clk., Icon., t. 52, f. 1 (*Phalæna*); Fabr., Ent. Syst., iii, 1, p. 414, 1770 (*Bombyx*); Mant., Ins., ii, 109, 17 (*Bombyx*); Sp. Ins., ii, 170, 15 (*Bombyx*); Oliv., Enc. Méth., 5, 29, 20, 1825 (*Bombyx*); Cram., Pap. Ex., 1, t. 2, f. A, et 3, t. 31, f. A, B (*Attacus*); Pal. Beauv. Ins. Afr. et Am. Lep., pl. 22, f. 3 (*Phalæna*); A. & S. Ins. Ga., p. 95, pl. 48, 1797 (*Phalæna*); Hb., Samml., i, f. 153 (*Echidna caudata*); II, f. 382, 383, 384, 1806 (*Tropea*); Verz., p. 152, 1816 (*Tropea*); Leach., Zool. Misc., 2, 1815 (*Actias*); Dru. Ill., 1, pl. 24, f. 1, 1770; Westw., ed., p. 45, 1837 (*Actias*); Harris, Cat. Ins. Mass., 1835, 72 (*Attacus*); Rept. Ins. Mass., 1841, p. 277 (*Attacus*); Inj. Ins., iii ed., 382, f. 179, 180; Wlk., vi, 1260, 1855 (*Tropea*); Fitch, 3d Rep., 134, 1856 (*Actias*); Morr., Syn., 1862, p. 225 (*Attacus*); Pack. Pr. E. S. Ph., iii, 1864, 379 (*Tropea*); Minot, Can. Ent., ii, 27; Chamb., id. 43; Riley, 4th Rep., 1878, 123, f. 47, 48, 49.

var. DICTYNNA Wlk., C. B. M., vi, 1264 (*Tropea*).

An easily distinguished and rather abundant species. The fore wings are of a variable shade of green, costal margin of primaries and a broad band on collar purple, fringes yellow and purple, the two colors variable in extent. Body white, antennæ yellow. A small vitreous spot at the end of the discal cell in each wing, margined with white, purple, green, and black.

Expands 3–5½ inches. *Hab.* Eastern and Central United States.

This species has also been figured innumerable times and is sufficiently well known to make description here unnecessary. The variety *dictynna*, according to Mr. Walker, differs as follows: "This species much resembles *T. luna*, but may be distinguished by the band on the wings, by the not empurpled exterior border, by the fore wings, which have a less oblique and more straight exterior border, and by the hind wings, which have shorter tails."

There are two annual broods of this insect in most sections of the country, and the midsummer brood is usually smaller, more yellowish, and has the wings more densely scaled.

TELEA Hb.

This genus is the close ally of *Antherea* and of *Saturnia*, as the term is used in Standinger. I am not at all certain that *Antherea* is not strictly synonymous with *Telea*, and am in doubt whether some of the European species of *Saturnia* are not referable here. The straightening out the perplexing generic synonymy in this group must be the work of the monographer of the whole family, and I simply point out the structures peculiar to our American species.

The primaries have ten veins; vein 7 and 8 from a long stalk out of the subcostal, and vein 9 also from the subcostal, very close to the inception of vein 8. There is thus an essential difference between this genus and *Actias*, in which vein 9 is from the same stalk with 7 and 8. The dorsal vein is furcate, rather an unusual feature in this group. The secondaries are, as usual, 8-veined, vein 7 very strongly curved.

Further details are best shown by a reference to the figure. The ♂ genitalia will be described in the reference to the species.

The only North American representative is—

T. polyphemus Cram., Pap. Ex., i, 8, pl. 5, f. A, B (*Phalæna*); Guel. ed. Linn., S. N., p. 2402 (*Attacus*); Fabr., Sp. Ins., ii, 168, 5 (*Bombyx*); Mant., Ins., ii, 108, 6; Ent. Syst., iii, 1, 410, 8 (*Bombyx*); Oliv., Enc. Méth., v, 25, 7, pl. 69, f. 4 (*Bombyx*); Hb., Saml., ii, pl. 385, 386 (*Telea polypheme*); Verz., 154, 1610, 1816 (*Telea*); Wlk., C. B. M., v, 1226, 1855 (*Telea*); A. & S. Ins. Ga., 93, t. 47, 1794 (*Phalæna*); Harris, Cat. Ins. Mass., 1835, 72 (*Attacus*); Rept. Ins. Mass., 1841, 279 (*Attacus*); Inj. Ins., Flint ed., 383, 384, f. 181 (*Attacus*); Fitch, 3d Rept., 1856, p. 137 (*Hyalophora*); Morris, Syn., 1862, 226 (*Attacus*); Riley, 4th Rept., 1878, 125, f. 50, 51, 52, 53, 54 (*Attacus*); Brodie, Pap., ii, 58 (list of 29 food plants); Pack., Guide, 6th ed., p. 297, pl. 6 and 7, and f. 228, 229 (*Telea*).

var. OCULEA Neum., Pap. iii, 71.

This species also needs no new description. It has appeared in almost all entomological reports and is known to the veriest tyro. Harris and Packard are accessible to all; to these works we refer the student. The antennæ of the ♀ of this species are like those of *Actias*. The genitalia of the ♂ are peculiar, and the supra anal plate shows in its modification a strong resemblance to the typical form of the next family—CERATOCAMPIDÆ. It is narrow, widening to the tip, and there modified into two distinct lobes. The side piece bears a three-pronged corneous clasper, which is figured on plate xiv, fig. 8. The structure is unique and very characteristic. Considerable has been written about the economic importance of this species, and as it is the nearest ally of forms that are made useful for sericulture in Japan and other eastern countries, this has more plausibility than what has been published of the other species of this family.

The species is found throughout the United States east of the Rocky Mountains, and in the southern portions of the country is double-brooded.

SATURNIA Schrank.

The genus *Saturnia* as here limited has but a single American representative, *S. galbina* Clem. In antennal structure it is peculiar by the long branches to the joints, those of the ♀ being only shorter and slighter than those of the ♂, while they are in both rather irregularly crossed and in the ♂ ciliate. Head much retracted, the palpi and tongue completely aborted, vestiture thin, long, and divergent. The body and abdomen are covered with similar long fine hair. The supra anal plate of the male has the typical structure of the group, the points diverging widely and terminating acutely. The figures on plate xiii will show the appearance.

Primaries with 10 veins, 5 and 6 from a stalk out of upper end of discal cell, 8 and 9 on a stalk out of 7, dividing near the apex. The cross-vein, closing discal cell, thin and straight. Secondaries 8-veined, the veins rather straight, but otherwise much as in the other members of the subfamily.

The only American species is—

S. galbina Clem., Pr. Ac. N. Sc., 1860, 156: Morris, Syn., 1862, 222; Wlk., C. B. M., suppl., 32, p. 530 (1865); Pack., Pr. E. Soc. Phil., iii, 383 (1864); Strk., Lep., 1, 104, pl. xii, f. 4 ♂ ♀.

Smoky or blackish, both wings with a broad white margin, which is buff-shaded outwardly. Primaries with a basal, curved, white band and an oblique white band from near apex to inner margin; the subcostal and median veins are white between the white bands, and sometimes all the veins are more or less white marked. A light carmine dash extends from the outer white line on vein 7 to apex; above this, shading the line outwardly, is a black patch, marked with blue scales. At the end of the discal cell is a large black ocellus with a narrow vitreous center and rings of black, yellow, black, blue and black, the blue ring being usually on the inner portion only. Secondaries with an indefinite broad and white basal band and an outer more distinct white band, running parallel to the outer margin. An ocellus at end of cell, similar in all respects to that of primaries. Beneath with the outer margin, apex, and ocelli reproduced as above. Basal band obsolete, outer band a narrow waved white line. The specimens vary much as to amount of white in the wings—sometimes the color is mostly blackish and the markings are limited, while in other specimens the white invades the whole wing—especially the secondaries are occasionally white from outer band to base. The males as a rule are smaller and whiter than the females.

Expands 2.25–2.60 inches. *Hab.* Texas, Arizona.

Rather a rare species. The larva is unknown so far as I am aware, though the cocoon has been superficially described by Mr. Geo. D. Hulst in a communication to the Brooklyn Ent. Soc., published in proceedings of the society in "Entomologica Americana." It is readily known by its white and smoky black colors and the carmine dash at the apex. How it compares with the European species of *Saturnia* I cannot say at present.

CALOSATURNIA, n. gen.

Head very much retracted; eyes small, narrow, ovate; tongue and palpi entirely aborted; vestiture thin and divergent. Antennæ of ♂ with two branches to each side of each joint, as usual, the pectinations extending to the tip. In the female the antennæ are stout, shortly pectinated to the tip; a single branch only to each side of each joint. Body vestiture hairy, thin, divergent, the thorax comparatively short. Legs short and weak, the posterior pair shortest and weakest; no visible spurs to any pair of legs. Genitalia of ♂ very like those of *Saturnia*, save that the points of supra-anal plate are not so diverging and not so acute. The side pieces are essentially the same. Primaries with but nine veins, 5 and 6 together from the upper end of the cell; 7 and 8 on a long stalk from the subcostal. The venation of the secondaries is as in *Saturnia*.

As I have previously remarked, it is somewhat a question to what species the term *Saturnia* will eventually be restricted. I am inclined to believe that this genus will be found valid even after the fauna of other countries shall have been studied, and there will probably be other species referable to it.

C. mendocino Behrens. Can. Ent., x.

Dark smoky brown, with a somewhat rusty suffusion on primaries; secondaries deep brownish yellow; primaries darker toward base and along costa; along inner margin with long thick reddish hair; at apex a black spot, followed by a few blue scales and a deep red blotch of variable size and indefinite shape. Before the end of the discal cell is an oblong, transverse white mark, followed by a black ocellus ringed with the ground color, and inwardly marked also by blue scales. Secondaries with basal third black, but covered with long tawny hair, obscuring this color—a broad black band near outer margin. At the end of the cell an ocellus similar to that on primaries. Thorax dusky, clothed with deep red brown hair; a broad white band across collar; a deep red tuft at base of antennæ, which are deep orange. Abdomen smoky. Beneath, legs crimson; primaries with maculation reproduced, but the ground color much brighter, almost tawny or reddish luteous. Secondaries almost creamy gray over the ground color, faintly showing the maculation of the upper side.

Expands 1.75–2.75 inches. *Hab.* California.

Also rather an uncommon species with characteristics hard to be mistaken. The insect has a European character or habitus, and its nearest ally will probably be a European form. The male genitalia are very much as in *Saturnia*, and no special description is necessary. So far as I know, the early stages of this species are undescribed.

HYPERCHIRIA. Hb.

Head strongly retracted, small; palpi in ♂ distinct but hardly exceeding front; of ♀ almost entirely obsolete. The antennæ in the ♂ have the upper branch of the joints shorter than the lower, but closely applied to it, so that it is somewhat difficult to trace them in all cases. The ♀ antennæ are simple, or serrate, never pectinate in the species known to me. The thorax is short, thick, rounded, and woolly; the abdomen in the ♀ exceeds the secondaries and is obtuse and cylindric. In the ♂ it is short and conic. The genitalia vary somewhat and are better described with the species. The venation differs essentially from all the preceding. The primaries have 10 veins, v. 5 from the cross-vein closing cell, nearer, however, to 6 than to 4. Vein 6 from the upper angle of cell, 7 and 8 on a stalk from the same point, 8 to the apex. The venation of the secondaries is variable and is described with each

species. The chief peculiarity in the venation of primaries is the inception of vein 5. A comparison of the figures on plate xiii will at once illustrate.

The legs are short, densely clothed with hair; the middle and hind tibia with short terminal spurs. The wings are short, stout, and rather broad, giving the insects rather a heavy appearance. Besides the characters enumerated, the species agree in typical maculation of secondaries. The disc is yellow, outwardly margined by a black line, at base usually more or less pink or reddish. The outer margin is somewhat variable in color, usually very near to that of primaries, and there is always a reddish or brown line or band through its center. In the yellow disc is a large black ocellus with a linear white pupil, and blue irrorations around it.

Four species are described from the United States. *Io*, the most common species, found everywhere in the Eastern United States, is readily distinguished from all its allies by the irregular subterminal line, which is as far from the apex as from the hind angle. The typical form is yellow, with the markings red brown, while the var. *lilith* is suffused with reddish, and in the ♀ the yellow is replaced by a ferruginous red.

The other species have the apex of primaries much more produced, and there is an excavation to the outer margin, making them slightly falcate.

Zelleri is the largest of the species, with smoky, luteous brown primaries in the ♀, the transverse anterior line irregular and distinct; the t. p. line is even, nearer to apex than to hind angle—a characteristic shared also by the following species, they having the line still closer to the apex:

Pamina and *zephyria* lack the t. a. line entirely, or it is very indistinct. In *pamina* the primaries are bright pale-clay yellow, the t. p. line dusky, with a yellow preceding shade; in *zephyria* the primaries are gray and the line is white, and more than usually oblique. The variety *aurosea* bears to *pamina* the same relation that the var. *lilith* does to *io*. It is the form with a reddish suffusion.

In tabular form, the scheme above set out appears as follows:

T. p. line irregular, wavy, as far from apex as from hind angle.
  Color ♂ primaries yellow, with deep red-brown markings; ♀ red brown, with yellow markings ..... IO.
  With a reddish suffusion throughout; in ♀ the yellow of primaries replaced by ferruginous red ..... *Var.* LILITH.
T. p. line even, much nearer to apex than to hind margin, apex more produced.
  Primaries smoky, luteous brown, t. a. line irregular, distinct ..... ZELLERI.
T. a. line wanting or very indistinct.
  Primaries bright pale-clay yellow, the transverse line dusky with a yellow preceding shade ..... PAMINA.
  With a reddish suffusion throughout ..... *Var.* AUROSEA.
  Primaries smoky gray, the transverse line white and more than usually oblique. ZEPHYRIA.

H. io, Fabr. Sp. Ins. 2, 173, No. 28; Mant. 2, 110, No. 36 (*Attacus*); Gmel. Ed. Linn. S. N. 2406, No. 477 (*Attacus*); A. & S. Ins. Ga., p. 97 t. 49 (*Phalæna*); Hb. Verz. 157 (*Hyperchiria*); Saml. III, pl. 17, f. 1–4 (*Hyperchyria*); Duncan Nat. Lib. 32, p. 156, pl. 16 (*Aglia*); Harris Cat. 1834, 184 (*Saturnia*); Rept. Ins. Mass. 1841, 284 (*Saturnia*); Inj. Ins. 393, f. 188 to 192 (*Saturnia*); Fitch 3d Rep. 1856, p. 61 (*Saturnia*); Morr. Syn. Lep. 220 (*Saturnia*); Tepper, Bkln. Bull. 1, 36.

Varia Wlk. Cat. Lep. B. M. vi, p. 1278; Pack. Pr. E. S. Ph. III, 384; Beth. Can. Ent. II, 19; Strk., Lep. 138, pl. 15, f. 15 and 16.

var. LILITH Strk. Lep. 139, pl. 15, f. 17.

So well known by figures in all the popular works on Entomology that further descriptions of color are useless. The larva is also well known, and is one of the "stinging" caterpillars, the hairs or spines being sufficiently poisonous to cause intense pain and considerable swelling if rudely placed on tender portions of the skin. The venation of primaries is as described. The secondaries have veins 2, 3, and 4 from the median vein, at about equal distances. A straight veinlet closes the cell, and 5 and 6 are from the same point at the upper angle. V. 7 is from the outer third of the subcostal. The genitalia are somewhat peculiar. The supra-anal plate is broad at base and suddenly narrows, ending in a sort of broad-pointed, spatulate tip. Beneath this is another corneous appendage, which is furcate but does not appear to be part of the plate. The figures will explain the appearance, and reference is made thereto to show the form of side piece as well. The variety does not differ in any respect from the type form except in the reddish suffusion. This does not seem to be a local characteristic, but I have received type and variety together and have taken the ♂ of one and the ♀ of the other in copulation.

H. zelleri G. & R., Tr. A. E. S., ii, 193, pl. ii, f. 65 ♀.

This species is unknown to me and is not in any collection I have ever seen. I doubt its being an American species, but rather think it comes over the border occasionally from Mexico. I reproduce the description of Grote & Robinson, but somewhat condensed.

Head and palpi rich dark brown; antennæ testaceous, a little slenderer than in allied species. Thoracic region above, dark brown; laterally at insertion of primaries are short whitish scales forming a spreading tuft. Abdomen above, bright ochreous brown, beneath thorax and legs rich brown, a little paler than upper side. Primaries, apices acute, but not produced. Basal third with rough or woolly dark brown scales, outwardly defined by a darker shade. These dark brown, rough squamæ extend along the costal region to the apex and intrude obliquely downwardly, twice over the middle of the wing; firstly, obliquely and broadly from the costa over the discal cross vein to the first m. nervule; this band is thrice regularly scalloped outwardly between the nervules, and includes a white discal dot on the cross vein situate just below the inception of the disco-cellular nervule; secondly, more narrowly and nearer the apices, the scales forming an even band extending downward to first median nervule at a point where the usual transverse line

crosses the nervule. This transverse line is narrow and distinct, whitish, and is rounded at costa, and joins the costal edge at a point considerably removed from apex. Ground color of median space, a frosted purplish brown, over which the dark costal scales downwardly intrude as above described. The dark scales extend again broadly and more diffusely downwards from the apex, bordering the transverse line externally, and irregularly widening over the median nervules to internal margin, and leaving the irregular terminal space of the wing a pale frosted purplish brown, over which the nervules are marked with ochreous.

Secondaries full and rounded. At base thickly clothed with long and very bright ochreous scales. A large black discal ocellus consisting of a broad blackish annulus surrounding a paler center, which contains a black pupil (the discal spot) containing a few white scales. Outside this ocelloid spot are two broad, subequal, even, blackish bands, the outer the broader, and which traverse the wing from costa to internal margin. The pale dull ground color of the wing separates these bands and obtains beyond the outer band, while the even narrow terminal space is concolorous with that on primaries, being purplish brown, frosted with pale scales, the nervules marked with ochreous.

Beneath of a clear pale purplish brown. On the primaries the discal mark is seen and a blackish shade band indicates the narrow tranverse line of the upper surface. Secondaries concolorous with primaries; there is a distinct white discal spot on the cross vein and a faint oblique dark shade band. The ground color of the wings has something of a dead pink tinge beneath; this is especially noticeable on the secondaries below the median nervule. Expanse, 5 inches. No habitat given. This seems evidently a specimen with an erroneous locality, else it would probably have been found by subsequent collectors.

H. pamina Neum., Pap. ii, 60.

var. AUROSEA Neum., Pap. ii, 61.

Head, thorax, and primaries an olivaceous creamy gray; in the ♀ paler. Primaries subfalcate, somewhat darker at base, but lighter along the exterior margin. An evenly oblique yellow line, with brownish exterior border, from very near apex to the center of the interior margin. An irregular square discal blotch with dark dots at the intersections of the nerves. Secondaries with the discal space bright yellow, the black ocellus centered with white, surrounded by a few blue scales. The margins to this field are rosy, and this rosy margin forms the band through the terminal space. Abdomen above rosy, beneath pale drab. Beneath, primaries and secondaries fawn drab, the transverse line of primaries of a purplish rose tint, the interspace between this line and base being likewise of a lighter purplish rose, fading toward the costa. Discal spot conspicuous, black with white central spot. Secondaries with markings of upper side faintly reproduced. Expands 2.75——3.65 inches. *Hab.* Arizona.

The variety *aurosea*, as has been remarked, differs in the deeper more reddish shade of the ground color. The venation of primaries is as in *io* and the others of the genus. The secondaries have 2, 3, and 4 from the median at about equal distances; the cell is closed by a slender vein, drawn inward at center, and forming thus two waves; 5 and 6 are from the same point at the upper end of the cell, and 7 is from the subcostal near the end of the cell. The genitalia are peculiar, the supra-anal plate forked, the forks pointed and curved outwardly, and covering another pointed corneous plate. The side piece is peculiar in shape and difficult to describe in words. The figure must serve to make it clear.

The insect has been raised by Mr. J. Doll. I have seen the larva in Mr. Neumoegen's collection. So far as I know it has not yet been described.

H. zephyria Grt., Tr. Kans. Ac. Sci. viii, 147 (1882).

Primaries are even, soft, deep smoky gray, a distinct somewhat curved white line crossing obliquely from the middle of the inner margin to the apex. At the end of the cell is a rather large black ring with a more or less indistinct white center. At the extreme base of the wing is a narrow white line. Thorax and head concolorous with primaries. Secondaries pink at base, and there densely clothed with long fine hair. The outer margin is pale gray, sharply limited inwardly by a black line. A darker gray shade equidistant from this line and the margin. Disc of wing bright yellow, within which is a large black ocellus with a linear white pupil, marked with pale blue scales each side. Abdomen deep carmine red, the tip and under side mouse gray. Beneath, pale mouse gray, primaries with a large black discal spot with white center, secondaries with ocellus faintly reproduced. Expands 2.25–3 inches. *Hab.*, New Mexico.

The venation of primaries in this species is in all essentials like that of *io*. The secondaries differ from all the other species in that the cross vein closing the cell runs obliquely upward, making the cell pointed with v. 4 from the point.

This species is still very rare, and I have been unable to obtain specimens of which I could examine the genitalia as closely as I desired. The shape of the side piece I could make out, and that I figure at pl. xiv, f. 10; but the supra-anal plate I could not examine. This is perhaps the handsomest and most distinctly marked of all the species, and by its dark color and the oblique white band is not likely to be wrongly identified. Professor Snow has bred this species, but I have seen no description as yet of the larva.

COLORADIA Blake.

Antennæ of the male doubly pectinated to the tip, the upper branches not more than half the length of the lower; the female antennæ simple. Head small, very much retracted; body robust, densely clothed with

fine diverging hairs; abdomen exceeding the secondaries in both sexes. Male genitalia figured on plate xiv, fig. 11. The side piece is divided, and the supra anal plate is but slightly narrowed to the tip and there emarginate. Primaries with arcuate costa, pointed apices, and obliquely rounded outer margin. Veins 12; 5 from the cross-vein at end of cell nearer to 6 than to 4, 6 and 7 from one point at the upper end of cell, 8 from 7 half way to the apex. Secondaries *with two internal veins;* 5 from the upper end of the cell, 6 and 7 on a short stalk from the same point. The chief peculiarity of the genus is the possession of two internal veins to the secondaries, a characteristic unique in the North American representatives of the family. It shows plainly in habitus and structure a tendency to the other Bombycid families, though fully within the definition of the present family. There is only one species thus far known.

C. pandora Blake, Proc. Ent. Soc. Ph., ii, 279, pl. vii, ♀ (1863); Strk., Lep., 137, pl. xv, f. 7, ♂ (1877).

Blackish gray, powdered with white scales. Primaries with a broad, waved, and dentate black transverse line from base, and another broad, black, lunulate line about one-third from tip, running parallel to outer margin; the two lines rather closely approximate on inner margin. An irregularly dentate and somewhat diffuse whitish band from apex to hind angle, inwardly somewhat darker shaded. A small black discal spot. Palpi and tongue aborted; antennæ yellow; thorax black, vestiture with fine white hairs intermixed. Secondaries thinly scaled; deep pinkish hair at base and along inner margin, whitish to the dusky outer margin. Within this margin is a narrow, lunulate black band. A small black discal spot. Beneath dull grayish white, the maculation of upper surface faintly reproduced, the costa and disk with long pinkish hair. Abdomen black, with edges of segments and sides clothed with white hair.

Expands 2.50–3.25 inches. *Hab.* Colorado, Oregon, New Mexico.

ANALYSES OF THE CINCHONA BARKS ON EXHIBITION IN THE MATERIA MEDICA SECTION. U. S. NATIONAL MUSEUM.

BY GEORGE E. DOERING, PHAR. D.

The collection of cinchona barks now on exhibition in the materia medica section of this museum represents about all the varieties that are to be found in commerce. They were received mostly from the Government plantations of India, Government plantations of Jamaica, Messrs. Howard & Sons, London, Messrs. W. H. Schieffelin & Co., New York, and the U. S. Centennial Exhibition, 1876.

The collection comprises nearly all the natural barks of South America, and almost every variety of the cultivated product from the plantations in India, Java, Ceylon, Mexico, and Jamaica. They number in all over a hundred specimens.

With such a large and varied collection the question naturally arose, what is the comparative value of these barks? To answer this it was simply necessary to assay them, which was accordingly undertaken at the suggestion of the present curator, Dr. H. G. Beyer, U. S. N. (Some specimens existed in such a limited quantity that even the small amount of 5 grams could not be spared, and thus had to be omitted from the list given below.)

Through the courtesy of Prof. F. W. Clarke I was allowed to do the work in the laboratory of the U. S. Geological Survey.

Many of the methods described in the books for determining the amount of cinchona alkaloids were tried, with the view of obtaining one which would give the smoothest results. The following is a description of the method employed:

(1) Five grams of the finely powdered bark are first digested for several hours with 100^{cc} of a 1 per cent. solution of sodium hydrate, filtered, and the contents of the filter washed with an additional 50^{cc} of alkaline solution. (This preliminary operation is to remove tannin, coloring, and other objectionable substances, which greatly interfere with the subsequent removal of alkaloids by chloroform.) This solution is then made acid, filtered from the precipitated cinchona red, the filtrate rendered alkaline, and such alkaloids as may have been dissolved are removed with chloroform, the chloroformic solution evaporated, and the residue weighed. This weight is to be added to the final result.

(2) The bark so prepared is now transferred to a flask, with 100^{cc} of a $2\frac{1}{2}$ per cent. solution of sulphuric acid, and digested for several hours on a water-bath; filter and repeat the operation, washing the filter until the filtrate ceases to become turbid upon the addition of sodium hydrate. (The bark that has so far as possible been exhausted of

alkaloids is still capable of yielding an acid infusion, which is decidedly fluorescent, but does not reveal the presence of alkaloids by the addition of alkali.)

(3) Sodium hydrate is now added to the acid liquor until distinctly alkaline, 15^{cc} chloroform next added, and the contents of the flask thoroughly agitated. After the chloroform has all settled to the bottom, the supernatant liquid is decanted and the chloroformic solution of the alkaloids transferred to a filter wetted with water. The decanted liquid is again treated twice with chloroform, using 10^{cc} each time, and the resulting alkaloidal solutions added to the above filter. As soon as all the aqueous fluid has filtered through, the filter is broken and its contents allowed to filter through a filter wetted with chloroform into a tarred flask; this is placed on a water-bath and the contents evaporated until the flask ceases to lose weight. This weight, plus the weight of the alkaloids obtained from the alkaline washings of No. 1, multiplied by 20, gives the percentage of total alkaloids.

(4) The amount of ether soluble alkaloids is obtained by treating these two residues with 30 times their weight of ether, filtering, evaporating, and multiplying the weight of the residue by 20.

No.	Name.	Locality.	Description.	Ash.	Alkaloids.		Remarks.
					Total.	Ether sol.	
				Pr. ct.	*Pr. ct.*	*Pr. ct.*	
52920	Cinchona anglica	Madras	Blackish quills fissured transversely	2.505	3.934	2.180	Natural bark.
52921	....do	....do	Curved, warty pieces of a chocolate color	1.980	4.818	3.744	Renewed bark.
52922	....do	....do	Thick, dark gray pieces fissured transversely	1.980	6.908	4.352	Mossed bark.
51999	Cinchona javanica	Java	Thick quills covered with lichens	1.700	0.588	0.200	
52000	....do	... do	..... do	1.820	1.668	1.010	
52002	Cinchona Harskarliana	....do	Large quills	1.780	2.597	0.900	
52007	Cinchona Pahudiana	....do	Very thin quills	1.920	0.578	0.190	
52911	....do	Madras	Thin quills covered with lichens	3.520	0.906	0.906	Natural bark.
52912	....do	... do	Smooth, chocolate-colored quills	2.541	1.008	0.669	Mossed bark.
52028	Cinchona Pelletierana	South America	Large, thick flat pieces	1.651	0.755	0.360	
52009	Cinchona Schuhkraft	Java	Thin quills	1.800	1.128	0.180	
53231	Cinchona hybrid	Jamaica	Quills	2.540	6.364	4.400	Root bark.
53205	....do	India	Large quills wrinkled longitudinally	2.344	4.966	2.770	
53204	....do	do	Dark quills marked with grayish spots	2.340	4.790	3.089	
53230	....do	Jamaica	Quills covered with lichens	1.900	3.468	2.160	
52909	Cinchona Pitayensis	Madras	Thin, rough quills	3.180	4.744	2.752	Natural bark.
52916	Cinchona micrantha	... do	Small quills covered with lichens	4.565	6.250	0.510	Do.
51651	Cinchona cordifolia	Venezuela	Thin twisted pieces	3.280	4.800	3.360	Var. rotundifolia.
51692	Cinchona carabayensis	Brazil	Large, thick pieces and thin quills	2.081	0.588	0.200	
50052	Cinchona officinalis		Thin quills	2.700	0.989	0.250	
52024	....do	Madras	Curved, thick pieces fissured transversely	2.220	2.388	2.000	
52015	....do		Very thin quills	2.660	1.906	1.520	Var. Crispa.
52890	....do	Madras	Thin quills, natural bark	3.920	2.424	2.040	Var. Uritusinga.
52905	.... do	....do	Blackish, curved pieces; mossed bark	3.600	1.380	1.090	Do.
52891	....do	....do	..... do	3.540	0.968	0.968	Do
52899	....do	....do	Dark, brown, warty pieces, renewed bark	3.420	4.386	3.080	Do.
52902	....do	....do	Long, black quills, natural bark	3.720	3.820	3.446	Do.
52021	.... do	South America	Long, thin, fibrous quills	1.800	0.958	0.670	
52032	....do	Madras	Long, curved pieces	1.000	9.122	4.000	
52016	....do	Java	Gray quills	3.020	1.177	0.890	
52005	....do	Ceylon	Very thin quills	2.581	1.306	0.610	
52026	....do	... do	Large quills of very thin bark	3.040	1.186	0.806	
52029	....do		Large quills covered with thick knotty rings	2.480	2.260	1.006	Knotty bark of Jussien.
52895	....do	Madras	Thin, wrinkled pieces, glossy chocolate color	3.320	3.868	3.480	Renewed after shaving.
53229	....do	India	Blackish quills covered with lichens	3.540	4.965	4.580	
53208	....do		Quills very much wrinkled	2.780	2.260	1.700	
53207	....do	India	Thick, gray quills	3.000	2.383	2.103	
53206	....do	....do	Dark colored quills covered with lichens	2.900	2.790	1.280	
52906	.... do	Madras	Thin, grayish-black quills	2.340	3.388	3.000	Mossed bark.
52908	....do	....do	Curved pieces	2.660	4.560	4.180	Renewed bark.

52907	....do	....do	Grayish black, wrinkled pieces	3.600	5.500	4.700	Mossed bark.
52897	....do	....do	Thin curved pieces	2.060	4.555	4.180	Renewed bark.
52893	Cinchona officinalis condaminea	....do	Dark brown, curved somewhat warty pieces	2.380	1.463	1.392	
52892	....do	....do	Curved brown pieces	1.640	1.528	1.140	
52898	....do	....do	Slender, chocolate-colored pieces	1.962	3.620	3.100	
52904	Cinchona officinalis angustifolia	....do	Curved pieces covered with lichens	2.480	1.090	0.710	Natural bark.
52901	....do	....do	Curved pieces	2.540	7.200	6.000	Renewed bark.
52900	....do	....do	Curved, wrinkled pieces	3.760	7.430	7.050	Mossed bark.
52941	....do	....do	Small, wrinkled pieces	2.900	6.388	6.000	Renewed bark.
52940	Cinchona pubescens	....do	Curved, warty pieces	2.270	5.526	2.771	Do.
52925	....do	....do	Small quills covered with lichens	3.960	4.280	3.892	Natural bark.
53926	....do	....do	Curved, warty pieces	2.040	4.388	4.030	Renewed bark.
52923	....do	....do	Small quills	2.740	4.880	4.430	Natural bark.
52924	....do	....do	Curved, warty pieces	2.200	5.613	5.230	Renewed bark.
52938	....do	....do	Twisted pieces	3.020	3.648	3.260	Do.
52927	....do	....do	Small quills	2.855	4.127	2.330	Natural bark.
52930	....do	....do	Twisted quills fissured transversely	2.901	6.548	6.160	Do.
52931	....do	....do	Black, curved pieces	2.780	3.566	3.000	Mossed bark.
52929	....do	....do	Black quills	3.940	2.846	2.300	Do.
52896	....do	....do	Curved, thick wrinkled pieces	2.480	5.080	4.600	Corky bark.
52914	....do	....do	Corky bark	3.560	1.638	0.250	
52915	....do	....do	....do	2.501	1.857	1.470	
52928	....do	....do	Curved, thin pieces fissured longitudinally	2.400	4.672	4.292	
50431	Cinchona succirubra		Thin quills	2.860	4.448	2.990	
50731	....do		Thin, fibrous pieces	4.640	3.007	1.760	Rubingosa bark.
52379	....do	Mexico	Dark gray quills and partly covered with lichens	1.761	2.708	1.281	
52013	....do	South America	Chocolate-colored quills	2.926	5.010	2.760	
52023	....do	....do	Thin quills; epidermis easily detached	2.743	4.928	2.594	
52018	....do	Madras	Small, fibrous pieces	2.599	5.189	2.370	
52012	....do	....do	Large quills and curved pieces	3.100	5.050	3.500	
52003	....do	....do	Warty quills	2.740	5.248	2.332	
52001	....do	Ceylon	Thick quills	2.500	3.940	1.780	
53030	....do	Java	....do	2.840	4.129	2.811	
52935	....do	Madras	Black quills	2.400	5.027	3.240	
52934	....do	....do	Thin quills	4.081	5.341	2.531	
52932	....do	....do	Dark, thin curved pieces	3.220	4.366	2.020	
52936	....do	....do	Dark, warty curved pieces	3.182	4.466	2.003	
52939	....do	....do	Curved pieces, very much wrinkled	2.560	4.536	2.097	
52933	....do	....do	Gray quills	2.446	4.268	1.930	
52937	....do	....do	Brown, wrinkled pieces	2.580	5.888	3.000	
53210	....do	India	Thick quills	3.370	9.249	3.343	
53201	....do	....do	Large quills	2.070	4.905	3.600	
53200	....do	....do	Very thin, wrinkled pieces	2.213	4.130	2.260	
53202	....do	....do	Large quills, brown, thin, wrinkled longitudinally	2.766	1.822	1.520	
53235	....do	....do	Thin pieces	2.561	3.940	1.402	
53659	....do	....do	Smooth, gray quills	2.722	5.280	3.000	
53237	....do	Jamaica	Thick quills	2.640	5.537	2.470	
50129	Cinchona calisaya		Thick, flat pieces	1.462	2.808	2.420	
50077	....do		Thick, flat pieces, very fibrous	4.000	1.607	0.710	
52380	....do	Mexico	Dark brown, curved pieces	1.380	4.501	1.600	

Analyses of cinchona barks—Continued.

No.	Name.	Locality.	Description.	Ash.	Alkaloids.		Remarks.
					Total.	Ether sol.	
				Pr. ct.	*Pr. ct.*	*Pr. ct.*	
52918	Cinchona calisaya	India	Thick, curved pieces covered with lichens	1.982	2.199	1.810	
52919	do	do	Dark, curved pieces covered with lichens	2.160	3.473	1.440	Var. Josephiana.
53639	do	do	Dark, thin quills	2.240	0.240	0.240	Var. Ledgeriana.
53233	do	do	Small quills covered with lichens	3.000	2.688	1.970	
53203	do	do	Thick quills	2.243	7.227	6.840	
53234	do	Jamaica	Dark brown quills and pieces	7.300	5.348	3.000	
53209	do	India	Thick quills	2.480	6.588	6.192	Do.
52004	do	Java	Large quills covered with lichens	1.980	4.580	4.200	Do.

NORSK NAVAL ARCHITECTURE.

By GEORGE H. BOEHMER.

(With five plates.)

In the section of Naval Architecture in the United States National Museum at Washington there is on exhibition the model of a boat used in the fisheries at Söndmöre, Norway, and with slight modifications all along the coast of Norway, from Egersund, in Lister, round the North Cape to the frontier of Russia, a distance of about twelve hundred geographical miles. They are called "Nordlandsbaade" (Northland boats), are described as long, narrow, and low, light and elegant, and fit both for sailing and rowing,[1] and are believed by the fishermen of that region, on account of their peculiar construction, to be more elastic, safer, and swifter in a sea way.

THE SÖNDMÖRE BOAT.

(See Plate xv.)

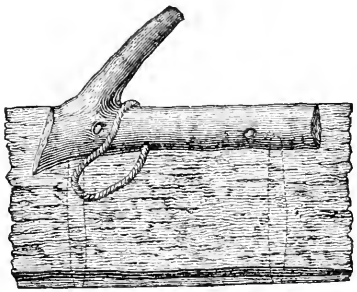
This boat is described as being clinker-built, and having four strakes, except at the bow, where there are six strakes; lower bow-plank put on diagonally with end chamfered to fit on other planks, to which they are nailed; no gunwales; strengthening pieces along the inside next to upper strake; heavy timbers; boat entirely open; six thwarts; five rowlocks; deep keel, curving up like a sled-runner at each end to form stem and stern posts, which are high; bottom slightly concave, with much dead rise, being nearly straight to top of upper strake; ends sharp and very flaring; small rudder; peculiar-jointed tiller; single mast, stepped amidships, with strong rake; four shrouds aside, with toggles on lower ends that pass through beckets at the boat's side; single lugsail, with narrow head, tacks down to stem.

The rowlocks of all the Northland boats, from the most ancient to the present Norwegian fishing craft, exhibit the same general model, although they differ from one another in size and details of work. In every case they are cut out of one piece of timber. The representation given on next page is from a boat built at Rannefjord, in the "Nordlands Amt," about latitude 66 north.

They are called "Keiper," and the same term ("Keipr") is found in old Icelandic sagas (Fornmanna Sögur) and in the Snorre's Edda. The Keiper consists of a piece of wood fastened to the gunwale by wooden pegs—in the Söndmöre boat, in the absence of a gunwale, they are

[1] Diriks and E. Sundt, in "Folkevennen" of 1863 and 1865.

fastened to the top plank by two iron nails—bearing an oblique prolongation at one end, and furnished with a loop of wicker-work rope or leather, through which the oar is passed, and which prevents its slipping out of the keip while rowing. These rowlocks are in Norway considered superior to ordinary tholes, being not so liable to break as the latter.



In some fishing craft the planks are tied to the frames by ropes through holes in the under side of the frames and corresponding holes or in cleats projecting from the planks.

Little, if any, change appears to have been made in northern naval architecture, for in the Northland boats of the present day we recognize the oldest forms known to us from the rock sculptures (*Helleristninger*, or *Hällristningar*) discovered in Sweden and Norway, with an antiquity reaching far back into prehistoric times, and supposed to have originated from 500 to 800 years before the Christian era; from boat-shaped stone burial grôups (*Skibssætninger*, or *Stenskepper*) supposed to have been erected during the transition time from the bronze period to the iron age in Scandinavia, and from *Boat remains* found at various times and places, representing structures dating from the third to about the ninth or tenth century of the Christian era.

I.—Helleristninger,[1]

or hällristningar, the picture groups of Scandinavia, engraved upon rock and originated during the bronze age, represent in simple outline

[1] O. Rygh: Om Helleristninger i Norge. I Videnskabs Selskabet i Kristiania Forhandlinger, 1873, p. 455–470. Dr. Henry Peterson: Notice sur les Pierres Sculptées du Danemark; in: Mémoires de la Société Royale des Antiquaires des Nord; Copenhague, 1877, p. 330–342. (Cited by Dr. C. Rau: Cup-shaped and other Lapidarian Sculptures, p. 25, in—Contributions to North American Ethnology, vol. v; U. S. Geographical and Geological Survey of the Rocky Mountain Region; U. S. Department of Interior.)

more or less equipped ships, sharp at the ends, with stem and stern posts alike, both curved and high. The oars appear as a series of vertical strokes along the sides of the ship.

Such representations have been discovered: in Denmark,[1] on the capstone of a funeral chamber near Herrestrup; in the northwest of Seeland;[2] on a bronze knife excavated in Ditmarsch;[3] in Sweden, on a heavy diorite slab from a tumulus in Scania, called Willfarahög;[4] at Kivik, Christianstad Län, Scania;[5] in Bohuslän,[6] on the Häggeby stone in Upland and on runic stones upon Gotland. The accompanying illustration (see Plate xvi) shows a runic stone found in Alskog parish, at Tjängvide, in the southern part of the island of Gotland. It is now in the museum at Stockholm. At the base is a dragon-ship with only one mast and one sail. (The illustration was taken from Paul du Chaillu, The Land of the Midnight Sun: New York, 1882.) They occur in Norway, along the coast as far north as Throndhjem fjord;[7] and in Russia, upon the southeast bank of Onega Lake,[8] which is the only one known to exist within the east Baltic regions of Russia.

Of the construction of the boats represented in these sculptures of course nothing is known, nor do the engravings permit of any estimate as to their dimensions, the only record handed down to us being the outlines, which, however, are sufficient to serve in the comparison with the lines of later structures.

A different view of the outlines of boats, supposed to have belonged to the period at the beginning of the Christian era, and which, in form,

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[1] Worsaae: The Primeval Antiquities of Denmark; translated by W. J. Thomas; London, 1849, p. 91. (Cited by Rau: Cup-shaped and other Lapidarian Sculptures, p. 27.) Worsaae: Nordiske Oldsager i det kongelige Museum i Kjöbenhavn, fig. 171–175. (Cited by C. Rau: Cup-shaped and other Lapidarian Sculptures, p. 27.)

[2] C. Rau: Cup-shaped and other Lapidarian Sculptures, p. 27, and fig. 21. Simpson: Archaic Sculptures, &c., p. 72. (Cited by Rau, &c., p. 27.) Ferguson: Rude Stone Monuments, fig. 106, p. 303. (Cited by Rau, p. 27.) Peterson, Dr. Henry: Notice sur les Pierres Sculptées du Danemark, p. 338. (Cited by Rau, p. 27.)

[3] Kemble: Horæ Ferales, p. 228.

[4] Nilsson: Das Bronzealter; Nachtrag, p. 42. (Cited by Rau, p. 29.) Simpson: Archaic Sculptures, &c., p. 78. (Cited by Rau, p. 29.)

[5] Rau: Cup-shaped and other Lapidarian Sculptures, p. 30 and figs. 24. Nilsson: Das Bronzealter. (Cited by C. Rau, p. 30.) Peterson: Notices sur les Pierres Sculptées, &c. (Cited by Rau, p. 30.)

[6] Montelius: Bohuslänske hällristningar, Stockholm, 1876, pp. 3, 18. Rau: Cup-shaped and other Lapidarian Sculptures, p. 30 and fig. 25. Nilsson: &c., p. 90. (Cited by Rau, p. 30.) Holmberg, A. E.: Scandinaviens Hällristningar, Stockholm, 1848. Åberg, Dr. Lennart: Hällristningar uti Bohuslän; in: Annaler for Nordisk Oldkyndighed; Kjöbenhavn, 1839; plate x, p. 386.

[7] N. Nicolaysen: Langskibet fra Gokstad ved Sandefjord. Kristiania, 1882, p. 9.

[8] Archiv für Anthropologie, x, p. 86; wood-cut, fig. 4. Grewingk, C.: Ueber die in Granit geritzten Bildergruppen am Onegasee. In: Bulletin histor. philol. de l'Académie des Sciences de St.-Pétersbourg, xii, No. 7 et 8. Schwede: Nachr. Iswestija der geographischen Gesellschaft zu St. Petersburg, 1850, p. 68. Grewingk, C.: Verhandlungen der esthnischen Gesellschaft zu Dorpat, vii, Heft 1, p. 25.

again resemble the Northland fishing boats of the present day, is obtained from the so-called

II.—SKIBSSÆTNINGER,[1]

(Stenskeppar, Skeppshögar, Skeppsformer;[2] Schiffsetzungen; Wella-Laiwe, Teufelsboote, or Steinschiffe)[3] or rows of stones set in such a manner as to form the outlines of boats, and which were employed for sepulchral purposes by the Vikings.

Sweden is the center of distribution of Norske boat-shaped groups. They occur in Bohuslän, Schonen, Blekingen, Oeland, Gotland, Nericke, and Upland.[4] Similar structures have been found near Stralsund, Germany,[5] and in the Baltic provinces of Courland,[6] and Estnish Livonia[7] of Russia.[8]

In Courland, Russia, only seven of these positions have been discovered, all being located in the diocese of Erwahlen,[9] and with one exception they occur in pairs, situated behind each other. The outlines of long, narrow, and pointed vessels are represented by a single row of stones. The stem and stern posts are shown by large bowlders, thus indicating for these parts a considerable elevation above the bulwark

[1] C. Engelhardt: Denmark in the Early Iron Age, London, 1866, pp. 38, 39.

[2] Bidrag til Kännedom om Göteborgs och Bohusläns Fornminnen.

[3] C. Grewingk: Die Steinschiffe von Musching und die Wella-Laiwe oder Teufelsboote von Kurland überhaupt. Dorpat, 1878. Döring, J.: Die Teufelsbootevon Kurland. Sitzungsberichte der Gesellschaft für Literatur und Kunst, 1860–1863. Mitau, 1864. Berg, C.: Notiz im Correspondenzblatt der Naturfor. Gesellsch. zu Riga, xx, 1872.

[4] Archiv für Anthropologie, x, pp. 83, 84.

[5] Hagenow: In Baltische Studien der Ges. f. Pommersche Geschichte, xv, 2, p. 49. Archiv für Anthropologie, x, p. 82.

[6] Grewingk: Zur Anthropologie des Balticums und Russlands. Im Archiv für Anthropologie, x, pp. 73–100; 297–300. Grewingk, C.: Die Steinschiffe von Musching und die Wella-Laiwe oder Teufels-boote von Kurland. Grewingk, C.: Steinalter der Ostseeprovinzen. Dorpat, 1865, p. 45. Döring, J.: Im Sitzungsbericht der Gesellsch. f. Literatur und Kunst. Mitau, 1864, p. 154. Berg: Im Correspondenzblatt des Naturforschenden Vereins zu Riga, xx, 1872, No. 7. Burchardt: In: Baltische Monatsschrift, xxiv. Riga, 1875.

[7] Sievers, Graf C.: Verhandlungen der estn. Gesellschaft zu Dorpat, viii, Heft 3, 1876. Sievers, Graf C.: Verhandlungen der Berliner Gesellschaft für Anthropologie, October 1875. Sitzungsberichte der estn. Gesellschaft. May, November, December, 1876. Archiv für Anthropologie, x, p. 79.

[8] Sitzungsberichte der Gesellschaft für Geschichte der Ostseeprovinzen, 1875, Riga, 1876, p. 54.

[9] Grewingk, C.; Die Steinschiffe von Musching und die Wella-Laiwe oder Teufelsboote Kurlands überhaupt. Dorpat, 1878. Zur Archaeologie des Balticums und Russlands. Im Archiv für Anthropologie, x, p. 73. Döring: In: Sitzungsberichte der Ges. f. Literatur und Kunst. Mitau, 1864, p. 154. Grewingk: Steinalter der Ostseeprovinzen, Dorpat, 1865, p. 45. Berg: In Correspondenzblatt des Naturfor. Vereins zu Riga, xx, 1872, No. 7. Burchardt: In: Baltische Monatsschrift, xxiv, Riga, 1875. Archiv für Anthropologie, x, p. 75.

of the boats; excavations in the bord-stones indicate the rowlocks. Their outlines are reproductions of the Upland, Häggeby, and Gotland runic stones. The direction of the boats suggests in the construction a general southeasterly course.

At a depth of from six inches to a foot below the surface a large stone plate was found, serving as a cover to chests built of plates of either natural or artificial formation. The cells of these chests were occupied by urns composed of gravel mixed with clay but little burnt, and containing more or less cremated human remains. The following illustration (see Plate xvii), copied from "C. Grewingk, Die Steinschiffe von Musching und die Wella-Laiwe oder Teufelsboote Kurlands überhaupt," shows in *a* the arrangement and outlines of these boat-positions; in *b*, a sectional view of one of the Musching boats, and in *c*, the stone chests which have served for the reception of the cremated remains of the dead.

Similar boats have been found in Livonia. Among them is the Slaweek stone boat[1] from the shores of Little Strante Lake in the district of Walk. It has a double row of bord-stones, from 4 to 5 feet high, is supplied with thirteen or fourteen row-benches, and is rounded off at stem and stern. The cremated remains of the dead had been deposited on the level ground between the stones.

In Estnish Livonia[2] similar positions were found, but lying either singly or in fours they are indicated by single rows of stones in a northeast to southwest or east to west direction, and are rounded off at stem and stern. They exhibit as many as eleven row-benches and some large bowlders, possibly indicating the position of the mast.

The boat representation found near Stralsund, Germany,[3] was provided with a double row of bord-stones. In its interior space, obliterated by digging, an empty chest of thin stone plates was found.

Among the boat representations of Sweden those in the forest of Braidfloar on the Island of Gotland,[4] of Eds in Upland,[4] Blomsholm in Bohuslän,[4] Kåseberg,[5] Lungersås upon Gotland,[5] Raftötangen in Blekingen[5] are the most important.

The dimensions of all these boat representations vary greatly; they may, however, be divided into two general groups of which the one includes only the seven positions of Courland, while all the other boats are included in the second group.

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[1] Sievers, Graf C.: Verhandlungen d. estn. Ges. zu Dorpat, viii, Heft 3, Dorpat 1876. Sievers, Graf C.: Verhandlungen der Berliner Gesellschaft für Anthropologie, 1875, October.

[2] Archiv für Anthropologie, x, p. 80. Sitzungsberichte der gelehrten estnischen Gesellschaft zu Dorpat, May, November, December, 1876; January, 1878.

[3] Hagenow, in Baltische Studien der Gesellschaft für Pommersche Geschichte, xv, 2 p. 49. Archiv für Anthropologie, x, p. 82.

[4] Archiv für Anthropologie, x, p. 83.

[5] *Ibid.*, p. 84.

Dimensions of boat positions.

Positions.	Length.	Width.
	Feet.	*Feet.*
Erwahlen, I position, Musching, 1	31	8
2	27	13
II position, Lieben, 1	25	10
2	31	10
III position, Widser, 1	50. 9	14
2	49. 0	10
IV position, Nogallen, 1	47. 10	10
Slaweek boat, Russia	140	40
Estnish Livonia, Russia	From 50 to 100	About 25
Stralsund, Germany	130	16
Braidfloar, Gotland, Sweden	144	16
Upland, Sweden	182	50
Blomsholm, Bohuslän, Sweden	141	31½
Kåseberg, Sweden	212	60

III.—Boat remains.

Although the form of the earliest Northern boats has thus become known to us, the mode of their construction, whether covered with wood or skins, tied together with withes or sinews, may forever remain a secret. Our first knowledge in this respect is of post-Christian boats belonging possibly to the third century after Christ; and this knowledge was derived from the discovery and excavation, at various times and places, of the remains. Such discoveries were made at Ultuna,[1] Lackalänga,[2] Borre[3] (near Horten, Norway), at Snape,[4] Suffolk, England (at which place a boat was dug out, 40 feet 8 inches long, 9 feet 6 inches wide, and 3 feet 10 inches deep, clinker built, containing, among other articles, a glass vessel with projections of a shape similar to one found in the boat discovered at Borre, and being well known from graves of the latter part of the iron age in England, France, and Germany).[5] Similar finds were made in the parish of Tune, and at Gokstad, Norway,[6] Nydam Moss, Schleswig, Prussia,[7] and other places.[8]

[1] B. E. Hildebrand, in Report of the seventh meeting of Scandinavian Naturalists, Kristiania, 1856, appendix, p. 644.

[2] N. G. Bruzelius, in Annaler for Nordisk Oldkyndighed, 1858, p. 179.

[3] Nicolaysen, in the report for 1852 of the Society for the Preservation of Norwegian Antiquities.

[4] Davidson, in the Proceedings of the Society of Antiquaries, London, 2d ser., vol. ii–iv.

[5] C. Roach: Smith's Coll. Ant., vol. ii, pl. li. Cochet, Normandie Souterraine, pl. x.

[6] Nicolaysen, N.: The Viking Ship discovered at Gokstad, in Norway, with a map, 10 engravings, and 13 plates. 88 pp., 4°. Kristiania, Alb. Cammermeyer. Langskibet fra Gokstad ved Sandefjord. Beskrevet af N. Nicolaysen. Med 1 kort, 10 træsnit, og 13 plancher. Kristiania, 1882.

[7] C. Engelhardt: Denmark in the Early Iron Age. London, 1866, p. 29. Sir John Lubbock: Prehistoric Times. Second edition. London, 1869, p. 8. Prof. Georg Stephens, F. S. A.: "Nydam Moss," in "The Gentleman's Magazine," October, 1863, new series, vol. 15, p. 681.

[8] N. Fornlevn., pp. 20, 179, 245, 551. (Cfr. N. Nicolaysen, Langskibet, &c., p. 12). Aarsber. f. Foren. t. Norske Fortidsmindesm. Bevar., 1869, 94; 1879, 292; 1880, 45. (Cfr. Nicolaysen, Langskibet, &c., p. 12.) O. Rygh: Faste fornlevn., og oldsag., i Nordre og Söndre Throndhjems Amt, p. 24, i. (Cfr. Nicolaysen, Langskibet, &c., p. 12.) Skilling-Magazin, 1867, pp. 717–719, 724, 738–739. (Cfr. N. Nicolaysen, Langskibet, &c., p. 12.) Polytekn. Tidsskrift for 1867. (Cfr. N. Nicolaysen, Langskibet, &c., p. 12.)

The vessels excavated from the mound raised over them had served as a burial place, in conformity with the Viking custom known to have prevailed among the Northmen throughout the later centuries of paganism in Scandinavia.

This mode of burial has been of great importance to archæological research, since it enabled us to study, from the remains thus preserved in a more or less perfect state and brought to light by excavation, the naval architecture of the nations among whom such customs prevailed.

The vessels excavated vary considerably in size, ranging from mere boats of 20 feet in length to sea-going vessels with a length of keel measuring from 40 to 60 feet. In the majority of cases the vessels had been placed on an even keel and the remains of the dead deposited with such articles as were to accompany the departed, after which a mound of earth was thrown up over the grave.

The composition of the earth used in the construction of the mound, together with other influences, had often tended to destroy the wooden structure, and often only just enough has been found to determine the size of the boat and its position in the mound. In many cases, too, the wood-work had been burned with the corpse, so that no positive knowledge could be obtained of the form or of the dimensions of the sepulchral ship.

The oldest naval relic of the early Scandinavian iron age ever discovered, part of an oar, was found in the Nydam Moss, northeast of Flensburg, in the Duchy of Schleswig, in the year 1859, and the remaining part of the same oar in 1862. On August 7, 1863, the remains of a boat were excavated; on October 18, 1863, a large and magnificent oak-built boat was discovered, lying in the direction of the valley, from southeast to northwest, and on October 29, 1863, a third boat, built of fir, was found at the side of the second boat and parallel with it.

The first of these boats was in a very poor state of preservation, having ing evidently been intentionally destroyed; nevertheless the fragments found and taken up displayed sufficient resemblance to the corresponding parts of the second and third boats to indicate the same construction for all the three boats. The second, and best preserved boat, was placed in the hands of Mr. Stephenson, restorer of antiquities, of Copenhagen, and of the restored boat the accompanying drawing (see Plate xviii) is a representation as figured by Prof. C. Engelhard[1], under whose direction the excavation of Nydam Moss had been placed by the Danish Government.

From its close resemblance both to the ancient form as represented in the "Helleristninger" and to the modern Northland boat, as illustrated by a model of a Söndmöre (Norway) boat in the United States National Museum (previously figured and described), the description as given by Professor Engelhard might be of interest, and I am indebted

[1] C. Engelhard: Denmark in the Early Iron Age. London, 1866.

to Dr. Charles Rau, of the U. S. National Museum, for the loan (probably the only copy in Washington) of the work for this purpose.

"When first discovered the boat, of course, was no longer in its original state. In course of time the washers of the bolts by which the planks were fastened together had corroded; the ropes joining the outer parts of the boat to the inner frame-work had been destroyed; the planks, in consequence, had separated and reassumed their original shape; the rowlocks had fallen from the gunwale; the ribs had sunk out of their proper places, and lay in different directions, while the stem and stern-posts had detached themselves from the bottom plank. By degrees, as the boat fell to pieces, these sank to the bottom to about the same depth, whilst the peat, at the same time, grew up around them, covering and protecting them from destruction. The shape of the boat could not, therefore, be directly ascertained from the pieces found, and the sketch was made after it had been restored to its original form in the Museum of Northern Antiquities at Flensburg.[1] No drawing, however, can fully convey the striking impression produced by the large, sharp, and well-built boat itself.

"The boat is 77 feet long, measured from stem to stern, and proportionally rather broad in the middle, viz, 10 feet 10 inches at the bottom, but higher and sharper at each end; it consists of eleven oak planks, five on either side, besides the bottom plank, of which the keel forms part, the latter being only a little more than 1 inch deep and fully 8 inches broad at the middle of the boat, gradually diminishing and at last disappearing entirely towards the stern posts.

"On all the planks there are perforated clamps of one and the same piece with the planks themselves, having been left projecting when the planks were cut out of the solid timber—a most surprising fact, considering the high development to which the smith's art had been carried by the people of the early iron period; a fact, too, which proves that they must have possessed a great abundance of timber, as they would not otherwise have wasted it to that degree, only in order to save a few nails, or to secure the clamps so much better.

"The boat is clinker-built, the planks held together by large iron nails, at intervals of 5½ inches,[2] with large rounded heads outside and square burs or washers inside. The spaces between the planks where they overlap each other were filled up—caulked—with woolen stuff and pitchy, sticky substance. The planks are cut from very fine pieces of timber, the bottom plank being 46 feet 8 inches long, and all of one piece. On both sterns, which are fixed to the bottom plank by means of wooden pegs, there are ornamental grooves, and each of them shows two large holes, which, to judge from the marks of wear, most likely

[1] The restored boat is now in the Museum at Kiel, Prussia.

[2] In the boat found at Snape, Suffolk, England, seven nails occupy a space of 3 feet, which corresponds with the Nydam boat as stated by Engelhard.

have served to pass the ropes through when the boat was to be hauled ashore. The ribs, which give the boat its shape, are mostly in their natural crooked and irregularly bent shape, and rest on the clamps projecting from the planks, which form regular rows across the boat, those on one plank corresponding exactly to those on the next. The ribs have perforations corresponding to the clamps, through which bast ropes were passed, tying planks and ribs together. This is again a fact highly surprising in a nation familiar with the use of iron, and able to work it so well, as their damascened swords prove that they could. At the same time it is possible that a loose connection between the frame-work and the planking of the boat served to give more elasticity to the sides, and that the boats built in this manner went through the surf and great waves easier than those more strongly built.

"On the gunwale were fixed the rowlocks, which, although made on the same general model, yet all differed from one another in size and in the details of the work. They were tied to the gunwale by means of bast ropes, and in this case, too, it might seem surprising that for fixing such important pieces as the rowlocks recourse should have been had to such weak fastenings, which must so often have required to be renewed.

"But this method had at the same time the advantage of rendering it possible to turn them, when necessary, and row the boat in the opposite direction, particularly as both ends of the boat are so exactly alike that it is difficult to say which is the prow and which is the stern. It is true that the width of the boat at the fourth rib is a few inches greater than at the fifteenth rib, which corresponds to it at the other side; but this difference is so small that it was probably not intentional, and the boat has no doubt been designed to shoot through the waves with equal speed, whichever way it was rowed. Its shape, therefore, in some respects, reminds us of Tacitus' description of the ships of Suiones[1]. For their ships differed entirely from those of the Romans, particularly in this, that the stems were exactly alike, so that, whichever way they were rowed, they had a prow fit for resisting a collision or for landing; and, besides, the ships of the Suiones had no sails. Tacitus further says of these boats, that their oars were not fixed in a row along the sides, but were loose, as in certain craft used on rivers, and could be put into the water on either side, as might be required; but this part of the description would not apply to the boats found at Nydam, for on them the oars were passed through loops of rope tied to the rowlocks, on which the marks of wear by the oars are still quite visible; they could not be turned the other way without loss of time and labor, nor would it be possible to back the oars for any length of time, or with sufficient precision, when they are thus tied to the rowlocks.

[1] Germanica C., 44.

"At the side, about 10 feet distant from the stern, the rudder was discovered.[1] Its length is 9 feet 7 inches, and near the middle it has a hole, through which a rope may have been passed for the purpose of tying it to the side of the boat. Just below this hole there is a little cushion of wood fixed with three wooden pegs, intended to protect the rudder from injury by knocking or grating against the side of the boat, and at the top end there is a loose piece with two handles.

"This is the most ancient form of rudder known. Rudders quite similar to this in shape and construction may be seen on many representations of ships of classic times, and always on the right-hand ["starboard"] of the steersman. Lateral rudders were retained down to a rather late period, and are represented, for instance, on the Bayeux tapestry of the middle of the XI century; in the bas-relief over the door of the Leaning Tower at Pisa, built in the XII century, &c.

"This kind of rudder must have been in use even after the middle of the XIII century, for in contracts concerning ships to be built for Louis XI the builders promise to furnish them with two rudders. It was only at the close of the XIII century that the side rudder was supplanted by the hinged rudder now in use.[2]

"The thwarts were strengthened by two angular boards underneath, and supported by three perpendicular pieces of wood. Only in one place, by the middle thwart, these boards were tolerably well preserved, but even there the ends were so soft as not to admit of any very complete examination, and it remains uncertain in what way they were fixed to the sides of the boat. A wicker-work mat covered the bottom of the boat. * * * The fir boat was tolerably complete when first discovered, and its different parts were brought on shore during the next following day after it had been laid bare and the contents taken out, on the 27th of October, 1863. In order to protect the timber of this boat until the restoration of the oak boat was finished it was covered over with peat, but before anything could be done to save it the country was occupied by hostile armies, in the spring of 1864. * * * Since then parts of it have been carried away, and the last remnant will probably soon be destroyed and disappear.

"* * * The bottom plank was about 51 feet 4 inches long, and ended in two points, which probably have carried long and pointed iron spurs; if so, these spurs must have been under water. The side planks have clamps ornamented with moldings, and cut out of the same piece of timber as the planks, just as in the two oak boats. The shape of the rowlocks is somewhat different, and they have formed a continuous row along the gunwale.

[1] It will be observed in the representations of the Nydam boat that the positions of rudder and rowlocks do not correspond; in fact, that the rudder is located near the stem. It is, however, conjectured that this apparent misrepresentation is intentional to better illustrate the methods of fastening.

[2] A. Jal, Archéologie Navale, passim; Smith's Voyage and Shipwreck of St. Paul.

"In this boat, as in the oak boat, the planking was tied to the ribs by ropes passing through the holes in the clamps, and the principle of construction was the same; the great peculiarity of the fir boat being the terminal prolongations of the bottom plank, which probably have carried iron points—a dangerous weapon of attack, equally fit for sinking an enemy's vessel or holding it firm while being boarded.

"As in the oak boat, the bottom was covered by a mat of wickerwork. In several places the timber had cracked, and been repaired by patches of wood. On their inner surface there are vestiges of the caulking material, consisting of woolen woven stuff, and a pitchy kind of substance similar to that used for fixing the feathers on the arrows.

"The boats here described I consider to have been merely rowing-boats, not destined to carry sails, and in forming this opinion I rely principally on the fact that neither masts nor any signs of rigging has been discovered, nor any arrangement in the boats for fixing the necessary ropes. It is true that in the middle of the bottom plank of the oak boat, as well as of the fir boat, there is a hole of about 1½ inches diameter; but these holes are too small to have carried masts, and may have served for letting out water when the boats were hauled on shore, as was probably the case at the beginning of the winter.

"* * * As I have stated before, the oak boat had been intentionally sunk by means of large holes cut in one of its sides below water-mark; at the same time it had been caused to lean over on that side which was nearest the shore, that is, on the northeastern side. Besides this, the stem-posts had in course of time detached themselves from the bottom plank, leaving a large opening at each end. All these circumstances had necessarily caused a great part of the contents of the boat to float or drift out of it. But a part remained, and showed, in several respects, an intentional arrangement, objects of the same kind being accumulated into heaps at particular places.

"*. * * In Nydam, Roman denarii were discovered, embracing the period from 69 to 217 of our era, and of the following emperors and empresses: Vitellius (1), Hadrian (1), Antoninus Pius (10), Faustina the Elder (4), Marcus Aurelius (7), Faustina the Younger (1), Lucius Verus (2), Lucilla (2), Commodus (5), and Macrinus (1). The latest of these coins was minted in A. D. 217.[1]

"They give us an approximate date for the objects with which they were found. Allowing some time for their transport from southern countries, the deposit in our peat bogs cannot have taken place before about the middle of the third century.

"All the known coins from discoveries of this age—from mosses, graves, and chance finds—are of the first three centuries of the Christian era;

[1] Obs: Laureate head. Imp[erator] C[aius] M[arcus] Opel[ius] Se[verus] Macrinus Avg[ustus]. Rev: Pont[ifex] Max[imus] Tr[ibunitia] P[otestate] Co[n]s[ul] P[ater] P[atriæ]. Jupiter standing, a spear in his left hand, and the thunderbolt in his right.

the latest known is of Macrinus (A. D. 217). Among them, coins of the Antonines are of most frequent occurrence."

Two representatives of Viking naval architecture, dating from the period extending from the year 800 to 1050 after Christ, are preserved in the Archæological Museum of the Royal Frederiks University at Christiania, Norway, and in these we again observe the same beautiful and graceful lines exhibited both in the Norwegian fishing-boats of the present day and in the rude drawings and other representations of boats previously described. One of these boats, the

TUNE SHIP,

was excavated from a mound in the parish of Tune, Norway, between the Christiania fjord and the Swedish frontier. In conformity with the Viking customs, it had served as a burial place, and although much of the wood had become decayed, and in addition to this, the sepulchre had previously been disturbed, it afforded much information, as an actual relic, of the character of the vessels belonging to the Viking period. The management of the excavation was intrusted to the skillful hands of Mr. O. Rygh.[1]

Commodore H. Müller, of the Norwegian navy, in his book,[2] revised by the historian, Prof. P. N. Munch, states "that the long-ships, in the peculiar sense of the word, must have been ordinarily clinker-built," and this statement is confirmed in the Tune ship, which is built entirely of oak, and is composed of keel, stem and stern posts, frames, timbers, beams, knees, and planking.

The keel, with a length of 45½ feet, is fixed to the stem and stern posts; the width of the boat amidships is 14½ feet.

The frames, 13 in number, are united by cross-beams, and are not fixed to the keel, but lie free above it. On the top of the frames, fitted on to the overlying limbs of the knees and their continuations, rest the ends of the beams, thus forming a ledge for the ends of the bottom boards to rest in. The knees are attached to the beams.

The planks, 12 in height, are laid in the same manner as in our present yachts and boats, each upper plank projecting a little over the edge of the lower one. Only the bottom plank and the two top planks were fastened with iron nails, the former to the keel, the latter to the knees; all the intervening ones, though fastened to each other by bolts of iron, riveted together, having been tied to the frames by bast ropes through holes in the underside of the frames and corresponding holes or in cleats projecting from the planks. The thickness of the planking differs, being in the lower ones almost that of the two top planks. The tightening of the joints was effected by means of a thin layer of oakum made of cow's hair.

[1] Skillings Magazin, 1867, p. 717–719, 724, 738–739. (cfr. Nicolaysen, Langskibet etc., p. 12.) Polyteku. Tidsskrift, for 1867. (cfr. Nicolaysen, Langskibet, p. 12.)

[2] Søkrigshistoriens vigtigste Begivenheder, p. 1. (cfr. Nicolaysen, Langskibet, etc., p. 14.)

The rudder had a fixed position somewhat before the stern-post on the right side of the vessel. The helm consisted of a plank in the shape of a broad oar, the lower portion of which, in the middle, was provided with a round hole, through which it was fastened to the side of the boat by means of a rope, while its short round upper neck was caught by a grummet. A small aperture in the opposite direction of the blade was made for the tiller in the upper part of the neck. The rudder was mounted with iron,[1] to which one or more cramps were added down towards the heel of the rudder.

The mast[2] is set in an opening made in a large block of oak fixed above the mid-frames of the vessel; over this is a large grooved block to admit the beams. The aperture extended at the same breadth a considerable distance sternward in order to facilitate the raising and lowering. In the fore it is supported against a projecting knot of the wood, so that there is a space between the mast and the side of the slot in the mast-block.

The most recent excavation of Viking naval architecture,

THE GOKSTAD SHIP,

(See Plate xix.)

was made in 1880, by Mr. Nicolaysen, president of the Norwegian Archæological Society, at Gokstad, near the town of Sandefjord, west of the mouth of the Kristiania fjord, and a short distance from the head of a small frith. This ship, fully described by Mr. Nicolaysen,[3] as well as that from Tune, belongs to the Archæological Museum of the Royal Frederiks University at Kristiania, and of the same I now give the description, verbatim, as obtained while viewing these interesting relics on occasion of a recent visit to Norway.

The ship measures 67 feet along the keel and 79 feet 4 inches from bow to stern (extreme measure); the width amidships is 17 feet; and its depth amidships, from keel to top of bulwark, 4 feet.

The ship is entirely of oak, clinker-built, the boards connected with iron nails and the seams caulked with oakum made of cow's hair spun into three-stranded cord. The connection of the plank with the frames is effected in the same peculiar manner as in the Tune ship. In the top sides only have nail fastenings been used, part of wood and part of iron; elsewhere the plank and frames are tied together through holes in the under side of the latter and corresponding holes in cleats which project from the planking. The cleats and the plank are in one piece In this vessel the plank is fastened to the frames with ties made of the

[1] Bergens Bylov, ix, p. 18. (cfr. Nicolaysen, Langskibet, p. 19.)

[2] Skillings Magazin, 1867, p. 717. (cfr. Nicolaysen, Langskibet, p. 20.)

[3] The Viking ship, discovered at Gokstad, in Norway. With a map, 10 engravings, and 13 plates; 88 p., 4°. Kristiania, Alb. Cammermeyer, 1882. Langskibet fra Gokstad ved Sandefjörd. Beskrevet af N. Nicolaysen. Med 1 Kort 10 Træsnit og 13 Plancher. Kristiania, Alb. Cammermeyer, 1882.

tough roots of trees. Such mode of fastening was possibly adopted to counteract the injurious effect of expansion and contraction in the wood when alternately wet and dry.

The planking has an average thickness of about 1 inch. The scantling, however, is not uniform throughout; thus the tenth strake from the keel is almost twice as thick, but somewhat narrower, and the fourteenth from the keel, that in which holes are cut for the oars, about $1\frac{1}{4}$ inch thick.

This ship, as indeed was the case with even the largest vessels of the Viking period, had both oars and canvas to propel her, and there has been only one mast. The mast was frequently lowered; for instance, when rowing against a head wind or when preparing for battle. The peculiar arrangement of ponderous beams at the step of the mast serves to facilitate raising and lowering; it affords, too, an excellent support, which, with the extreme lightness of the ship's scantlings could hardly in any other manner have been given to the mast. This method of fixing the mast is exactly similar to that adopted in the Tune ship; nay, the ornamental form given to the top beam, which has the ends modeled so as to represent the tail of a fish, is the same in both. When stowed away, the mast was perhaps laid on the stanchions, which are provided with cross bars, placed fore and aft, and fastened at the bottom of the vessel to beams having the ends, like the block at the step of the mast, cut into the shape of a fish's tail. Moreover, when the mast was down, the said cross-bars may also have had to support the yard, a very heavy spar compared to the size of the vessel, which, as still usual in many coasting craft from the northern districts of Norway, certainly carried only one sail (a large square sail). In this manner her mast and yard could be stowed away without incommoding the crew. Fragments only remaining of the mast, its entire length cannot be accurately determined.

The oars, of which several have been preserved, are about 20 feet long, the length varying slightly according as they had to be served amidships or at the extreme ends of the vessel. They have been plied through holes bored in the third strake from the top, and provided on the inside with sliding covers, which, when the oars were unshipped, could be pushed over the holes to prevent the sea from entering. The oars have been passed through the holes from inboard, and hence there is a notch cut in the edge of the hole for the blade. No trace can be discovered of thwarts or seats for the oarsmen.

From the number of holes the vessel is shown to have carried 16 oars on either side. As many as 32 men would thus have been required to serve the oars alone, and the ship must therefore have had a complement of not less than 40 hands, even with only one man to each oar and the oarsmen not rowing by turns.

There was no deck, only loose boards resting on shoulders cut in the frames. These boards, particularly in the midship section, are placed

at some distance from the bottom, thus affording space for stowing away beneath them a good many of the articles belonging to the ship or to the crew, but no accommodation for the men. To provide some protection against the weather it was customary in the ships of that period to stretch a tent-cloth above some part of the vessel, under which most of the hands could find shelter. In the ship discovered at Gokstad were found the four supports of such a tent, together with fragments of the cloth and the cords. The supports are heavy boards, 11 feet 8 inches (3.5 meters) in length, finely carved at the upper extremities to represent the head of some animal, and in part painted. They had been placed obliquely, so as to form two crutches, one at each end of the tent, with the carved heads projecting, and connected together by the pole, or rather transverse bar of the tent, which thus formed a gable-ended roof, extending fore and aft from the pole to the rail of the ship. The tent-cloth is made of a rather fine woolen texture, white, with broad red stripes sewed on; the cords for fastening it are hemp. The pieces of ship's rope, of which a good many were found, are all made of bast.

The rudder is hung by a rope a little forward of the stern-post, on the right-hand side, as usual in all vessels of the Viking period, and long after—down, indeed, to the XIV century (hence "starboard"). The method of fastening and guiding this ancient style of side-rudder was not satisfactorily known previous to the discovery of the Gokstad ship.

Of the numerous articles of antiquarian value found in or about the ship, more or less perfectly preserved, the following deserve special mention:

a. Fragments of three oak boats that had been broken up previous to being deposited in the vessel, and no part of which, with the exception of the keel, can now be put together. Like the ship, they were clinker-built, but instead of holes for the oars they have rowlocks of a peculiar form, fastened to the gunwale. Two of the boats have certainly carried a mast. Their size has been comparatively considerable, the keel of the largest boat measuring 22 feet 4 inches in length, and that of the smallest 14 feet. Several of the oars belonging to the boats are preserved; they exactly resemble those used for rowing the ship.

b. The stock of the anchor; being of iron, it had almost corroded away.

c. A landing-stage, or gangway, 25 feet long, but only 20 inches wide. It has the upper surface transversely ribbed, to give a secure footing.

d. Fragments of sleeping berths, at least four. These berths, a couple of which have been restored, are of much the same shape as the bedsteads now in use among the Norwegian peasantry. They are very low and put together so as to be readily taken to pieces and stowed away.

e. Parts of a wooden chair, finely carved, that would appear to have been the high seat of the chieftain or commander of the vessel. The side pieces—in an excellent state of preservation—are modeled at the top to represent the heads of animals, in precisely the same style as the upper end of the tent-supports.

f. A great variety of kitchen utensils, among which were a very large and massive copper kettle, together with the iron chain, gracefully wrought, for suspending it over the fire; bits of a smaller kettle, of iron, and of the chain belonging to it; numerous tubs and buckets of different sizes; wooden plates; several small, finely carved wooden drinking-cups, with handles; and many other articles. No trace of a fireplace can be discovered in the ship, nor would it, indeed, have been easy to provide one in an open vessel of this kind. Hence, the cooking utensils were only of service while coasting, when a harbor could at any time almost be gained; and in those days a ship kept near the shore whenever possible.[1]

Something remains to be said of the tomb in which this vessel was discovered, and to which we are indebted for her preservation.

The barrow was very large, of the usual circular form. The ship had been interred in the middle, on her keel, decorated with shields hung close together along the rail on both sides of the vessel. This was a general custom in Norway till late in the Middle Ages, when dressing a ship on festive occasions, and corresponded to the decking out of a vessel with flags in our times. A few of these shields have been successfully restored and placed in position. They are of wood, circular in shape, 36 inches in diameter, but extremely thin, with a boos of iron in the center, and plated at the rim with narrow strip of the same metal.

A large grave-chamber of wood is built in the middle of the ship from the mast towards the stern. It has the form of a gable-roof, the sides consisting of round logs, and the gable-ends of planks placed on end. In this chamber the remains of the dead were deposited, unburnt, and no doubt on a bed, fragments of a bedstead having been found in the chamber.

Unfortunately, this ship-tomb had been visited by grave-robbers, in all probability during the pagan era. They have dug into the mound on the port side, and gained access through a large opening which they cut in the ship's side and the wall of the grave-chamber. This accounts for the fact, that the bones of the body had nearly all disappeared; that in the chamber there were but few articles of antiquarian value compared with what it might reasonably have been expected to contain; and in particular, that no implement of war was to be found. Mean-

[1] Nicolaysen, Langskibet, etc., p. 23, says: "The cooking could only be done on land, which is presupposed in the municipal law of Bergen (1276), where it is enacted that the mate shall, whensoever the ship lies at anchor in harbor, cause the crew to be put on shore and backward once a day, but the cook thrice, once to take in water and twice to prepare food."

while, the miscellaneous character of that still remaining gives reason to infer that a manifold collection of weapons, ornaments, and utensils had originally been deposited. Thus, several iron fish-hooks and a turned draughtsman of horn were found in the grave-chamber. The most remarkable of the remaining articles are two ornamental mountings for belts or straps, one of gilded bronze, beautifully executed in a peculiar and characteristic style, and the other of lead. Of wearing apparel belonging to the deceased a few small fragments were found, some of gold brocade.

A great number of animals must have been sacrificed on the occasion of this burial. The bones of at least 12 horses and 6 dogs, as also the bones and feathers of a pea-fowl, were collected from different parts of the mound.

The various articles of antiquarian value found in the barrow, together with the style of ornamentation in the carving of different parts of the ship, sufficiently attest the correctness of the inference concerning her antiquity which the mere fact of entombing a vessel in itself entitles us to draw, namely, that she belongs to the period extending from the year 800 to 1050 after Christ.

Mr. Nicolaysen in his description of this boat says:[1] "That there may yet be found in many parts of our country, near its sea coast, tumuli containing ships in tolerable preservation, is by no means improbable; though this can only occur when the under-ground is blue clay; but any larger or better appointed vessel can scarcely be found. Still, it is not impossible that one may yet be brought to light whose exceptionally careful conservation will enable us to elucidate that which in the Gokstad ship is still wanting, and specially show the height of the posts and the form and fixing of the oarsmen's benches in our ancient vessels. Certain, nevertheless, it is that we shall not disinter any craft which, in respect of model and workmanship, will outrival that of Gokstad. For, in the opinion of experts, this must be deemed a masterpiece of its kind, not to be surpassed by aught which the shipbuilding craft of the present age could produce. Doubtless, in the ratio of our present ideas, this is rather a boat than a ship; nevertheless, in its symmetrical proportions and the eminent beauty of its lines is exhibited a perfection never since attained, until, after a much later but long and dreary period of clumsy unshapelmess, it was once more revived in the clipper-built craft of our own country."

[1] Nicolaysen, Langskibet, etc., p. 71.

A NEW LAND SHELL FROM CALIFORNIA, WITH NOTE ON SELENITES DURANTI, NEWCOMB.

By WILLIAM G. MAZYCK.

Selenites cælata Mazyck.

Shell small, depressed, brownish horn-color, with very coarse, rough, crowded, sub-equidistant, irregular ribs, which are obsolete at the apex; whorls 4, rounded, somewhat inflated below, gradually increasing, the last not descending at the aperture; suture impressed; umbilicus wide, clearly exhibiting all of the volutions; aperture almost circular, slightly oblique; peristome simple, its ends approaching and joined by a very thin, transparent, whitish callus, through which the ribs are distinctly seen.

Greater diameter 4^{mm}; height $1\frac{3}{4}^{mm}$.

Santa Barbara, California, Dr. L. G. Yates.

Hayward's, Alameda County, California, W. H. Dall, U. S. National Museum.

Selenites Duranti Newcomb.

Helix Duranti Newc.: Proc. Cal. Acad. Nat. Sci., iii, 118, 1864.
Patula Duranti Tryon, Am. Jour. Conch., ii, 263, pl. iv, fig. 53, 1866.
Hyalina Duranti Binney & Bland, Ld. F.-W. Sh., i, 37, fig. 49, 1869.
Macrocyclis Duranti W. G. Binney, T. M., v. 94, 188, Manual Am. L. Sh., 85, fig. 49, 1885.

Newcomb's description of this little shell is as follows:

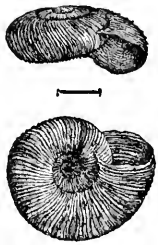
"Shell depressed, discoidal, pale corneous, under the lens minutely striated, opaque, broadly and perspectively umbilicated; whorls 4, the last shelving but not descending (at the aperture); suture linear; aperture rounded, lunate, lip simple, the external and internal approaching.

"*Habitat.*—Santa Barbara Island."

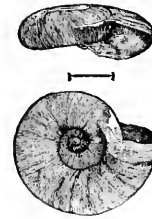
Tryon repeats this description, adding the words "*Spire not at all elevated*, perfectly plane above." His figure is very poor indeed, and shows little more than simply the size of the shell.

Mr. Binney's description, which is repeated in each of his works above named, differs in this important particular: For Newcomb's "Under the lens minutely striated," he substitutes the contradictory words "with very coarse, rough striæ." In a note written in answer to an inquiry addressed to him regarding this singular discrepancy, he says: "My description and figure are from an individual, not from the species. I am absolutely sure my specimen was one of the original find." His figure, drawn by Morse, rather represents a comparatively smooth, semi-transparent shell.

The figure given below was drawn from a specimen received from Mr. Binney, which agrees closely with Newcomb's diagnosis, and with specimens in the Smithsonian collection received from Newcomb himself.



Selenites cælata Mazyck.



Selenites Duranti Newcomb.

Selenites cælata, described above, is about the size of, but differs materially from, this species in its general outline, being more nearly circular and of greater height, *S. Duranti* being, as emphasized by Tryon, "*not at all elevated*, perfectly plane above," with the aperture transversely sub-oval, as Newcomb says, "rounded, lunate." But *S. cælata* is somewhat convex below, has the spire sufficiently elevated to distinctly show each whorl when viewed from the side, and its aperture is almost circular. The most marked difference is, however, in the sculpture—*S. Duranti* being minutely striated while *S. cælata* is covered, except at the apex, with heavy, coarse, rough ribs, presenting, in this respect, somewhat the appearance of some forms of *Patula alternata*, Say, by which feature it differs utterly from any of its congeners. It is a much thicker shell than *S. Duranti*.

NOTE BY W. H. DALL.—*Helix cælata* of Studer, a European species related to *H.* (*Trichia*) *hispida*, belongs to a totally different group, and cannot affect the validity of Mr. Mazyck's specific name.

NOTES ON A COLLECTION OF FISHES FROM THE ESCAMBIA RIVER, WITH DESCRIPTION OF A NEW SPECIES OF ZYGONECTES (ZYGONECTES ESCAMBIÆ).

By CHARLES H. BOLLMAN.

In the month of March, 1886, a small collection of fishes was made in the Escambia River by Prof. David S. Jordan and a company of students from the Indiana University, the present writer being one of the number.

About half of the species mentioned, comprising the smaller ones, were obtained at Flomaton, Ala.; either in the river at that point or in a small sluggish stream or gutter, which flows through the street of Flomaton, and enters the river about half a mile below the village. The rest of the collection, comprising the larger species, was obtained from fishermen, who caught them near the mouth of the river. The specimens studied are in the museum of the Indiana University, and duplicates of most of them have been sent to the United States National Museum.

1. **Erimyzon sucetta** Lacépède.

Two specimens.

2. **Minytrema melanops** Rafinesque.

One male obtained from a fisherman at Flomaton

3. **Notropis venustus stigmaturus** Jordan.

Common in the river at Flomaton.

4. **Notropis xænocephalus** Jordan.

Common in the river. This and the above species were called "roaches" by a fisherman.

5. **Ericymba buccata** Cope.

Two specimens obtained in the river.

6. **Notemigonus chrysoleucus bosci** Cuv. & Val.

Specimens obtained from smacks that fished near the mouth of the river.

7. **Clupea chrysochloris** Rafinesque.

A few specimens obtained.

8. **Clupea sapidissima** Wilson.

Two large specimens obtained. I find no material difference between these and northern specimens of the shad.

9. **Dorosoma cepedianum** Le Sueur.

Several specimens obtained.

10. Zygonectes escambiæ, sp. nov. (No. 37994, U. S. N. M.)

Body elongate, moderately stout, compressed posteriorly; back slightly elevated; caudal peduncle moderate.

Head moderate, flat above, broad between the eyes; eyes large, 3 in head; mouth moderate; jaws armed with an outer series of rather long and slender teeth, behind which is a band of smaller teeth. Scales moderate.

Dorsal fin short and small, its height 2 in head, its insertion opposite that of the anal in the female, but a little more posterior in the male; anal short, rather high, $1\frac{1}{2}$ in head, ventrals just reaching vent, nearly 2 in head; pectorals $1\frac{1}{2}$ in head.

General color in life orange-brown, each scale with a black edge, these forming distinct longitudinal stripes. Upper surface of head dark; jaws, opercles, and area in front of eyes bright orange; suborbital region jet black; area above opercle extending across back orange, suffused with dusky. Under parts orange. All the fins dusky. In the females the spots on the scales are more suffused.

Head $3\frac{3}{4}$ in length; depth nearly 5.

D. 6 or 7; A. 8 or 9. Lat. l. 36; L. transv. 12.

Length of the largest specimen 45 mm.

This species was found to be very common in the gutter flowing through the town of Flomaton.

11. Zygonectes cingulatus Cuv. & Val. (No. 37995, U. S. N. M.)

Body rather short and deep, compressed posteriorly; back elevated caudal peduncle deep.

Head not large, flat, broad between the eyes; eyes moderate, $3\frac{1}{2}$ in head; mouth moderate; outer row of teeth long and slender, behind which is a band of smaller teeth; large teeth nearly equal in each jaw. Scales large. Dorsal fin short, rays moderate, $2\frac{1}{4}$ in head; anal larger than the dorsal, rays long, 2 in head; ventrals short, $2\frac{1}{2}$ in head; pectorals $1\frac{3}{4}$ in head.

General color olivaceous, scales edged with dusky, forming a few faint longitudinal stripes; about 15 faint dark vertical bars, interspaced with light orange, which is more plain posteriorly; almost everywhere numerous, small, black points. Belly orange. Fins all blood red, fading to dusky in alcohol.

Head $3\frac{1}{2}$ in length; depth $3\frac{3}{4}$. D. 7; A. 8. Lat. l. 34. L. transv. 10.

Described from seven specimens taken at the same locality and in the same ditch as the preceding. Specimens were also obtained in the gutters of Pensacola.

These appear to be identical with the types of *Fundulus cingulatus*, examined by Dr. Jordan in the museum at Paris.

12. Esox reticulatus Le Sueur.

Numerous young specimens obtained at Flomaton in the gutter. Two large ones were obtained from the fishermen, who caught them near the mouth of the river; called "jack" by the fishermen.

13. Pomoxis sparoides Lacépède.

A few specimens obtained near the mouth of the river.

14. Chænobryttus gulosus Cuv. & Val.

A few specimens were obtained from the same place as the above.

15. Lepomis megalotis Rafinesque.

A few specimens were obtained in the gutter at Flomaton, while others were seen.

16. Lepomis pallidus Mitchill.

Common.

17. Lepomis holbrooki Cuv. & Val.

Common.

18. Micropterus salmoides Lacépède.

A few were obtained near the mouth of the river.

19. Etheostoma beani Jordan.

One large specimen obtained in the river at Flomaton.

20. Etheostoma nigrofasciatum Agassiz.

Seven small specimens were obtained in the river at the same place as the above.

21. Etheostoma squamiceps Jordan.

Head $3\frac{1}{2}$ ($4\frac{1}{5}$ in total); depth $4\frac{1}{5}$ ($5\frac{1}{6}$). D. X—9. A. II, 7. Scales 6–49–12.

Body rather robust, the back not elevated, the sides somewhat compressed, the caudal peduncle stout. Head rather short, the snout rather blunt, the anterior profile somewhat decurved. Snout as long as eye, 4 in head. Premaxillary not protractile.

Mouth small, oblique, the lower jaw somewhat included, the maxillary extending to front of eye, $3\frac{1}{2}$ in head. Teeth rather large, close set. Preopercle entire. Gill-membranes rather broadly united. Opercular spine well developed. Nape, cheek, opercles and breast covered with small scales. Body with moderate, etenoid scales, those on belly similar. Lateral line straight, its pores wanting only on the last 4 or 5 scales.

Fins all low. Dorsal spines subequal, the longest about $3\frac{1}{2}$ in head. Soft dorsal well separated from spinous dorsal, its longest rays not quite head. Caudal fin rather large, $1\frac{2}{5}$ in head. Anal small, the longest rays $1\frac{2}{3}$ in head, the spines small. Pectorals $1\frac{1}{5}$ in head; ventrals $1\frac{1}{2}$.

Color in life dusky olive, with about ten rather diffuse blackish crossbands, most distinct just below lateral line, along which is a longitudinal pinkish streak. Scales above with many dark punctulations, but with no distinct spots. A dark bar below eye, and a horizontal dark streak

through it. Both dorsals and caudal barred with black in fine pattern as in *E. flabellare*, but less distinctly. Lower fins pale. No red or blue markings anywhere.

The number of fin rays in this specimen is different from that in the original type of the species, with which however it seems to agree in other respects.

A single specimen 58^{mm} long was taken in a gutter at Flomaton.

22. Roccus lineatus Bloch.

A specimen 18 inches long obtained from fishermen. I compared this with a specimen 10 inches long from Washington market, and the chief difference was in the length of the second anal spine, which was 7½ in head in the former, and 5 in the latter.

The name *lineatus* for this species has been recently set aside in favor of the later *saxatilis* or *septentrionalis* on the ground that the original *Sciæna lineata* of Bloch is the European species.

A recomparison of Bloch's figure (Tafel 304) with the different species of this genus convinces me that the present species was intended. The name *lineatus* must therefore stand. In this view Professor Jordan now concurs.

INDIANA UNIVERSITY, *September* 20, 1886.

DESCRIPTION OF SIX NEW SPECIES OF FISHES FROM THE GULF OF MEXICO, WITH NOTES ON OTHER SPECIES.

By DAVID S. JORDAN and BARTON W. EVERMANN.

In the months of March and April, 1886, the writers, accompanied by a party of students from the University of Indiana visited Pensacola, Fla., for the purpose of making collections of fishes. Through the kindness of Mr. Silas Stearns, Mr. Evermann and Mr. Charles H. Bollman were enabled to accompany the fishing boats to the "Snapper Banks" between Pensacola and Tampa Bay. From the "spewings" of the Snappers and especially from those of the Red Grouper (*Epinephelus morio*) a considerable number of species were obtained, some of which have not been included in any of the numerous similar collections heretofore made by Mr. Stearns and Dr. Jordan.

Six species in this collection appear to be new to science. The types of all these are in the United States National Museum.

1. **Callechelys muræna**, sp. nov. (No. 37996, U. S. N. M.).

Head, 7 times in trunk, 13 times in total length, the head being almost exactly one inch (m. .024) long, the trunk 7 (m. 175) and the tail 5 (m. 127), the whole specimen being 13 inches long, the tail proportionally shorter than usual in this group.

Body stouter and more compressed than in other species of this group, its depth at the gill-opening a little more than the length of the upper jaw, which is 3 in head. Mouth larger than in related species, but of the same general form, the lower jaw shorter and narrower than the upper. Eye small, not half as long as snout, placed over the middle of the upper jaw. Nostrils labial, the anterior in a short tube, the posterior without tube, and placed just before front of eye. Tip of lower jaw extending a little before front of eye.

Teeth small, all uniserial or nearly so, all of them more or less bluntly conical. Those in front of upper jaw larger than the others, those on front of lower jaw and on vomer also enlarged, those on maxillary small and nearly uniform. All the larger teeth directed more or less backwards.

Gill-openings rather small, somewhat oblique, the distance between them about half the height of one of them, which is a little more than the cleft of the mouth. Dorsal fin rather high, beginning on the head at a distance behind angle of mouth a little more than half the length of upper jaw. Anal, well developed, but lower than the corresponding parts of the dorsal. Tail projecting behind dorsal and anal. No trace of pectoral fins.

Color dark olive, closely mottled and spotted with confluent blotches of dark olive and blackish, the spots most distinct anteriorly, poste-

riorly confluent so that the tail is nearly plain dusky. Belly scarcely paler. No black around gill-opening. Dorsal and anal chiefly blackish, each with a conspicuous, narrow, pale margin.

A single specimen obtained on the Snapper Banks by Mr. Stearns. It has little resemblance to *Callechelys scuticaris* (= *C. teres*) or to *Callechelys bascanium*, being much stouter and more like *Muræna* in form and color.

2. **Steinegeria rubescens**, gen. & sp. nov. (*Bramidæ*).

Head $2\frac{2}{3}$ in length ($3\frac{1}{2}$ with caudal); depth 2 ($2\frac{1}{3}$). D. XI–I, 18; A. ii, 20; V. I, 5. Scales *ca.* 50—26. Length (No. 37991, U. S. N. M.) 5 inches.

Body ovate, considerably compressed, the greatest thickness a little less than half length of head. Anterior of profile from tip of snout to base of dorsal nearly straight. Outline of belly prominent, the axis of body being rather nearer dorsal than ventral outline. Breast and belly not carinate.

Head but little longer than deep, its upper surface flattish, the bones not very firm. Interorbital space nearly flat, with two ridges, about as broad as eye, which is $3\frac{1}{3}$ in head. Preorbital very narrow, somewhat cavernous, its edge sharply dentate; snout short, 5 in head.

Mouth very oblique, the lower jaw strongly projecting, the broad maxillary reaching to below middle of eye, its length half that of the head. Each jaw with a band of small cardiform teeth, those in front largest, especially in the lower jaw, but all of them small. A band of villiform teeth on each palatine bone, but none on the vomer; premaxillaries protractile. Lower jaw with conspicuous pores.

Preopercle forming a nearly even curve, without distinct angle. Ascending limb of preopercle very finely serrulate, with some four or five coarser teeth about the angle. Other opercular bones very thin, with entire edges. Cheeks, opercles, maxillary and top of head closely covered with scales similar to those on rest of body, but a little smaller.

Gill-rakers rather short and wide apart, 8 or 9 developed on the lower part of the arch, the longest about one-third length of eye.

Body closely covered with membranous scales which are closely imbricated, deeper than long, each with a distinct median keel besides which are some smaller radiating ridges especially on the scales of the sides of the body. These ridges on the scales give the body a rough appearance, although they are not spinigerous. The keels on the scales form continuous ridges giving the whole body a striated appearance. Scales largest on middle of sides, becoming smaller on back and on belly. No distinct lateral line. Fins with few scales or none.

Dorsal spines very slender and flexible, some of them ending in filaments (all more or less mutilated in typical example.) Soft rays separated from spines by a deep notch extending nearly to base of fin. Soft dorsal elevated, the longest rays about $1\frac{1}{3}$ in head. Caudal lunate, its

peduncle very short and slender. Anal fin high, its spines short and slender, the longest ray $1\frac{1}{3}$ in head. No free anal spines. Ventrals inserted before pectorals, their length $1\frac{1}{5}$ in head. Ventrals not depressible into a fissure of the abdomen. Pectorals $1\frac{1}{5}$ in head. Vent well behind ventrals.

Color in life salmon red, rather bright and nearly uniform, darker on back, silvery under the chin. Fins all salmon, with black areas toward base on both dorsals and anal. Ventrals largely black. Lining of opercles pale.

A single specimen, in fair condition, was found by Dr. Jordan in the stomach of a Red Grouper, at Pensacola.

The species is evidently allied to *Grammicolepis*, *Psenes*, and other genera which have been lately placed in or near the *Bramidæ*. We are unable, however, to find any described genus in which it can be placed, and we therefore regard it as the type of a new one, *Steinegeria*, the characters of which are included in the foregoing account. We may regard *Steinegeria* for the present as a member of the family of *Bramidæ*, though the natural limits of that family are yet to be defined. We have named the genus in honor of our friend, Dr. Leonhard Stejneger, of the United States National Museum, in recognition of his most excellent work in the field of American ornithology.

3. **Serranus ocyurus**, sp. nov.

(*Serranus trifurcus* Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 273, not *Perca trifurca* L.)

Very closely allied to *Serranus atrarius*, of which it is doubtless to be regarded as a geographical variety.

Head $2\frac{3}{4}$ in length ($3\frac{3}{4}$ in total); depth 3 ($4\frac{1}{2}$). D. X, 11; A. III, 7. Scales 5 to 6—50—14. Length of type (No. 37997, U. S. N. M.) $10\frac{1}{4}$ inches.

The description of *Serranus trifurcus* mentioned above was taken from young examples of this species. It applies well enough to the adult, so that a repetition is unnecessary. The type of *Serranus ocyurus*, compared with the ordinary *Serranus atrarius*, seems to differ chiefly in color and in the greater development of the caudal fin. There are also some differences in the gill-rakers, in the scales on the cheek, and in the armature of the preopercle. These differences are indicated in the following account:

Color pale olive, somewhat darker on the back; each side with three longitudinal rows of quadrate black blotches; the uppermost series obscure, along base of dorsal fin; the second distinct, and placed just below lateral line, the three anterior blotches of this series somewhat confluent; the lower series very distinct, jet-black, and not confluent, placed along side of belly, on the level of the axil of the pectoral. The blotches in each series correspond in position to those in the other series, so that, with dusky shades extending from one to another, they form

about seven dusky cross-bands. Some dark, inky spots on opercle and above base of pectoral. Opercle and preopercle with dusky shades. Chin with some dusky. Spinous dorsal plain. Soft dorsal with fine oblique bars on a pale ground, two of the dark blotches on body extending on its base. Last ray with two or three dark spots. Caudal fin with the middle rays black, the outer pale, all of them with darker spots, which become black on the median rays.

Anal fin pale, slightly mottled, the tips of its rays dusky; ventrals dusky; pectorals entirely pale.

Caudal fin with its upper and lower lobes filamentous, much produced, the middle rays still longer, exserted for a distance nearly equal to $\frac{2}{3}$ length of head, the total length of the longest ray being half the length of the body.

Dorsal spines not filamentous, the longest $2\frac{1}{2}$ in head. Pectorals $1\frac{4}{5}$ in head, reaching a little past tips of ventrals.

Scales on cheeks a little larger than in *S. atrarius*, in about 7 rows. Serræ of preopercle smaller than in *Serranus atrarius*.

Gill-rakers shorter and farther apart than in *Serranus atrarius*, only 11 or 12 developed. (In *Serranus atrarius* about 20 are present.)

In spite of the striking differences in color, in which this species considerably resembles the very young of *S. atrarius*, the details of form and structure are almost identical in the two species, and the present should probably be considered as the Gulf representative of the *S. atrarius*.

4. Scarus evermanni Jordan, sp. nov.

Head $2\frac{5}{6}$ ($3\frac{1}{2}$ in total); depth $2\frac{5}{6}$. Length of type (No. 37990, U. S. N. M.) 3 inches.

Very close to *Scarus croicensis*, and similar to it in pattern of coloration except that the sharply-defined streaks on the sides of the breast are in *S. evermanni* inky-blue, in *S. croicensis* whitish.

In life, the type of *Scarus evermanni* was bright green, olivaceous above, paler below; the lower half of the body becoming posteriorly more and more yellow and on the lower half of the caudal peduncle bright light yellow; this color is brightest above front of anal.

A longitudinal band of bright crimson (fading to whitish in spirits) on body, on level of eye, but narrower than eye and growing fainter behind. Some crimson marks on the scales above this band forming a faint interrupted band below lateral line. Both these bands continued on head to eye with a band of green (brown in spirits) between them. Sides of belly each with three sharply-defined lines of indigo-black, like ink-marks, each on a row of scales; these stripes running from the breast to beyond front of anal. No spot on base of pectoral. Bright green on top of head above eyes, reddish below. Caudal fin green, its lower half yellow. Dorsal, anal, and pectorals (mutilated in the type), apparently all green, at least at base. Ventrals yellow.

In spirits, fading to brown, with one distinct pale lateral stripe on level of lower part of eye, and a fainter one above it. Blue-black streaks on sides of belly not fading in alcohol. A small dark spot on upper edge of caudal peduncle near base of caudal.

Teeth pale; no canines. Caudal fin (mutilated) apparently subtruncate in life. Scales on cheek in two rows. Generic characters as in other species of *Scarus* (*Pseudoscarus* Bleeker).

The type was obtained from the stomach of a Red Grouper, off Tampa Bay, by Mr. Charles H. Bollman.

5. Scarus bollmani, sp. nov.

Head, $3\frac{1}{5}$ in length ($3\frac{4}{5}$ in total); depth, $3\frac{1}{5}$. Length of largest example (No. 37993), 5 inches (125^{m}).

Closely allied to *Scarus punctulatus*, *S. virginalis*, etc., but differing from these in coloration.

In life, bright green, darker on the back, paler below. A broad lateral band mostly below level of eye and twice width of eye, of a brilliant orange-yellow color extending from gill-opening to opposite vent, where it ceases almost abruptly. The upper part of this band is a yellow streak more than half as wide as eye, and nearly on level of pupil. This is persistent and bright yellow in alcohol, while the orange fades to pale. Behind the vent, the side is a little brassy or yellowish, this shade scarcely contrasting with the green ground color. There is also in life, an ill-defined band of blood-red nearly a scale wide above and below the ground color. Base of pectoral with a blue-black mark, upper part of head dark green, below eye bright yellowish green, with some bluish markings on opercle.

Caudal fin green, its outer rays blackish. Other fins injured in both the typical examples, the dorsal bright green at base, ventrals pale.

Teeth pale. Two small blunt posterior canines in upper jaw, near angle of mouth. Caudal short, almost truncate, the middle rays a little shorter than outer ones. Two rows of scales on cheek.

Generic characters as in other species of *Scarus* (*Pseudoscarus* Bleeker).

Two specimens were obtained from stomachs of Red Groupers (*Epinephelus morio*), the first one by Mr. Charles H. Bollman, off Tampa Bay. The second was sent later by Mr. Stearns. The latter is especially the type of the foregoing description and is numbered 37993 on the Fish Register of the U. S. National Museum.

6. Prionotus roseus, sp. nov.

(*Prionotus scitulus* (not type) Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 288, specimen from Pensacola.)

Head, $3\frac{1}{6}$ in length (4 with caudal); depth, 6 ($7\frac{1}{2}$). D. X — 12; A. 12. Scales (transverse series) 65–70; pores in lateral line 60–65. Length of type (No. 37989, U. S. N. M.), $6\frac{1}{2}$ inches.

Allied to *Prionotus scitulus*. Body quite slender, little compressed, narrowed above, the width of the nape between the occipital spines being about one-fifth the head. Head quite short, and rather high, the eyes prominent, so that the anterior profile forms a sharp angle at front of eye, and is somewhat concave. Snout rather narrow, $2\frac{1}{6}$ in head, its tip somewhat emarginate. Edges of snout finely serrulate and without spine. Surface of bones of the head comparatively smooth, the small granulations arranged in distinct, fine, radiating striæ.

Mouth small, the maxillary $3\frac{1}{4}$ in head, the mandible not quite reaching front of orbit. Band of palatine teeth narrow.

Eye moderate, $5\frac{1}{5}$ in head. (Apparently a slight cirrus above it, on one side, in typical example; possibly a result of mutilation.) Interorbital space narrow, deeply concave, its least width $7\frac{1}{4}$ in head. Orbital rim considerably elevated, both in front and behind, its edge granular-serrate. A shallow groove across top of head behind orbital rim, which does not end in a distinct spine. Occipital ridges weak, the inner pair without spines, the outer with short ones which reach somewhat beyond front of dorsal. Temporal region with an elevated roughish ridge, but without distinct spine. Preopercle with a single moderate spine, which has no smaller one at its base, either in front or below. Opercular spines small and sharp. Humeral spine moderate. No trace of spines on suborbital or preorbital, the head being provided with but five pairs of spines, including the humeral spine. Membranous flap of opercle scaly. Gill-rakers short and thickish, about eight developed, these little longer than the interspaces, and not half length of pupil, and nearly half as broad as high.

Scales small, those on the breast much reduced in size, about 12 between occiput and dorsal.

Spinous dorsal high, the first spine serrulate in front, shorter than the second, which is $1\frac{3}{5}$ in head. (Second dorsal and anal mutilated.) Caudal unequally and slightly lunate, the lower lobe the longer, $1\frac{1}{6}$ in head. Pectoral reaching nearly to last rays of dorsal, a little more than half length of body. Ventrals as long as head.

Coloration in spirits, grayish, unspotted, more dusky above. Dorsal dusky, with no very distinct markings. Caudal fin yellowish, marbled at base with dusky, its tip black. Pectorals mostly black. Lower fins pale.

In life the specimen was chiefly pinkish red, which color still persists on the inside of the opercles.

The type of this species was taken from the "spewings" of Red Groupers, off Tampa Bay, by Mr. C. H. Bollman. Mangled remains of others have been received from Mr. Stearns, and have been regarded by us as belonging to *P. scitulus*, but that species is not yet certainly known to occur in this region.

Besides the species above described as new, the following may be worthy of mention:

7. **Narcine brasiliensis** (Olfers).

Torpedo brasiliensis Olfers, Torped., p. 19, tab. ii, fig. 4; Duméril, Hist. Poiss., 514, pl. ii, figs. 3 and 3a, 1865 (Antilles and Brazil); Gray, Cat. Chond. Brit. Mus., 102; Günther, viii, 453, 1870 (Pará; Caribbean Sea; Cuba; Jamaica); Henle, Narcine, 31, tab. i, figs. 1 and 2, 1834 (Rio Janeiro); Müller and Henle, Plag., 129; Kner, Novara, Fisch., 418; Goode and Bean, Proc. U. S. Nat. Mus., 1882, 240; Bean and Dresel, Proc. U. S. Nat. Mus., 1884, 170; Jordan, Cat. Fish. N. A., 11, 1885.

Torpedo bancroftii Griffith, Cuvier, Animal Kingd., x, pl. 34, 649, 1834.

Narcine brasiliensis Duméril, Rev. Zool., 1852, 272.

Narcine brasiliensis corallina Garman, Bull. Mus. Comp. Zöol., xi. 234, 1881; Jordan and Gilbert, Synopsis, 877, 1882; Jordan, Proc. U. S. Nat. Mus., 1884, 149; Jordan, Cat. Fish. N. A., ii, 1885.

Narcine nigra, Duméril, Rev. Zool.,1852, 276; Duméril, Hist. Poiss., 515, pl. 11, figs. 4 and 4a, 1865 (Brazil).

Torpedo pictus Gronow, Cat. Fish, Ed. Gray, 13, 1854 (Antilles and American Ocean).

Narcine umbrosa Jordan, Proc. U. S. Nat. Mus., 1884, 105, 147 (Key West); Jordan, Cat. Fish. N. A., 11, 1885.

From an examination of the material at hand we are convinced that the synonymy of this species should stand as here given. Three specimens in the museum of the Indiana University show three distinct styles of coloration, and no other constant differences being observable, they would seem to be specimens of different ages of one and the same species.

Specimen No. 2987, ♂, ten inches long, from Key West, is one of the two specimens upon which Dr. Jordan based his description of *N. umbrosa*. The coloration as then given by him and which is still verified by the specimen before us is as follows:

"Light brown; tip of snout blackish; a large black triangular area before each eye, covering most of the front of the disk; space between the eyes pale; space between the spiracles mostly pale; a round black blotch on median line behind this; a round blotch behind and outward from each spiracle; another near this on the outer edge of the disk; another behind this on the edge of the disk; a large transversely oblong blotch in line with this on each side of the median line; posterior part of disk with a dark blotch near the edge; a large black blotch between angle of pectoral and ventral; ventrals each with two dusky blotches, the posterior one on the claspers; a dusky blotch on the back of the tail between them, each dorsal in a distinct black cross blotch, which extends up on the fins; a dark blotch on the tip of each dorsal and three on the caudal; in all about thirty distinct dusky spots and blotches above, all of them larger than the eye. There are also some rows of dark dots, apparently the mouths of pores, along each side of the tail above, near its base, and along the sides of the disk." Pale below; edge of pectorals dusky; ventrals showing slight traces of dusky along the edge; an irregular dark blotch on each side near the posterior angle of the pectoral.

No. 3501, ♀, from Pensacola. This specimen is fourteen inches long. In color it is of a darker brown than No. 2987; tip of snout with a blackish area near its edge; a large black blotch covering space from each eye forward and outward to edge of disk; space between the eyes plain, that between the spiracles with two dark blotches containing paler centers; a large triangular area of pale bounded by dark extending backward and outward from each spiracle; a similar area on the median line behind the spiracles; behind this and on the middle of the back is a much larger space similarly inclosed by an irregular dark line; on a line between this and the edge of the disk is a much smaller one; in front of this and nearer the median line is another larger one; pectorals with three or four groups of dark lines and spots; two pairs of such spots on the tail in front of dorsal fins; each dorsal in a dark cross-blotch which extends up on the fins; a black blotch on the anterior edge of each dorsal, and three on the caudal. Pale below, with edges of pectorals and ventrals dusky. The position of the markings is almost identical with that in specimen No. 2987. The only material difference in the coloration is that the larger specimen is darker and the spots and blotches have taken on the forms of lines inclosing areas of the general color of the back.

The third specimen (No. 1525, ♀, from Pensacola) measures seventeen inches in length. Above, it is almost uniform dark brown; below, pale, with two small dark spots just back of the mouth; another on each side near the middle of the pectoral fin; edges of the pectorals dusky.

8. Sidera nigromarginata (Girard).

(*Neomuræna nigromarginata* Girard.)

This species was first described in the Mexican Boundary Survey, from a specimen collected at Saint Joseph's Island, Texas, in 1853, by Gustav Würdemann. Since that time no other specimens have been seen, and Girard's specimen has been regarded as being identical with *Sidera ocellata*. The spots in Girard's plate were seen to be too small for *ocellata*, but this was thought to be the fault of the artist. The one specimen, a foot in length, which we have, was found dead on the beach of Santa Rosa Island by Mr. Evermann, and it agrees so exactly with Girard's plate that we have no hesitancy in referring it to that species, which we now believe to be a valid one and sufficiently distinct from *Sidera ocellata*.

The markings in *S. nigromarginata* are much finer than in *S. ocellata*. Color rather pale olive (in spirits), with a broad dusky shade along sides. Everywhere, except on belly, with round stellate pale olive spots of unequal size, the largest scarcely larger than the pupil. Spots on head and anterior parts smaller than the others. Dorsal and anal fins mostly black, the color on the dorsal formed of round black blotches, which are more or less confluent. No black around gill-opening.

Mouth smaller than in *S. ocellata*, the gape 3 in head. Head $2\frac{1}{3}$ in trunk. Tail a little longer than head and trunk.

Teeth smaller than in *Sidera ocellata*, some of those in the upper jaw slightly serrate behind.

9. Myrophis punctatus Lütken.

? *La Murène Myre* Lacépède Hist. Nat. Poiss., ii, pl. 3, f. 3, 1798 (not descr.; not *Muræna myrus* L.).

? *Muræna longicollis* Cuvier, Règne Animal 313, 1828 (no descr.; based on Lacépède).

Myrophis longicollis Kaup, Apodes, 30, 1858 (Surinam); Peters, Ak. Wiss., Berl., 1864, 397; Jordan, Proc. Acad. Nat. Sci. Phila., 1883, 282.

Myrophis punctatus Lütken, Vid. Med. Naturh. Foren., Kjoben., 1, 1851; Jordan, Proc. U. S. Nat. Mus., 1884, 33 (name only) (Pensacola); Jordan, Cat. Fish. N. A., 54, 1885.

Myrophis microstigmius Poey, Repert. Fis. Nat., ii, 250, 1867; Jordan & Gilbert, Synopsis, 900, 1883.

Myrophis lumbricus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 261 (Galveston); Jordan & Gilbert, Synopsis, 899, 1883 (Galveston); Jordan, Cat. Fish, N. A., 54, 1885.

After a careful examination of fourteen specimens, all from Pensacola, we have with some hesitancy reached the conclusion indicated in the synonymy here given. A few of these specimens were secured with a seine near Pensacola, but the majority were taken from the stomachs of Red Groupers and Red Snappers brought in by the fishing smacks. A number of the latter are in very good condition but a few have been more or less mutilated in the process of digestion. To the eye, four of these specimens appear to have the head much larger and the cleft of mouth much greater than in the others, but when the measurements are taken, this apparent difference proves tangible only to the eye, as no important differences in the proportion of parts can be made. The largest specimens are usually but not always those with the largest mouth. There also appears to be a difference in the plumpness or stoutness, but the most plump as well as the most slender are found among those of the large-mouth pattern. There is also considerable variation as to the relative distance of the beginning of the dorsal from the gill-opening, but the variation as shown by the small-mouthed specimens is equaled by that in the others; in all, however, it is nearer the vent than the gill-opening. It is probable that these differences are due to a difference in sex. In coloration and general form of body they agree very well with the description of *M. lumbricus* as given by Professors Jordan and Gilbert.

The name *Muræna longicollis* Cuvier based on a poor figure only, without a description, is apparently too doubtful to be adopted for this species or any other.

10. Trachurus trachurus L.

(*Caranxomorus plumieranus*. Lacépède.)

Specimens similar to others from the North of Europe.

11. Pronotogrammus vivanus Jordan & Swain.

Numerous examples, in excellent condition, taken from the stomach of the Hind (*Epin. drummond-hayi*).

In life, carmine, deepest on the back, becoming a clear violet on the sides. Back and sides everywhere freckled with golden olive, this color on the sides forming reticulations around the violet. Belly silvery, flushed with red. Golden olive about the eye; a bright golden stripe from eye to base of pectoral above; another from snout along lower border of eye to middle of base of pectoral. Another fainter above, from eye backwards.

Dorsal fin carmine, the rays tinged with red, the filaments carmine. Caudal fin carmine, with golden on the rays anal wholly of a very bright yellow. Pectoral all light carmine. Ventrals yellow on anterior rays, the last rays carmine.

This species is very closely related to *Pronotogrammus multifasciatus* from Cape San Lucas, the type of the genus *Pronotogrammus*. These two species differ considerably from the type of *Anthias*, and it is not unlikely that the former generic name should be retained for them.

In *P. rivanus*, the fourth and fifth dorsal spines are longest, the latter $2\frac{1}{4}$ in head, and with a slender filament attached to its membrane, the filament being $1\frac{1}{3}$ in head. Similar, but shorter filaments are attached to the 6th, 7th, 8th, and 9th spines.

Both caudal lobes ending in filamentous prolongations, the total length of the lobes being $2\frac{1}{3}$ in body. Pectorals and ventrals short.

12. Epinephelus niveatus (Cuv. & Val.).

Epinephelus flavolimbatus Poey.

One specimen about two feet long obtained. This agrees with the account of *Epinephelus niveatus* given by Jordan & Swain in all respects but the color. It seems probable that *E. flavolimbatus* is the adult of *E. niveatus*, but if so, the change in coloration is very remarkable.

Color in life, brownish flesh-color, unspotted, a clear blue streak from eye to angle of preopercle. No spots or blotches anywhere, and no black on caudal peduncle. Whole dorsal with a narrow edge of bright yellow. Dorsal pectorals, anal and caudal dusky, anal and caudal without pale edging. Ventrals dusky. A very faint moustache of dark olive, along the maxillary.

13. Pomacentrus caudalis Poey.

14. Callionymus (?**bairdi** Goode & Bean).

One specimen, somewhat mutilated.

15. Scorpæna occipitalis Poey.

16. Dactyloscopus tridigitatus Gill.

One specimen taken with the seine on Santa Rosa Island; the first record of the species from north of Key West.

17. Ophidium beani Jordan.

18. Phycis floridanus Bean.

Taken in great numbers with the seine in shallow waters near the shore, where it took the hook readily. A few obtained from the Snap-

per Banks. According to the fishermen, this species has never before been known to enter the shallow waters. It is thought that the excessive cold preceding the date of our visit has caused this temporary change in the habits of this interesting species.

19. **Etropus crossotus** Jordan & Gilbert.

20. **Halieutichthys reticulatus** Mitchill.

INDIANA UNIVERSITY,
September 17, 1886.

A REVIEW OF THE GOBIIDÆ OF NORTH AMERICA.

By DAVID S. JORDAN and CARL H. EIGENMANN.

In the present paper we have attempted to give the synonymy of each of the genera and species of Gobies found in the waters of America north of Surinam and Panama. The specimens examined belong to the U. S. National Museum and to the museum of the Indiana University, most of the latter having been collected by Professor Jordan.

The group offers considerable difficulty, as most of the species are of small size, and many of them are but scantily represented in collections.

The determination of the proper limits of the genera has been especially difficult, as the characters used as generic by Bleeker, Gill, and others are, in themselves, of small value, and subject to many intergradations. Among the *Eleotridinæ* we find the skeletal differences well marked, easily defining the genera, at least, if only American species are taken into consideration. Among the American *Gobiinæ*, however, the skeletons of *Gillichthys* and *Typhlogobius* only show any well-marked peculiarities, so far as we have seen, and no characters of importance can be drawn from this source. We have ventured to detach from *Gobius*, on characters of minor importance, the genera *Lophogobius*, *Chonophorus*, *Lepidogobius*, and *Microgobius*, but the characters of none of these groups have any high importance, and it is not unlikely that Dr. Günther is right in uniting all with *Gobius*.

The genera of Gobiidæ recognized by us may be defined as follows:

ANALYSIS OF GENERA OF NORTH AMERICAN GOBIIDÆ.

a. Ventral fins separate; body scaly.

b. Ventral rays I, 4. (*Oxymetopontinæ*).

c. Forehead bluntly rounded, without sharp keel; tongue very slender, sharp; body elongate, compressed, covered with very small scales, some cycloid, some ctenoid; head short, compressed, rather broad above; mouth oblique, the lower jaw projecting; teeth in few series, some of them canine-like; isthmus narrow. Dorsals separate, the first of six slender spines; soft dorsal and anal elongate; caudal lanceolate ..... IOGLOSSUS, 1.

bb. Ventral rays 1.5; (*Eleotridinæ*).

d. Vomer with a broad patch of villiform teeth; gill-openings extending forward to below posterior angle of mouth, the isthmus thus very narrow; teeth villiform, the outer scarcely enlarged; vertebræ 12 + 13 (*dormitor*);

skull above with conspicuous elevated ridges, one of these bounding the orbit above, the orbital ridges connected posteriorly above by a strong cross, ridge; a sharp longitudinal ridge on each side of the occipital, the two nearly parallel, the post-temporals being attached to the posterior ends. Insertions of post-temporals widely separated, the distance between them greater than the rather narrow interorbital width; the post-temporal bones little divergent; top of head depressed, both before and behind the cross-ridge between eyes; a flattish triangular area between this and the little elevated supraoccipital region; preopercle without spines; lower pharyngeals with slender depressible teeth, and without lamelliform appendages; scales of moderate size, ctenoid ..... GOBIOMORUS, 2.

dd. Vomer without teeth; isthmus broad; gill-openings scarcely extending forward below to posterior angle of preopercle; skull without crests.

e. Body anteriorly entirely scaly.

f. Lower pharyngeal teeth setaceous, the bones with an outer series of broad flexible lamelliform appendages or teeth; body short and elevated, cyprinodontiform; teeth slender, those in the outer row scarcely larger, and movable; top of head without raised crests, flattish, its surface uneven; post-temporal bones rather strongly diverging, the distance between their insertions about half the broad flattish interorbital space; no spine on preopercle or branchiostegals; scales large, ctenoid. Species herbivorous.

DORMITATOR, 3.

ff. Lower pharyngeals normal, subtriangular, the teeth stiff, villiform, none of them lamelliform; scales of moderate or small size; body oblong or elongate.

g. Body moderately robust, the depth 4–5½ times in the length to base of caudal; cranium without distinct median keel; a small supraoccipital crest.

h. Post-temporal bones little divergent, not inserted close together, the distance between their insertions greater than the moderate interorbital space, or 3⅔ in length of head; top of skull little gibbous; interorbital region somewhat concave or channeled;

lower pharyngeals narrower than in *Eleotris;* preopercle without spine; scales very small, ctenoid, about 100 in a longitudinal series. Vertebræ, 11+13; teeth moderate, the outer series enlarged..... GUAVINA, 4.

hh. Post-temporal bones very strongly divergent, their insertions close together, the distance between them about $\frac{2}{3}$ the narrow interorbital space, and less than $\frac{1}{7}$ length of head; top of skull somewhat elevated and declivous; interorbital area slightly convex transversely; lower pharyngeals rather broad, the teeth bluntish; preopercle with partly concealed spine directed downward and forward at its angle; scales moderate, ctenoid, 45 to 60 in a longitudinal series; vertebræ (*pisonis*) 11 + 15; teeth small.*

ELEOTRIS, 5.

gg. Body very slender, elongate, the depth nine times in length to base of caudal; post-temporal bones short, strongly divergent, the distance between their insertions about equal to the narrow interorbital space, or about $\frac{1}{6}$ length of head; top of head with a strong median keel, which is highest on the occipital region; no supraoccipital crest; preopercle without spine; mouth very oblique; the teeth small; scales very small, cycloid.

EROTELIS, 6.

ee. Body naked on the anterior part; head naked; lower jaw with four larger recurved teeth .....GYMNELEOTRIS, 7.

aa. Ventral fins united.

i. Dorsal fins separate free from caudal. (*Gobiinæ.*)

j. Ventral disk short, adnate to the belly; body subcylindrical, covered with ctenoid scales; lips very thick; upper teeth mostly small and movable, lower fixed; dorsal spines 6.

k. Teeth simple.....SICYDIUM, 8.

kk. Teeth trifid (or bifid).....SICYOPTERUS, 9.

jj. Ventral disk free from the belly.

l. Dorsal spines four to eight; eyes well developed.

m. Teeth emarginate, uniserial, those of the lower jaw nearly horizontal; dorsal spines 6; scales large, ctenoid; gill-openings moderate.

EVORTHODUS, 10.

mm. Teeth simple.

n. Maxillary normal not prolonged behind the rictus; skull of the usual gobioid form, comparatively short and abruptly broadened behind the orbits (at least in typical species).

* These characters of the skeleton are taken from *Eleotris pisonis* and have not been verified on other species.

o. Body scaly, more or less.

p. Dorsal spines 6; scales evidently ctenoid.

q. Interorbital area anteriorly elevated, with a large foramen-like depression in front of eye; body short, compressed, formed much as in *Dormitator;* nape with a fleshy crest; scales large. Vertebræ 11+15 ..... LOPHOGOBIUS, 11.

qq. Interorbital area not elevated in front, higher than the occipital region; body more elongate; no fleshy nuchal crest; isthmus broad.

r. Inner edge of shoulder-girdle without fleshy cirri or papillæ; cranium anteriorly short; interorbital space narrower, grooved, with a low median ridge or none: median crest on cranium low. Vertebræ 12+16 (*niger*); 10+15 (*oceanicus*) ..... GOBIUS, 12.

rr. Inner edge of shoulder-girdle with two or three conspicuous dermal flaps; preorbital region very long; premaxillary and maxillary strong; interorbital groove with a conspicuous median crest. CHONOPHORUS, 13.

pp. Dorsal spines 7 or 8; scales very small, cycloid or weakly ctenoid.

s. Inner edge of shoulder-girdle with two or three dermal flaps or processes; interorbital groove with the median ridge little developed (*lepidus*). Body little compressed ..... LEPIDOGOBIUS, 14.

ss. Inner edge of shoulder-girdle without fleshy processes; body more or less compressed; mouth very oblique; teeth strong; interorbital groove with or without a median ridge. Vertebræ 11+15 or 16 ..... MICROGOBIUS, 15.

oo. Body entirely naked; body not strongly compressed. GOBIOSOMA, 16.

nn. Maxillary much produced backward, extending beyond the gill-opening in the adult; skull comparatively long, gradually (not abruptly) broadened behind orbits; median crest of cranium well-developed; a cross-ridge across posterior part of interorbital space; scales small, cycloid; dorsal spines 6; no fleshy processes on shoulder-girdle; isthmus broad. Vertebræ 14+16 (*mirabilis*). GILLICHTHYS, 17.

ll. Dorsal spines two (or one); body wholly naked; eyes reduced to small rudiments; interorbital area forming a sharp median ridge; skull rather abruptly widened behind

orbits; anterior portion of skull unusually long; no flaps on shoulder-girdle; skull highest at nape, depressed above the eyes .....
TYPHLOGOBIUS, 18.

ii. Dorsal fin continuous, the second and the anal joined to base of caudal; eyes minute; body elongate; scales minute or wanting; mouth very oblique, the lower jaw projecting; gill openings moderate; (*Gobioidinæ*).

u. Dorsal rays vi–16 to 23; anal rays 17 to 23.

r. Teeth, small in a single series; scales present .....TYNTLASTES, 19.

rr. Teeth in a band, those of the outer series being very stong; scales present.
GOBIOIDES, 20.

1. IOGLOSSUS.

IOGLOSSUS (Bean MSS), Jordan and Gilbert, Proc. U. S. Nat. Mus., 1882, 297, (*calliurus.*)

Type *Ioglossus calliurus* Bean.

This singular form is quite unlike all the other American gobies, although apparently closely related to the *Orthostomus* of Kner. But one species is known.

ANALYSIS OF THE SPECIES OF IOGLOSSUS.

a. Body elongate, compressed; its depth 7 in length, its width 2⅓ in head, which is 5 in length. Head compressed, higher than wide, rounded above. Eye large, 3⅜ in head, longer than snout, equal to the interorbital area which is broad and rounded. Mouth small, very oblique, almost vertical; maxillary extending to below anterior edge of pupil, 2⅓ in head. Teeth in the lower jaw unequal, irregularly placed, in a very narrow band, some of them canine-like; those of the upper jaw in two series; the outer series long and stout, the inner minute; behind these in front are two fang-like canines. All the teeth fixed. Tongue very narrow, lying in a groove in bottom of the mouth. Scales all small, the anterior ones imbedded and cycloid, those of the caudal peduncle imbricated, ctenoid; head and nape naked. Dorsal spines weak, graduated from the first to the fifth which is highest, 1⅓ in head. Dorsal rays high, the last extending past base of caudal. Caudal long, pointed, 1⅔ in body. Pectorals very short, the longest ray ⅔ of head; ventrals contiguous, very narrow and long, 4⅓ in length. Light olive, everywhere densely punctate with microscopic points. Dorsals edged with black; caudal with a median reddish stripe and two bluish bands. Dorsal VI-23; anal 22, ventral I, 4.
CALLIURUS, 1.

1. Ioglossus calliurus.

Ioglossus calliurus (Bean, MSS.), Jordan & Gilbert Proc. U. S. Nat. Mus., 1882, 297 (Pensacola, Fla.); Bean, Proc. U. S. Nat. Mus., 1882, 419 (Pensacola, Fla.); Jordan & Gilbert, Syn. Fish., North America, 949, 1883 (Pensacola); Jordan, Proc. U. S. Nat. Mus., 1884, 437 (Pensacola); Jordan, Catalogue Fish., North America, 106, 1885 (name only).

Habitat.—West Indian fauna; Pensacola.

The numerous specimens of this species have all been taken from the stomachs of the Red Snapper, *Lutjanus aya*, at Pensacola. All of the known specimens have been obtained by Mr. Silas Stearns.

2. GOBIOMORUS.*

GOBIOMORUS Lacépède, Hist. Nat. Poiss., ii, 699, 1798 (*dormitor*, etc).
PHILYPNUS Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 255, 1837 (*dormitator*).
LEMBUS Günther. Cat. Fish. Brit. Mus., i, 505, 1859 (*maculatus*).
GOBIOMORUS Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 571 (restricted to *dormitor*).

Type *Gobiomorus dormitor* Lacépède.

2. Gobiomorus lateralis.

Philypnus lateralis Gill, Proc. Acad. Nat. Sci. Phila., 1860, 123 (Cape San Lucas).

Habitat.—Pacific coast of America, from San José to Panama.

3. Gobiomorus dormitor.

Gobiomorus dormitor Lacépède, Hist. Nat. Poiss., ii, 599, 1798 (from a drawing by Plumier).
Batrachus guavina Bloch & Schneider, Syst. Ichth., 44, 1801 (based on *Guavina* of Parra).
Platycephalus dormitator Bloch & Schneider, Syst. Ichth., 1801, 60 (Martinique).

Habitat.—Rio Grande to Martinique, in fresh waters.

4. Gobiomorus longiceps.

Eleotris longiceps Günther, Proc. Zoöl. Soc., Lond., 1864, 151 (Nicaragua).

Habitat.—Lake Nicaragua.

3. DORMITATOR.

Prochilus Cuvier, Règne Animal, ed. i, 1817 (*mugiloides*), (preoccupied).
Dormitator Gill, Proc. Acad. Nat. Sci., Phila., 1862, 240 (*gundlachi=maculatus*).

Type *Eleotris gundlachi* Poey=*Sciæna maculata* Bloch.

5. Dormitator maculatus.

Sciæna maculata Bloch, Ichth., tab. 299, f. 2, 1790 (West Indies).
Eleotris mugiloides Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 226, 1837 (Martinique, Surinam).
Eleotris sima Cuv. & Val., xii, 232, 1837 (Vera Cruz).
Eleotris somnolentus Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169 (Rio Grande).
Eleotris omocyaneus Poey, Memorias, ii, 269, 1860 (Havana).
Dormitator gundlachi Poey, Syn. Pisc. Cub., 396, 1868 (Cuba).
Dormitator lineatus Gill, Proc. Acad. Nat. Sci. Phila., 1863, 271 (Savannah).

* The *Eleotridinæ* have been made the subject of a special paper (A Review of the American Eleotridinæ, in Proc. Ac. Nat. Sci., Phil., 1885, 66–80) by Eigenmann and Fordice. For the synonymy and characters of the species of *Gobiomorus, Dormitator, Guavina, Eleotris, Erotelis*, and *Gymneleotris* the reader is referred to the paper in question. Only the outlines of the synonymy are here presented.

Habitat.—East coast of America; South Carolina, Texas, Louisiana, south to Surinam; chiefly in fresh water.

6. Dormitator latifrons.

Eleotris latifrons Richards, "Voy. Sulph. Fish., 57, plate 35, fig. 4–5," 1837 (Pacific coast, Central America).

Dormitator microphthalmus Gill, Proc. Acad. Nat. Sci. Phila., 1863, 170 (Panama).

Habitat.—Pacific coast of Central America, from Cape San Lucas southward to Panama.

4. GUAVINA.

GUAVINA Bleeker, Esquisse d'un Syst. Nat. Gobioid., 302, 1874 (*guavina*).

Type *Eleotris guavina* Cuv. & Val.

7. Guavina guavina.

Eleotris guavina Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 223, 1837 (Martinique).

Habitat.—East coast of tropical America, West Indies, south to Surinam, in fresh waters.

5. ELEOTRIS.

ELEOTRIS Gronow, Zooph., 83, 1763.
ELEOTRIS Bloch & Schneider, Syst. Ichth., 65, 1801 (*pisonis*).
CULIUS Bleeker, Esquisse d'un Syst. Nat. des Gobioid., 303, 1874 (*fuscus*).
? OXYELEOTRIS Bleeker, Esquisse, 303, 1874 (*marmorata*).
? GOBIOMORPHUS (Gill) Bleeker, Esquisse, 303, 1874 (*gobioides*).

8. Eleotris amblyopsis.

Eleotris amblyopsis Cope, Proc. Am. Phil. Soc., 1870, 473 (Surinam).

Habitat.—Atlantic coast of America, from Charleston to Surinam.

9. Eleotris pisonis.

Gobius pisonis Gmelin, Syst. Nat., 1206, 1788 (based on *Eleotris* of Gronow).

Gobius amorea Walbaum, Artedi Pisc., iii, 205, 1792 (based on *Eleotris* of Gronow).

Eleotris gyrinus Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 220, 1837, plate 356 (Martinique, San Domingo, Surinam).

Eleotris picta Kner & Steindachner, Abhandl. bayer. Ak. Wiss., 1864, 18, plate iii, fig. 1 (Rio Bayano, near Panama).

Culius perniger Cope, Trans. Am. Phil. Soc., 1870, 473 (St. Martin's).

Habitat.—Both coasts of Central America, north to Cuba and Texas, chiefly in fresh waters.

10. Eleotris æquidens.

Culius æquidens Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 461 (Mazatlan).

Habitat.—Streams about the Gulf of California, south to Colima.

11. Eleotris belizana.

Eleotris (Culius) belizana Sauvage, "Bull. Soc. Philom. Paris, 1879, 16 (reprint)" (Belize).

Habitat.—Belize.

6. EROTELIS.

EROTELIS Poey, Memorias de Cuba, ii, 273, 1861 (*valenciennesi* = *smaragdus*).

12. Erotelis smaragdus.

Erotelis smaragdus Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 231, 1837 (Cuba).

Erotelis valenciennesi Poey, Mem. de Cuba, ii, 273, 1861 Cuba).

Habitat.—Florida Keys to Cuba; strictly marine, not ascending rivers.

7. GYMNELEOTRIS.

GYMNELEOTRIS Bleeker, Esquisse d'un Syst. Nat. des Gobioïd., 304, 1874, (*seminuda*)

13. Gymneleotris seminuda.

Eleotris seminuda Günther, Proc. Zoöl. Soc. London, 1864, 24, "plate iv, fig. 2, 2a" (Pacific coast of Panama).

Habitat.—Pacific coast of Panama.

8. SICYDIUM.

SICYDIUM Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 168, 1837 (*plumieri*).

Type *Gobius plumieri* Bloch.

This genus, as here restricted, contains probably but a single species, widely diffused in the fresh waters of the West Indies.

ANALYSIS OF THE SPECIES OF SICYDIUM.

a. [Front teeth of lower jaw not larger than those behind; a single row of inconspicuous papillæ on the gum beneath the upper lip; a large median papilla above the maxillary suture; a median cleft in the upper lip; head, 4 to 4⅘ in length (without caudal); depth, 4½ in length; scales small, reduced on neck and belly; diameter of eye contained 6 or 7 times in head, 2 to 3 times in interorbital space; pectorals longer than head; third, fourth, and fifth dorsal spines produced into long ribands; the fourth, which is longest, 2 to 3 times height of body; color uniform, olive or violet-brown; dorsals with irregular dark markings; anal with a dark marginal band, sometimes edged with white.] (*Grant.*) PLUMIERI, 14.

14. Sicydium plumieri.

Gobius plumierii Bloch, Ichthyologia 125, taf. 178, fig. 3. (Martinique; on a drawing by Plumier) Bloch & Schneider, Syst. Ichth., 69, 1801 (copied); Lacépède ii, 537, 562, plate 15, fig. 2 (copied), 1798.

Sicydium plumierii Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 168, 1837 (Porto Rico); Gill, Proc. Acad. Nat. Sci. Phila., 1860, 101; Günther, Cat. Fish. Brit. Mus., iii, 92, 1861 (Barbadoes, West Indies); Poey, Fauna Puerto-Riqueña, 338, 1881 (Porto Rico); Grant, Proc. Zool. Soc. London, 1884, 156; plate xi, fig. 1 (West Indies).

Sicydium siragus Poey, Memorias de Cuba, ii, 278, 1876 (Santiago de Cuba).

? *Sicydium antillarum* Grant, Proc. Zool. Soc. London, 1884, 157, plate xii, fig. 3 (Barbadoes).

Habitat.—Fresh waters of the West Indies.

We have at present no specimens of this species. The *Sicydium antillarum* of Mr. Ogilvie-Grant, seems to differ only in the greater prominence of the teeth, a matter subject to variations, perhaps according to the age, sex, or condition of the specimen.

9. SICYOPTERUS.

SICYOPTERUS Gill, Proc. Acad. Nat. Sci. Phila., 1860, 101 (*stimpsoni*).

COTYLOPUS Guichenot, in Maillard Notes sur l'Isle de la Réunion, ii, Addenda 9, 1864 (*acutipinnis*).

SICYDIOPS Bleeker, Esquisse d'un Système Natural des Gobioides, 314, 1874 (*xanthurus*).

?MICROSICYDIUM Bleeker, l. c., 314, 1874 (*gymnauchen*).

Type *Sicyopterus stimpsoni*.

As here restricted, this group would include all the species of *Sicydium*, in which the teeth are trifid, bifid, or (by wearing of the tips) clavate. Having had no opportunity to study the species of this group, we do not know whether this division is a natural one or not.

ANALYSIS OF THE SPECIES OF SICYOPTERUS.

a. Head 4 to 5 in length (to base of caudal); width of head, $\frac{3}{4}$ its length; depth of body, $5\frac{1}{2}$ to $6\frac{1}{4}$ in length; scales ctenoid; teeth in upper jaw curved, tricuspid, trident-shaped, the middle cusp terminal, very short, soon worn away; dorsal VI–I, 10. Anal I–10. Caudal rounded; dorsal spines produced in filaments.

b. [Neck and belly naked; a double or treble row of small papillæ on the gum beneath the upper lip, without a larger median papilla; third dorsal spine twice height of body; second dorsal higher than the body; scales 60 to 64; color violet-brown, yellowish in young specimens, shaded with indistinct transverse bands of darker; an irregular brown spot on the axis of the pectoral and a broad dark band from the base of the pectoral to the root of the caudal; fins violet, clouded with darker; 60 to 64 scales in a longitudinal series.] (*Grant*) ..... GYMNOGASTER, 15.

bb. [Neck and belly covered with small scales; gum beneath the upper lip smooth; a median papillose tubercle above the maxillary suture; second and third dorsal spines one and a half times the height of body; second dorsal not as high as body; scales 78; color olive-brown; anal yellow, with a black and white band along the margin; membrane of the second dorsal clear, spotted with brown; caudal with a dark and yellow band round the extremity; 78 scales in a median series.] (*Grant*) ..... SALVINI, 16.

15. Sicyopterus gymnogaster.

Sicydium gymnogaster Grant, Proc. Zool. Soc. London, 1884, 158, plate xi, fig. 2, and xii, fig. 6 (Mazatlan).

Habitat.—Fresh waters of the Pacific slope of Mexico.

We know this species only from the description and figure given by Mr. Ogilvie Grant.

16. Sicyopterus salvini.

Sicydium salvini Grant, Proc. Zool. Soc. London, 1884, 159, plate xii, fig. 2 (Panama).

Habitat.—Streams of the Pacific slope of the Isthmus of Panama.

This species is known to us only from the description and figure given by Mr. Ogilvie-Grant.

10. EVORTHODUS.

EVORTHODUS Gill, Proc. Acad. Nat. Sci. Phila., 1859, 195 (*breviceps*).

Type *Evorthodus breviceps* Gill.

We know nothing of this genus beyond the account given by Dr. Gill. Its dentition more resembles that of the *Sicydium* group than the true Gobies, though it (inferentially) agrees with the latter in the development of its ventral fins.

ANALYSIS OF THE SPECIES OF EVORTHODUS.

a. [Teeth emarginate, uniserial; those of the lower jaw nearly horizontal; some of the dorsal rays filamentous; profile blunt, evenly decurved; head about as deep as wide, 4½ in length; depth 4½; eye 3 in head. Caudal rounded, 3 in body; dorsal VI–I, 10; anal I–11. Color light-brown, with irregular blackish blotches along the sides; two black spots at base of caudal fin, one above the other alternating with one anterior on the peduncle; first dorsal with two bands parallel with its upper margin, second dorsal with three narrow longitudinal bands.] (*Gill*) ..... BREVICEPS, 17.

17. Evorthodus breviceps.

Evorthodus breviceps Gill, Proc. Acad. Nat. Sci. Phila., 1859, 195 (Trinidad); Günther, Cat. Fish. Brit. Mus., III, 85, 1861 (Trinidad; Surinam).

Habitat.—Fresh waters of Trinidad and Surinam.

We know this species only from the description of Dr. Gill.

11. LOPHOGOBIUS.

LOPHOGOBIUS Gill, Proc. Acad. Nat. Sci. Phila., 1862, 240; (*crista-galli=cyprinoides.*)

Type *Gobius crista-galli* Cuv. & Val.

The single species which forms this group differs considerably in form from our other gobies. The study of its skeleton shows no distinction of much importance, unless the peculiar form of its interorbital area be regarded as such.

ANALYSIS OF THE SPECIES OF LOPHOGOBIUS.

a. Body short and deep, little compressed, cyprinodontiform; greatest hight 3⅜ in length; greatest width 5½; length of head 3⅔; head naked; a prominent naked dermal crest extending from above middle of eyes to near front of spinous dorsal; diameter of eye 3⅓ to 4 times in head, little greater than interorbital area; profile convex: snout stout, bluntish, about as long as eye; mouth very oblique, the gape slightly curved; upper lip on level of lower border of eye; lower jaw somewhat projecting; teeth in both jaws in bands, the outer series somewhat enlarged and erect; those of the inner series small, depressible backwards; scales large, reduced on breast and nape; a few scales on the upper edge of the opercle; median line before dorsal naked; dorsal spines produced in short filaments; last rays of soft dorsal reaching caudal; caudal rounded; pectorals lanceolate, reaching beyond insertion of anal, its upper rays not silk-like; dorsal VI or VII–11; anal 10; scales 26 to 30; color blackish-green, some green streaks about eye ..... CYPRINOIDES, 18.

18. Lophogobius cyprinoides.

Gobius cyprinoides Pallas, "Spicilegia, Zool. viii, 17, tab. 1, fig. 5, 1770;" ("Amboina") Cuvier & Valenciennes, Hist. Nat. Poiss. xii, 129, 1837 (copied); Günther, Cat. Brit. Mus. iii, 8, 1861 (San Domingo, Jamaica).

Lophogobius cyprinoides Poey, "Repertorio i, 335, 1867; Poey, Syn. Pisc. Cub., 393, 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 125, 1876 (Cuba); Jordan, Proc. U. S. Nat. Mus., 1886, 49 (Havana, Cuba).

Gobius cristagalli Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 130, 1837 (Havana); Guichenot "Poiss. in Ramon de la Sagra, Hist. Cuba, 128, plate 3, fig. 3" (Cuba).

Habitat.—West Indian Fauna.

This remarkable little fish is rather common in the markets of Havana, in which locality our specimens were taken. We have also seen specimens from Aspinwall. Günther is doubtless correct in identifying the *cristagalli* of Cuvier & Valenciennes with the *cyprinoides* of Pallas.

12. GOBIUS.

GOBIUS Artedi, Genera 28, 1738 (*Gobius ex nigricante varius*, etc., = *niger*).

GOBIUS Linnæus, Syst. Nat., Ed. x, 1758 (*niger*, etc.), and of authors generally.

GOBILEPTES Swainson, Nat. Hist. Classi. Fishes, ii, 1839, 183 (no type mentioned; *lanceolatus* doubtless intended).

GOBIONELLUS Girard, Proc. Acad. Nat. Sci. Phila., 1858, 168 (*hastatus* = *oceanicus*).

CTENOGOBIUS Gill, Fish., Trinidad, 374, 1858 (*fasciatus*).

EUCTENOGOBIUS Gill, Annals Lyc. Nat. Hist. New York, 1859, 45 (*badius*).

SMARAGDUS Poey, Memorias de Cuba, ii, 279, 1861 (*smaragdus*).

? POMATOSCHISTUS Gill, Proc. Acad. Nat. Sci., 1863, 263, foot-note (*minutus*).

CORYPHOPTERUS Gill, Proc. Acad. Nat. Sci. Phila., 1863, 263 (*glaucofrænum*).

? DELTENTOSTEUS Gill, Proc. Acad. Nat. Sci. Phila., 1863, 263, foot-note (*quadrimaculatus*).

? GOBIICHTHYS Klunzinger, Fisch. Rothen Meeres, 479, 1871 (*petersii*).

MESOGOBIUS Bleeker, Esquisse d'un Syst. Nat. Gobioid., 317, 1874 (*guavina*).

STENOGOBIUS Bleeker, l. c. 317 (*gymnopomus*).

OLIGOLEPIS Bleeker, l. c. 318 (*melanostigma*).

GNATHOLEPIS Bleeker, l. c. 318 (*anjerensis*).

CALLOGOBIUS Bleeker, l. c. 318 (*hasselti*).

HYPOGYMNOGOBIUS Bleeker, l. c. 318 (*xanthozona*).

? HEMIGOBIUS Bleeker, l. c. 318 (*melanurus*).

? CEPHALOGOBIUS Bleeker, l. c. 320 (*sublitus*).

? ACENTROGOBIUS Bleeker, l. c. 321 (*chlorostigma*).

? POROGOBIUS Bleeker, l. c. 321 (*schlegeli*).

? AMBLYGOBIUS Bleeker, l. c. 322 (*sphinx*).

ZONOGOBIUS Bleeker, l. c. 323 (*semifasciatus*).

? ODONTOGOBIUS Bleeker, l. c. 323 (*bynoënsis*).

STIGMATOGOBIUS Bleeker, l. c. 323 (*pleurostigma*).

? OXYURICHTHYS Bleeker, l. c. 324 (*belosso*).

Type *Gobius niger* Linnæus.

The genus *Gobius*, as here understood, comprises a very large number of species more or less closely related to the European type of the genus, *Gobius niger*, and its American relative, *Gobius soporator*. An examination of skulls or skeletons of numerous European and American species shows a remarkable uniformity in most respects. The general form and

structure of the cranium is the same in all, the only differences being very minor ones in the height of certain crests. *Gobius oceanicus* is the most aberrant of these species, but that agrees wholly with the common gobies in the structure of the skull, and the greater elongation of the body is due to the elongation of individual vertebræ, not to any increase in their number. Of the European species examined, certainly *ophiocephalus*, *jozo*, *paganellus*, *quadrimaculatus*, and *mertensi* ought not to be generically separated from *Gobius niger*. *Gobius* (*Pomatoschistus*) *minutus* differs notably in the narrowness of its isthmus, and its very small scales are scarcely ctenoid. It is however evidently very closely related to *Gobius* (*Deltentosteus*) *quadrimaculatus*, which, in turn, approaches *Gobius paganellus* and the true gobies. The American forms mostly have a somewhat less depressed form of the head than the European ones, and in many of them the scales do not extend so far forward behind the eyes. No generic distinction can however be made out by us, and as before stated, an almost unbroken series leads from *G. soporator*, the species most like the European ones, to *G. oceanicus*, the most aberrant.

We have placed in the synonomy above a considerable number of the generic names of Dr. Bleeker. In most cases the types of these nominal genera have not been examined by us, but the characters assigned by Bleeker are mostly of specific value only. We feel reasonably certain that the natural boundaries of the genus *Gobius* are broader than given in this paper, rather than narrower. No serious violence would be done in merging *Lophogobius*, *Chonophorus*, *Lepidogobius*, and *Microgobius* also in *Gobius*, and the relations of *Gobiosoma* with the same group are very close.

ANALYSIS OF NORTH AMERICAN SPECIES OF GOBIUS.*

a. Anterior half of trunk scaled; head naked.

b. Upper rays of pectoral fin silk-like; *i. e.*, short and very slender and flexible, free for nearly their whole length.

c. Body robust, compressed posteriorly; depth 5 to 5½ in length; head broad, low, rounded in profile, its length 3⅔ in body. Eye 4 to 5 in head; mouth large, little oblique; lips thick; teeth in both jaws in bands, the outer series a little enlarged; scales large, strongly ctenoid, smaller on nape and belly; dorsal spines short, none filamentous; color olivaceous, light or dark, varying from sand-color to greenish black, everywhere mottled and marbled with dark and paler; fins speckled; a faint dusky spot behind eye. Dorsal VI–10. Anal 8 or 9. Scales 36 to 41.....SOPORATOR, 19.

bb. Upper rays of pectoral normal, not silk-like.

d. Scales large (25 to 42).

e. Scales 25 to 35.

Gobius fasciatus (No. 25) is omitted from the following analysis, the published descriptions being insufficient to separate it from *Gobius boleosoma*.

f. Dorsal soft rays 14; vertex and nape with a slight median fold of skin.

g. [Body stout, compressed, its depth 5 in length; head $3\frac{2}{3}$; eye equal to snout, 4 in head; vertex and nape with a slight median fold of skin; maxillary reaching front of pupil; lower jaw slightly produced; teeth in bands, the outer slightly enlarged. Olivaceous; spinous dorsal black at tip; second dorsal and anal spotted; scales each with a broad dusky margin. D. VI–14. A. 12. Scales 26–10.] (*Bean.*)

NICHOLSI, 20.

ff. Dorsal soft rays 10–12; no median fold of skin on vertex and nape.

h. [Caudal with two spots at its base; jaws unequal, the lower slightly produced; body robust, compressed behind, the depth 5 in total length; head $4\frac{1}{3}$; eye longer than snout, $3\frac{1}{2}$ in head; maxillary reaching pupil; teeth in a band, the outer enlarged and distant, the inner enlarged and bent backwards; brownish; a faint blue spot on each scale; six spots along middle of back; similar spots on scapular region and middle of sides; two spots on base of caudal; a dark spot above opercle; blue dots on head; a straight blue line crossing cheek above and continued on opercle; dorsals faintly spotted. D. VI–10. A. 10. Scales 25–7.] (*Gill.*)

GLAUCOFRÆNUM, 21.

hh. Caudal with a single spot at its base or plain.

i. Dorsal spines low, the highest little longer than head.

j. Region from nape to dorsal entirely scaled. Body subfusiform, little compressed; depth $4\frac{1}{2}$ in length; head blunt, 4 in length, rounded in profile. Eye equal to snout, 4 in head. Mouth small, horizontal, the lower jaw included; maxillary 3 in head, reaching to below eye. Teeth small, in bands in both jaws, the outer enlarged, those of the upper jaw very slender. Scales large, ctenoid, those of nape and belly little reduced. Longest dorsal spine shorter than head. Caudal scarcely pointed, about as long as head. Color whitish gray, middle of sides with four or five dark blotches, from each of which a narrow dark bar extends downwards and forwards; a large black blotch above pectorals, obsolete in female; a small black spot at base of caudal; a dark mark below eye; vertical fins barred. D. VI–12. A. 11 or 12. Scales 33 .. STIGMATURUS, 22.

jj. Region between nape and dorsal with a narrow naked median strip. Body moderately elongate, subfusiform, the depth $5\frac{1}{3}$ in length. Head large, not so blunt as in *G. boleosoma*, its length $3\frac{2}{5}$ to $3\frac{2}{3}$ in length; anterior profile gently decurved; snout $3\frac{1}{5}$ to $3\frac{1}{2}$ in head; eye 4; mouth large, slightly oblique; maxillary extending to front of pupil, $2\frac{1}{3}$ in head. Teeth small, slender and curved, in moderate bands; scales moderate, ctenoid, those in front much reduced in size. Breast naked. Longest dorsal spine $1\frac{1}{2}$ in head. Caudal as long as head,

somewhat pointed. Olivaceous, mottled with gray; about five rounded dark blotches along middle of sides, the last forming a spot at base of caudal; no dark spot on side of nape; some dark marks on head; vertical fins barred. D. VI-12. A. 13. Scales 33 to 35.....SHUFELDTI, 23.

jjj. Region between nape and dorsal entirely naked.

k. Highest rays of second dorsal little more than half head, none of them reaching base of caudal.

l. Profile much decurved, skull rounded behind, without distinct median ridge; mouth horizontal. Body elongate, deepest below front of dorsal, tapering regularly backwards, the greatest depth $5\frac{1}{2}$ in length. Head short, blunt, profile anteriorly abruptly decurved, cheek somewhat swollen. Length of head $3\frac{1}{2}$ in body. Snout about equal eye, $3\frac{2}{3}$ in head. Mouth horizontal, maxillary reaching to below pupil (in male); lower jaw included. Teeth in both jaws in a band, the outer row of the upper jaw large, recurved. Scales large, ctenoid, somewhat reduced anteriorly. Nape, breast, and belly naked. Dorsal spines about $\frac{2}{3}$ of head. Caudal pointed, $2\frac{2}{3}$ to $3\frac{1}{2}$ in body. Color olivaceous, with numerous dark reticulations on the back; five black spots along the sides, the last forming a spot on base of caudal, sometimes with **V**-shaped dark bars extending from them to dorsal. Breasts and sides of belly with numerous dark specks in male; a dark line between eyes; a dark line from eye to middle of premaxillary, some dark spots below eye, sometimes forming bars, sometimes a stripe. A large oblique spot above pectorals, continued on opercle; a black spot at base of pectoral. Dorsals and caudal barred, anal uniform dusky, ventrals and pectorals black in male, white in female. Dorsal VI-11. Anal 10-12. Scales 25-30 .....BOLEOSOMA, 24.

ll. Profile little decurved, skull flattish behind, much broader than in *boleosoma*, with an evident median ridge; mouth very oblique, much larger than in *boleosoma;* lower jaw thin and flat. Back slightly arched. Body a little deeper and rather less compressed than in *G. encœmus*, the depth 5 to 6 in length. Head 4. Anterior profile moderately decurved. Eye $3\frac{1}{3}$ in head. Mouth large, oblique; maxillary reaching to below pupil in both sexes. Teeth above uniserial, some of them enlarged and recurved; lower teeth in a narrow band, males with the hindermost of the outer series sometimes a strong, exserted, recurved canine; belly naked. Longest dorsal spine $\frac{2}{3}$ head; caudal $3\frac{1}{2}$ in body. Color light greenish, sides of male with 5 or 6 narrow, straight, rather sharply defined whitish or yellowish cross-bars, regularly placed; four dark bars, three below eye and one on opercle; a small

dark spot behind and above opercle. Vertical fins barred; female with a row of irregular dark spots connected by a dusky streak, and with the pale cross-bars obsolete. D. VI-12; A. 13. Scales 27.
STIGMATICUS, 26.

kk. Highest rays of second dorsal as long as head, the last reaching base of caudal. Body elongate, the back not arched; depth 6 in length; head 4, not compressed, the cheeks tumid. Profile abruptly decurved, the snout $3\frac{1}{3}$ in head. Mouth large, nearly horizontal, the maxillary reaching posterior edge of eye in males, middle of eye in females. Teeth in narrow bands in both jaws, the outer somewhat enlarged, the outer in some (males?) much enlarged above and recurved, the enlarged teeth fixed, the others movable. Scales large, ctenoid, reduced anteriorly, belly naked. Dorsal spines little filamentous, the longest about equal to head; caudal $2\frac{1}{4}$ to 3 in body. Males dark olive, with 4 oblong dark blotches along middle of sides; a dark caudal spot; a black blotch larger than eye on each side of shoulder; dorsal spotted. Caudal reddish above, dusky below. Females with 5 oblong dark blotches on sides, the last on base of caudal; from each of the middle blotches a V-shaped bar runs to the back; a black shoulder blotch; a dark bar from eye to mouth; ventrals pale, with two dark streaks. D. VI-11. A. 12. Scales 30 (27 to 33.)
ENCÆOMUS, 27.

ii. Dorsal spines high, the highest reaching past middle of second dorsal. Nape scaly. Body elongate, moderately compressed, the depth $4\frac{2}{3}$ in length, the head $4\frac{1}{3}$. Profile very obtuse anteriorly; eye small, $4\frac{1}{2}$ in head. Mouth nearly horizontal, the maxillary extending beyond pupil, $2\frac{2}{5}$ in head. Teeth strong, uniserial; four shortish canines in lower jaw behind the other teeth; upper teeth largest. Some of the dorsal spines filamentous, reaching (♂) past middle of second dorsal. Caudal $\frac{1}{4}$ longer than head. Scales large ctenoid, those on nape and belly much reduced in size. Dark olive, with 4 or 5 irregular, confluent, blackish cross-bands, besides irregular, dark blotches. Head marked with darker, fins mostly dusky; caudal dark blue with two red longitudinal stripes. D. VI-11. A. 10. Scales 27..... LYRICUS, 28.

ee. Scales moderate, 39 to 42.

m. Dorsal says VI-11. A. 11. Body moderately elongate, compressed; depth $5\frac{1}{4}$; head 4. Head not compressed, the cheeks tumid, the snout short, abruptly decurved; mouth large, little oblique, the jaws equal, the maxillary $2\frac{1}{8}$ in head, reaching to below pupil; eye 5 in head; teeth above large, unequal, uniserial, some of them fixed, those below small, in a band. Scales anteriorly, cycloid, be-

coming larger posteriorly, and ctenoid; dorsal spines scarcely filamentous, none of them as high as body; caudal 2¼ in body, light olive,* with dark olive blotches; body and head with many conspicuous round spots of cream-color, each surrounded by a dusky ring, these most distinct on the head, all smaller than pupil; snout with dusky streaks; dorsals and caudal sharply barred; anal and ventrals dusky (♂). A small round dark spot at base of caudal. D. VI–11. A. 11. Scales 39 to 42 ..... SMARAGDUS, 29.

mm. [Dorsal rays VI–9; A. 9. Depth 6½ in total length; head broad, flattish: snout short, decurved; eye 4¼ in head, 1⅛ in interorbital area, longer than snout. Maxillary extending to below middle of eye. Some of the dorsal spines produced in filaments, the third 1½ times depth of body. Caudal short, rounded. Two rows of ill-defined blotches on upper half of body; two rows of brownish spots on second dorsal, the upper strongly marked. Scales 40.] (*Steindachner.*) ..... POEYI, 30.

dd. Scales rather small, 53–92.

n. [Scales comparatively small (53). Body elongate, compressed behind; head a little compressed; head 3⅘ in length; depth 5. Eye 3½ in head, shorter than the rounded snout; maxillary reaching to below middle of eye; teeth small, the outer a little enlarged; dorsal spines all shorter than head, not filamentous. Nape scaly, its scales much reduced in size; scales ctenoid; two violet stripes from eye to mouth; 8 or 9 violet bars on sides; 3 or 4 bars on caudal; second dorsal spotted; D. VI–12. A. 11 or 12. Scales 53–13.] (*Steindachner.*) KRAUSSI, 31.

nn. [Scales moderate (55 to 60). Caudal fin about half longer than head; body elongate, the depth 6½ in length; head 4⅘. Eye longer than snout, 4 in head, mouth slightly oblique, the jaws equal, the maxillary not reaching centre of eye; teeth in a narrow band, the outer much enlarged and separated from the others by a narrow interspace. Second dorsal spine not equal to depth of body. Caudal 3½ in body. Scales on nape and axil very small, those on posterior part of body much larger. Light olive green; a series of brown spots along middle of tail; sides of head with dusky blotches, vertical fins dotted with black. D. VI–13. A. 14. Scales 58–20.] ..... SAGITTULA, 32.

nnn. Scales very small (60 to 90); caudal more than twice as long as head. Body compressed, extremely elongate, the depth 6 to 7⅔ in length; head higher than wide, short, compressed, 4½ to 5 in length, mouth

* This is the coloration of the male. The female we have not seen, unless a plain olivaceous example from Charleston, agreeing in all essential respects except in coloration, represents the latter.

wide, oblique; maxillary in adult reaching to below posterior border of eye. Lower jaw very thin and flat; teeth in both jaws small, subequal; those in the upper jaw in a single series, those of the lower in a narrow band; outer teeth somewhat movable. Scales anteriorly small, cycloid, imbedded, those behind larger and ctenoid; a few scales on upper anterior corner of opercle; dorsal fins high, some of the spines filamentous, longer than head. Caudal very long, filamentous, 2 to $2\frac{2}{3}$ in body. Light olive, fins dusky in male; a round, black spot on sides, a little larger than eye, below spinous dorsal; first dorsal spine with two or three black spots; a small dusky spot at base of caudal. Emerald spot on tongue conspicuous, fading in spirits. D. VI-14. A 14 or 15. Scales, 70 (60 to 90).....OCEANICUS, 33.

aa. Region before dorsal and anal fins entirely naked.

o. Scales large, 14 series developed. Depth $5\frac{2}{3}$ in total length; head $4\frac{1}{4}$, nearly as broad as high. Eyes equal to the rounded snout; mouth slightly oblique, the jaws equal, the maxillary extending to below middle of eye; teeth in villiform bands; two curved canines on each side of lower jaw. First dorsal spine elongate, sometimes reaching base of caudal; caudal rounded, shorter than head; blackish, fins mostly black; dorsal filament whitish (♂ ?). D. VI-11. A. 9. Scales, 14.....PARADOXUS, 34.

oo. Scales exceedingly minute. Head 4 in total length; depth, 6. Head broader than high; snout obtuse, as long as eye; jaws equal, maxillary extending to below middle of eye; teeth in villiform bands, the anterior in upper jaw slightly enlarged; two small, curved canines on each side of lower jaw. Dorsal fins low, the anterior not elevated; caudal rounded, blackish; fins and sides of head dotted. D. VI-15. A. 10.....SEMINUDUS, 35.

19. Gobius soporator.

Gobius soporator Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 56, 1837 (Martinique); Guichenot, "Poiss. in Ramon de la Sagra, Hist. Cuba, 127," 1855 (Cuba); Günther, Cat. Fish. Brit. Mus., iii, 26, 549, 1861 (Jamaica, Mexico; Panama; Sicily (?); Caribbean Sea); Cope, Ichth. Lesser Antilles, 473, 1871 (St. Martin's; New Providence); Goode, Bull. U. S. Nat. Mus., v, 75, 1876 (Bermudas); Poey, Enumeratio Pisc. Cub., 124, 1876 (Cuba); Goode & Bean, Proc. U. S. Nat. Mus., 1879, 127 (Pensacola, Fla.); Bean, Proc. U. S. Nat. Mus., 1880, 83 (Bermuda); Jordan & Gilbert, Bull. U. S. Fish. Com., 1882, 108 (Mazatlan); Jordan & Gilbert, Bull. U. S. Fish. Com. 1882, 111 (Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 296 (Pensacola); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 368 (Cape San Lucas); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 377 (Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 626 (Panama); Jordan & Gilbert, Syn. Fish. North America, 634, 1883; Jordan, Proc. U. S. Nat. Mus., 1884, 37 (Pensacola, Fla.); Jordan, Proc. U. S. Nat. Mus. 1884, 140 (Key West); Jordan, Proc. U. S. Nat. Mus., 1884, 260 (Guaymas, Mexico); Jordan, Catalogue Fish. North America, 105, 1885 (name only); Jordan, Proc. U. S. Nat. Mus., 1886, 49 (Havana, Cuba).

Gobius catulus Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169 (St. Joseph's Island); Girard, U. S. & Mex. Bound. Survey, 26, plate xii, fig. 9–10, 1859 (copied).

Evorthodus catulus Jordan & Gilbert, Syn. Fish. North America, 632, 1883 (copied).

Gobius mapo Poey, Memorias de Cuba ii, 277, 1861 (Cuba); Poey, Syn. Pisc. Cuv., 292, 1868 (Coast of Cuba).

Gobius lacertus Poey, Memorias de Cuba, ii, 278, 1861 (Cuba); Poey, Syn. Pisc. Cub., 392, 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 125, 1876 (Cuba).

Gobius carolinensis Gill, Proc. Acad. Nat. Sci. Phila., 1863, 268 (Charleston, S. C.); Gill, Cat. Fish. East coast North America, 21, 1873 (name only); Goode, Proc. U. S. Nat. Mus., 1879, 110 (Arlington, Florida); Jordan & Gilbert, Syn. Fish. North America, 634, 1883.

Habitat.—Shore fauna of Tropical America, on both coasts, Charleston to Surinam, Guaymas and Panama.

This species is the commonest of all shore-fishes in Tropical America, abounding everywhere in tide-pools and cavities among the reefs. Among our species, it seems to be the one most nearly related to the European *Gobius niger*, and it may therefore be held to represent the subgenus *Gobius*, if our other species be placed in different subgenera.

This is certainly the *Gobius catulus* of Girard, the *Gobius mapo* of Poey, and the *Gobius carolinensis* of Gill. The *Gobius lacertus* of Poey seems to be the same species, probably based on paler specimens than usual. The coloration in life varies much with the surroundings.

The specimens before us are from Key West, Panama, and Cuba.

20. Gobius nicholsi.

Gobius nicholsii Bean, Proc. U. S. Nat. Mus., 1881, 469 (Departure Bay, British Columbia); Jordan & Gilbert, Syn. Fish. North America, 946, 1883 (copied); Jordan, Catalogue Fish. North America, 105, 1885 (name only).

Habitat.—Coast of British Columbia.

This species is known to us only from the account given by Dr. Bean.

2 Gobius glaucofrænum.

Coryphopterus glaucofrænum Gill, Proc. Acad. Nat. Sci. Phila., 1863, 263 (Washington Territory).

Gobius glaucofrænum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 53 (name only); Jordan & Gilbert, Syn. Fish. North America, 635, 1883 (copied); Jordan, Cat. Fish. North America, 105, 1885 (name only).

Habitat.—Coast of Washington Territory.

This species is known only from the description of Dr. Gill. The types are now lost, and the explorations of Professors Jordan and Gilbert have failed to recover the species. It may be possible that it is the young of *Gobius nicholsi*, but the difference in Dr. Gill's count of the fin rays and scales, from the formula of the latter species, makes this seem unlikely. The so-called genus *Coryphopterus* has no evident excuse, being apparently fully identical with *Ctenogobius*, itself not tangibly distinct from the typical *Gobius*.

22. Gobius stigmaturus.

Gobius stigmaturus Goode & Bean, Proc. U. S. Nat. Mus., 1882, 418 (Florida); Jordan & Gilbert, Syn. Fish. North America, 946, 1883 (West coast Florida); Jordan, Proc. U. S. Nat. Mus., 1884, 140 (Key West); Jordan, Cat. Fish. North America, 105, 1885.

Habitat.—Florida Keys.

This species is known to us from the original type, and from a number of specimens collected by Dr. Jordan at Key West. It is very close to *Gobius boleosoma*, but thus far it may be readily distinguished by its pale coloration and by its scaly nape.

23. Gobius shufeldti (nom. sp. nov.).

?? Gobius würdemanni Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169 (Brazos Santiago, Tex.); Girard, U. S. & Mexico Bound. Survey, 25, 1859 (copied); Jordan & Gilbert, Syn. Fish. North America, 634, 1883 (copied).

Gobius würdemanni Jordan, Proc. U. S. Nat. Mus., 1884, 321 (New Orleans); Jordan, Cat. Fish. North America, 105, 1885 (name only, probably not of Girard).

Habitat.—Gulf coast of United States; vicinity of New Orleans.

This species is known to us only from numerous specimens collected by Dr. R. W. Shufeldt in the vicinity of New Orleans. The original description given by Girard of his *Gobius würdemanni* is very scanty and insufficient for the determination of the species. He may have possibly intended the present species, but it seems unlikely, and the statement that the third dorsal spine is filamentous comes nearer *G. lyricus*. In any case, the present species is distinct from the others known to Girard, and is closely related to *G. boleosoma*. It seems better to give it a new name, in honor of its distinguished discoverer rather than to retain for it a name to which it is probably not entitled.

The types of *Gobius shufeldti* are Nos. 35202, U. S. Nat. Mus.

24. Gobius boleosoma.

Gobius boleosoma Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 295 (Pensacola); Jordan & Gilbert, Syn. Fish. North America, 946, 1883 (West coast Florida); Jordan, Proc. U. S. Nat. Mus., 1884, 140 (Key West); Jordan, Cat. Fish. North America, 105, 1885.

Habitat.—Gulf of Mexico.

The numerous specimens of this species before us are from the shores about Pensacola, where it is very abundant. A few are also in our collection from Key West. The species may be identical with Gill's *Ctenogobius fasciatus*, but our knowledge of the latter is not sufficient to justify an identification.

25. Gobius fasciatus.

Ctenogobius fasciatus Gill, Syn. Fish., Trinidad, 376, 1858 (Trinidad).

Gobius fasciatus Günther, Cat. Fish. Brit. Mus., iii, 34, 1861 (copied).

Habitat.—Trinidad.

The following is the substance of Dr. Gill's description of this species. It seems to be closely related to *G. boleosoma.*

Body oblong, the depth 7 in total length; head flattish above, 5 in total; snout equal to eye, more than 4 in head; teeth in both jaws in a band, the outer row recurved, the last tooth on each side in the lower jaw somewhat enlarged in the male. Brownish yellow; four linear dark spots in a line on the sides, a dark spot and numerous black dots at base of caudal; ventral fins barred. Dorsal VI–11, Anal 10. Scales large.

26. Gobius stigmaticus.

Smaragdus stigmaticus Poey, Memorias de Cuba, ii, 281, 1861 (Cuba).

Gobionellus stigmaticus Poey, Syn. Pisc. Cub., 394, 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 126, 1876, (Cuba); Jordan & Gilbert, Syn. Fish. North America, 947, 1883 (copied); Jordan, Cat. Fish. North America, 106, 1885 (specimen referred to from Florida Keys).

Gobius stigmaticus Jordan, Proc. U. S. Nat. Mus., 1886, 49 (Havana, Cuba).

Habitat.—West Indian fauna; Cuba, Florida Keys.

We have numerous specimens of this species from Havana, where it is not rare. Specimens from the Florida Keys, in the U. S. Nat. Mus., have been identified with it by Dr. Bean. The difference between the sexes in form and color, is in this species considerable. With this species begins the transition from the more typical gobies to the elongate forms called *Gobileptes* or *Gobionellus*.

27. Gobius encæomus.

Gobius encæomus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 611 (Charleston, S. C.); Jordan & Gilbert, Syn. Fish. North America, 945, 1883 (Charleston, S. C.); Jordan, Proc. U. S. Nat. Mus., 1884, 141 (Key West); Jordan, Cat. Fish. North America, 105, 1885 (no locality); Jenkins, Johns Hopkins Univ. Circular 43, 11, 1885 (Beaufort, N. C.).

Gobionellus encæomus Jordan, Proc. U. S. Nat. Mus., 1886, 28 (Beaufort, N. C.).

Habitat.—South Atlantic coast of United States.

This abundant species is very close to *G. stigmaticus*, of which it is probably a northern variety. Only the difference in color, and some slight differences in proportions seem to distinguish it. As in *G. stigmaticus*, the sexual differences are marked. The specimens before us are from Beaufort, N. C.

28. Gobius lyricus.

Gobius lyricus Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169 (Brazos Santiago, Tex.); Girard, U. S. & Mex. Bound. Survey, 25, plate xii, fig. 4 and 5, 1859 (Brazos Santiago, Tex.); Günther, Cat. Fish. Brit. Mus., iii, 550, 1861 (copied); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 294 (Galveston, Tex.); Jordan, Cat. Fish. North America, 105, 1885 (name only).

Euctenogobius lyricus Jordan & Gilbert, Syn. Fish. North America, 633, 1883.

? Gobius würdemannii Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169 (Brazos Santiago, Tex.); Girard, U. S. & Mex. Bound. Survey, 28, 1859 (copied); Jordan & Gilbert, Syn. Fish. North America, 105, 1883 (copied).

Smaragdus costalesi Poey, Memorias de Cuba, ii, 280, 1861 (Rio Almendares); Poey, Syn. Pisc. Cub., 394, 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 126, 1876 (Cuba).

Habitat.—Gulf of Mexico; Texas, Cuba.

This species is best known from a male specimen, obtained by Dr. Jordan at Galveston. With this specimen corresponds very closely Poey's account of his *Gobionellus costalesi*. The original account of *Gobius würdemanni* may have been drawn from a female of the same species.

29. Gobius smaragdus.

Gobius smaragdus Cuvier & Valenciennes, Hist. Nat. Poïss., xii, 120, 1837 (Cuba); Jordan, Proc. U. S. Nat. Mus, 1886, 49 (Havana, Cuba).

Gobionellus smaragdus Poey, Syn. Pisc. Cub., 394, 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 126, 1876 (Cuba); Hay, Proc. U. S. Nat. Mus., 1885, 552(Saint Augustine, Fla.).

Smaragdus valenciennesi Poey, Memorias de Cuba, ii, 280, 1861 (Cuba).

Habitat.—West Indian fauna; Cuba, Florida.

We have examined two specimens of this species, one from Havana, the other collected at Saint Augustine, by Prof. O. P. Hay. Both these have the pale spots very sharply defined, but they may perhaps not be present in the female. The green spot above the base of the tongue is conspicuous in life.

30. Gobius poeyi.

Gobius poeyi Steindachner, Ichthyol. Notizen, vi, 44, 1867 (Barbadoes).

Habitat.—West Indian fauna; Barbadoes.

This species we know only from Dr. Steindachner's description.

31. Gobius kraussi.

Gobius kraussii Steindachner, Ichth. Beiträge, viii, 16, 1879 (Surinam).

Habitat—Coast of Surinam.

This species is known only from Dr. Steindachner's description.

32. Gobius sagittula.

Eucteuogobius sagittula Günther, Proc. Zoöl. Soc. London, 1861, 3 (west coast Central America); Günther, Fish. Centr. Amer., 389, 1869 (Panama); Günther, Cat. Fish. Brit. Mus., iii, 555 (west coast Central America).

Gobius sagittula Jordan & Gilbert, Bull. U. S. Fish. Com., 1882, 108 (Mazatlan); Jordan & Gilbert, Bull. U. S. Fish. Com., 1882, 111 (Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 380 (San José); Jordan, Cat. Fish. North America, 105 (name only).

Habitat.—Pacific coast of Tropical America; Cape San Lucas to Panama.

This species is common on the west coast of Mexico, where numerous specimens were obtained by Professor Gilbert. We have no specimens at hand, and, therefore, are obliged to make use of the published accounts of this species.

33. Gobius oceanicus.

Gobius cauda longissima acuminata "Gronow, Zooph., 82, no. 277, plate 4. fig. 4."

Gobius oceanicus, "Pallas, Spicilegia, viii, 4, 1769 (after Gronow);" Jordan, Proc. U. S. Nat. Mus., 1886, 49 (Havana, Cuba).

Gobionellus oceanicus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 613 (Charleston, S. C.); Jordan & Gilbert, Syn. Fish. North America, 636. 1883; Jordan, Cat. Fish. North America, 106, 1885 (name only).

Gobius lanceolatus Bloch, Fische Deutschlands, ii, 8., taf. 38, fig. 1, 1783 (Antilles); Bloch & Schneider, Syst. Ichth., 69, 1801 (Antilles); Lacépède "ii, 545, plate XV, fig. 1, 1801"; Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 114, 1837 (Havana); Günther, Cat. Fish. Brit. Mus., iii, 50 (Brazil, West Indies); Poey, Syn. Pisc. Cub., 393., 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 126, 1876 (Cuba); Poey, Fauna Puerta-Riqueña, 338, 1881 (Porto Rico).

Gobius bacalaus Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 119, 1837 (Surinam); Poey, "Repertorio I, 334"; Poey, Syn. Pisc. Cub., 394, 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 126, 1876 (Cuba).

Gobionellus hastatus Girard, Proc. Acad. Nat. Sci. Phil., 1858 (St. Joseph's Island, Tex.) 168; Girard, U. S. & Mex. Bound. Survey, 25, plate XII, fig. 7–8 (copied).

Habitat.—West Indian fauna; North to South Carolina and Texas.

This species is generally common in the West Indies. The specimens before us are all from Havana, except one, a large example from St. Joseph's Bay, Florida.

This species differs considerably from the typical species of *Gobius*, but a series of intermediate forms renders it impossible to define it as a distinct genus, or even subgenus. Different specimens show considerable variations in the size of the scales, but there is not much doubt that all the names included in the foregoing synonymy belong to one species, for which the earliest name is that of Pallas.

34. Gobius paradoxus.

Gobius paradoxus Günther, Proc. Zool. Soc., London, 1861, 3 (west coast Central America); Günther, Cat. Fish. Brit. Mus., iii, 549, 1861 (west coast Central America); Jordan & Gilbert, Bull. U. S. Fish Com., 1882, iii (Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 626 (Panama).

Habitat.—Pacific coast of Tropical America; Panama.

This species is not rare at Panama where specimens were obtained by Professor Gilbert. As these are not now at hand, we are compelled to fall back on Dr. Günther's description. This species is a very peculiar one in regard to its squamation and the development of its spines, and it may be perhaps properly the type of a distinct genus.

35. Gobius seminudus.

Gobius seminudus Günther, Proc. Zool. Soc., London, 1861, 3 (west coast Central America); Günther, Cat. Fish. Brit. Mus., iii, 554, 1861 (west coast Central America); Jordan & Gilbert, Bull. U. S. Fish Com., 1882, iii (Panama); Jordan, Proc. U. S. Nat. Mus., 1885 (Panama).

Habitat.—Pacific coast of Central America.

This species was obtained by Professor Gilbert at Panama. As his specimens have been unfortunately destroyed, we here use the description of Dr. Günther.

It is remarkable that in the Panama fauna are four gobies, not especially related to each other, each of which has the anterior half of the body naked, this region in all our other gobies being scaled. These are *Gymneleotris seminuda*, *Gobius paradoxus*, *Gobius seminudus*, and *Microgobius emblematicus*. Can there be any physical cause for this?

Doubtful species of Gobius.

Gobius ——.

Gobius lineatus Poey, Memorias de Cuba, ii, 424, 1861 (Havana); Poey, Synopsis 1868, 393; Poey, Enumeratio, 125, 1875 (name preoccupied; not *Gobius lineatus* of Jenyns).

This species, which must, if valid, receive a new name is characterized as follows:

Body elongate, subcylindrical; depth of body 6 in length, head $3\frac{1}{2}$; eye in head 6 times; maxillary extending almost to below middle of eye; pectorals rounded; dorsals high, yellowish green; the body with 20 vertical yellow bands; a red band extending from snout to point of opercle; fins yellowish. Dorsal VII, 12.

Gobius ——.

Gobius brunneus Poey, Synopsis Pisc. Cubens., 393, 1868 (Havana); Poey, Enumeratio 125, 1876 (name preoccupied; not *Gobius brunneus* of Schlegel).

This species, which, if valid, must receive a new name, is thus characterized:

Color dark-gray with brighter spots; pectoral, dorsals, and caudal spotted with black; outer series of teeth notably stouter and somewhat separated; profile more oblique and longer than in *Gobius lacertus* (*soporator*); maxillary extending to below middle of eye which is contained $4\frac{1}{2}$ times in head; interorbital space $\frac{1}{3}$ of eye, snout $1\frac{1}{2}$. Dorsal inserted in the middle point between snout and end of second third of caudal.

13. CHONOPHORUS.

? RHINOGOBIUS Gill, Proc. Acad. Nat. Sci. Phila., 1859, 145 (*similis*).

CHONOPHORUS Poey, Memorias de Cuba, ii, 274, 1861 (*bucculentus* = *taiasica*).

? AWAOUS Bleeker, Esquisse d'un Système Naturel des Gobioïdes, 320 (*ocellaris*; name from "les Awaous" of Valenciennes).

Type: *Chonophorus bucculentus* Poey = *Gobius taiasica* Lichtenstein.

We cannot feel certain that Bleeker and Gill are right in considering *Chonophorus* as identical with *Rhinogobius*, as the description of *Rhinogobius similis* is not sufficiently full to permit a proper comparison of the two groups.

The name "*Awaous*" cannot be adopted from Valenciennes for this group, as this name, as used by him, was evidently not in any sense a subgeneric name, but a French plural noun, "Awaou" being the vernacular name of one of the species in the Sandwich Islands.

The American species are closely related and form a well-marked group, but their relation to the East Indian and Asiatic forms called *Awaous* and *Rhinogobius* is, as above stated, yet to be proven.

ANALYSIS OF THE SPECIES OF CHONOPHORUS.

a. Scales about 53; little crowded anteriorly, 21 before dorsal on nape; depth, $5\frac{2}{3}$ in length, head, 4; eyes placed high, interorbital area equal to diameter of eye; mouth, horizontal; maxilary extending to middle of eye, $2\frac{1}{3}$ in head, lower jaw more flat than in *taiasica*: teeth small, in narrow bands, those of the outer row above enlarged, some large teeth in band of lower jaw. D. VI-1, 12, A. I, 10. Uniform yellowish in spirits ..... FLAVUS, 36.

aa. Scales 60 to 70, crowded anteriorly, about 30 scales before the dorsal on nape; 21 scales between second dorsal and anal; head broader than high; body compressed posteriorly, rather depressed anteriorly; greatest depth 5¼ in length; head, 3¼ in length; eye small, less than interorbital (in adult), 3 times in snout (twice in young), and about 7 times in length of head; distance from eye to mouth 3½ in head, the preorbital being much enlarged; mouth large, horizontal; maxillary extending to below anterior part of orbit; lower jaw included; teeth of the upper jaw in two series, those in anterior series much enlarged, recurved; those of lower jaw in a narrow band, outer series scarcely enlarged; inner edge of shoulder-girdle with 2 or 3 rather long papillæ. Body covered with ctenoid scales, much reduced in size anteriorly; nape closely scaled, breast scaly, head naked; dorsal fins less than hight of body; dorsal spines scarcely filamentous, not as high as the soft rays; caudal rounded, shorter than head; ventrals very broad and short, 1½ to 1⅔ in head; the rays very much branched. Olivaceous, a series of irregular, roundish blotches along middle of sides; narrow dark streaks radiating from eye; a blackish streak running across upper margin of opercle and extending obliquely across base of upper pectoral rays; belly white; dorsal and caudal more or less distinctly barred with wavy blackish lines. D. VI, 11, A. 11. Scales, about 65.

TAIASICA, 37.

aaa. [Scales 76 to 82; 24 scales between second dorsal and anal; head as broad as high; depth of body 6⅔ in length; head 4; head flat above, snout elongate, upper profile oblique; eye, ⅓ of head, equals interorbital area (in adult); month horizontal; lower jaw included; maxillary reaching to below anterior margin of eye; teeth of the outer series enlarged; canine teeth, none; scales ctenoid, those on nape and anterior part of body very small; head naked; dorsal fins lower than body, none of the spines produced; caudal rounded, 7 in length of body. Yellowish-olive; back and sides reticulated with blackish; head, dorsal, caudal, and pectoral fins dotted with blackish, the spots forming streaks on second dorsal; six cross series of dots on the caudal; an irregular small blackish spot on the upper part of the root of pectoral. Dorsal, VI–11. Anal, 11. Scales about 80.] (*Günther*).....MEXICANUS, 38.

36. Chonophorus flavus.

Gobius flavus Cuv. & Val., Hist. Nat. Poiss. xii, 60, 1837 (Surinam); Günther, Cat. Fish. Brit. Mus. viii, 13 (copied).

Habitat.—Surinam.

An examination of the type of *Gobius flavus* Cuv. & Val. has proven it to be a *Chonophorus*, having the dermal flaps on the shoulder girdle as in *Ch. taiasica*, to which it is closely related.

37. Chonophorus taiasica.

Amore guacu Marcgrave, Hist. Brasil., 1648, 166 (Brazil).

Gobius taiasica Lichtenstein, "Berl. Abhandl. 1822, 273" (not *Tajasica* Marcgrave).

Chonophorus taiasica Jordan, Proc. U. S. Nat. Mus. 1886, 49 (Havana, Cuba).

Gobius banana Cuvier & Valenciennes, Hist. Nat. Poiss., xii, 103, 1837 (St. Domingo); Günther, Cat. Fish. Brit. Mus. iii, 59, 1861 (Caribbean Sea; Antilles; West Indies); Steindachner, Ichth. Not. vi, 45, 1877 (Surinam); Cope, Ichthyology Lesser Antilles, 473, 1871 (St. Domingo); Jordan & Gilbert, Proc. U. S. Nat. Mus. 1882, 368 (Cape San Lucas); Jordan & Gilbert, Proc. U. S. Nat. Mus. 1882, 379 (San José); Jordan, Catalogue Fish. North America, 105, 1885 (name only).

Gobius martinicus Cuvier & Valenciennes, Hist. Nat. Poiss. xii, 105, 1837 (Martinique); Castelnau, "Anim. nouv ou rares de l'Ameri. du Sud, Poiss. 26."

Chonophorus bucculentus Poey, Memorias de Cuba, ii, 275, 1861 (Cuba).

Rhinogobius bucculentus Poey, Syn. Pisc. Cub. 394, 1868 (Cuba); Poey, Enumeratio Pisc. Cub., 125, 1876 (Cuba).

Rhinogobius contractus Poey, Memorias de Cuba, ii, 424, 1861 (Cuba); Poey, "Annals Lyc. Nat. Hist. New York, ix, 322;" Poey, Enumeratio Pisc. Cub. 125, 1875, Poey, La Fauna Puerto-Riqueña, 338, 1881 (Porto Rico).

Gobius dolichocephalus Cope, Trans. Amer. Phil. Soc. Philad. 1869, 403 (near Orizaba, Vera Cruz).

Habitat.—Fresh waters of the West Indies and of both coasts of Mexico.

The specimens of this species before us are from the Rio Almendares, near Havana, and from near Cape San Lucas. We are unable to detect any specific differences between these examples. The former corresponds to the *Rhinogobius bucculentus*. There are considerable (sexual) differences in the size of the mouth corresponding to the distinctions between *banana* and *martinicus*, and to those between *bucculentus* and *contractus*. *Gobius dolichocephalus* Cope has the scales slightly smaller than the average in *G. banana*, but in this respect the species is subject to considerable variation.

It seems to us that there is little room for doubt that this is the species to which Lichtenstein, in his commentary on Marcgrave, has given the name *Gobius taiasica*. We have not seen the original paper of Lichtenstein. According to Cuvier & Valenciennes, this *Gobius taiasica* is "a goby of Brazil, 6 or 7 inches in length, with rounded tail, of a dirty gray color, covered with small brown specks; of which the head forms one-fifth the total length. The fin rays are D. VI–12. A. 12. C. 15. P. 16. V. 1–5."

Among the known species this can only be *Chonophorus banana*, *Gobius soporator*, or *Gobius oceanicus*, as no other West Indian species reaches a length of 3 inches. Of these, only the first corresponds at all to the above account. We therefore adopt the name of *Chonophorus taiasica*. The "Amore Guacu" of Marcgrave seems to be this species.

38. Chonophorus mexicanus.

Gobius mexicanus Günther, Cat. Fish. Brit. Mus., iii, 61, 1861 (Mexico).

Habitat.—Fresh waters of the eastern slope of Mexico.

This species is known to us only from Dr. Günther's description. It is evidently a near ally of *Chonophorus taiasica*.

14. LEPIDOGOBIUS.

LEPIDOGOBIUS Gill, Annals Lyc. Nat. Hist. N. Y. 1859, 14 (*lepidus*).
EUCYCLÓGOBIUS Gill, Proc. Acad. Nat. Sci. Phila. 1862, 279 (*newberrii*).
CYCLOGOBIUS "Steindachner."

Type *Gobius gracilis* Girard = *Gobius lepidus* Girard.

We retain the name *Lepidogobius* for two species, apparently allied to each other, and differing from the typical Gobies in the small, cycloid scales, in the presence of 7 or 8 dorsal species, and in the presence of fleshy processes on the shoulder girdle.

The two species have been made types of distinct genera by Dr. Gill, but the differences between them, although considerable, seem to us of less than generic importance.

ANALYSIS OF THE SPECIES OF LEPIDOGOBIUS.

a. Head scaled; body elongate (*Lepidogobius*).

b. Body elongate, subfusiform, little compressed, depth about 7 in length. Head regularly conical, 4⅕ in length. Eye twice as long as high; its longitudinal diameter equals snout, 4 in head. Snout not obtuse in profile. Interorbital area narrow, about equal the diameter of pupil. Mouth large; maxillary reaching to below posterior edge of pupil, 2½ in head. Teeth small, all similar, those of the upper jaw in two or three series, those of the lower jaw close set, in a broad band. Body covered with small cycloid scales, which are very much reduced anteriorly, especially on nape; cheeks, sides of head and upper posterior part of opercle covered with small scales. Top of head scaly to eye. Breast scaled. Dorsal spines weak; the highest one half head. Soft dorsal low, none of the rays reaching caudal. Caudal long, somewhat pointed. Dorsal, vii, 16–18. Anal, 15. Scales about 86 .. LEPIDUS, 39.

aa. Head naked; body short, chubby (*Eucyclogobius*).

c. Body short, little compressed, its depth 4½ in length. Head large, 3½ in length, rounded above: snout broad. Mouth large, somewhat oblique, the lower jaw somewhat projecting: maxillary extending more or less beyond orbits Eye small, 5 in head, shorter than snout. Teeth rather strong, in narrow bands, the outer row larger: outer teeth of lower jaw somewhat movable. Scales very small, cycloid; head and nape naked. Dorsal spines very slender, not filamentous, lower than the soft rays; caudal truncate, about as long as pectorals and considerably shorter than head. Ventrals inserted under lower anterior edge of pectorals. Olivaceous, mottled with darker; head with some dusky markings; second dorsal and caudal checkered; a faint spot at base of caudal. Dorsal, vii to viii—12. Anal 11 or 12. Scales 60 to 70..... NEWBERRYI, 40.

39. Lepidogobius lepidus.

Gobius gracilis Girard, "Proc. Acad. Nat. Sci. Phil., 1854, 134" (preoccupied by *Gobius gracilis* Jenyns.)

Lepidogobius gracilis Gill, Annals Lye. Nat. Hist. New York, 1859, 14; Gill, Proc. Acad. Nat. Sci. Phil., 1863, 279 (California); Gill, Proc. Acad. Nat. Sci. Phil., 1863, 266 (no locality); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 455 (Puget Sound; San Francisco); Jordan & Jouy, Proc. U. S. Nat. Mus., 1881, 9 (San Francisco); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 53 (San Francisco: Victoria); Jordan & Gilbert, Syn. Fish. North America, 637, 1883.

Gobius lepidus Girard, Pacific Railroad Survey, 127, plate xxv *a*, fig. 5 & 6, 1859 (San Francisco); Günther, Cat. Fish. Brit. Mus., iii, 78, 1861 (San Francisco).

Lepidogobius lepidus Jordan, Catalogue Fish. North America, 106, 1885 (name only).

Habitat.—Pacific coast of United States, San Francisco, northward.

This species is common in rather deep water outside the bay of San Francisco; from this locality our specimens were obtained.

40. Lepidogobius newberrii.

Gobius newberrii Girard, "Proc. Acad. Nat. Sci. Phil., 1856, 136"; Girard, "Boston Journal Nat. Hist., 1857, 530, plate xxv, fig. 5–8"; Girard, Pacific Railroad Survey, 1859, 128 (Tomales Bay, Cal.); Gill, "Annals Lyc. Nat. Hist. New York, 1859, 16"; Günther, Cat. Fish. Brit. Mus., iii, 77, 1861 (copied); Steindachner, Ichth. Beiträge, viii, 17, 1879 (Santa Monica, California; Artesian well).

Lepidogobius newberryi Gill, "Ann. Lyc. Nat. Hist. N. Y., 1859, 14"; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 455 (California); Jordan & Gilbert, Syn. Fish. North America, 637, 1883; Jordan, Catalogue Fish. North America, 106, 1885 (name only).

Eucyclogobius newberryi Gill, Proc. Acad. Nat. Sci. Phil., 1862, 330 (name only); Gill, Proc. Acad. Nat. Sci. Phil., 1863, 265 (name only); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 53 (name only).

Habitat.—Coast of California.

This species is rather rare on the California coast. While agreeing closely with *L. lepidus* in many respects, it differs considerably in the naked head and less elongate form. Both species have the fleshy papillæ on the shoulder girdle, found also in *Chonophorus*.

15. MICROGOBIUS.

MICROGOBIUS Poey, Enumeratio Pisc. Cubens., 1875, 127 (*signatus*).

Type *Microgobius signatus* Poey.

We retain the genus *Microgobius* for four small, brightly-colored Gobies, which differ considerably in form and appearance from the species of related genera. The technical characters of *Microgobius* do not seem to have much importance, but for the present we regard it as worthy of retention.

ANALYSIS OF THE SPECIES OF MICROGOBIUS.

a. Body entirely scaled, except the nape, belly, and breast, which are naked, like the head.

b. Scales about 42. Body elongate, moderately compressed, the depth 4 to 5 in length; head long and large, rather sharp in profile, 3 to 3½ in body; eye longer than snout, 4 in head; mouth large, very oblique, the lower jaw strongly projecting; maxillary 1½ to 2½ in head, extending to opposite middle of eye, or much beyond the orbit; teeth in few series, the outer very long and slender, curved, the lower longest, none canine-like; scales small, some of them with short, thick teeth, those of anterior part of body not well developed; dorsal spines more or less filamentous, the 3d and 4th or 4th and 5th sometimes with long filaments; caudal pointed, about as long as head. Grayish-olive, with rather sharply-defined markings of darker brown overlaid with orange in life; head with a pale bluish or gilt stripe from maxillary backward across suborbital region to upper edge of gill-opening; another pale gilt streak from snout along lower part of eye, another from angle of mouth upward and backwards; rest of head dark; opercle with an oblique blackish bar; top of head and nape with dark marblings surrounded by paler reticulations; back with a series of black cross-blotches mostly separated on the median line; two narrower dark vertical bars behind pectoral; middle line of side posteriorly with longitudinally oblong black blotches; besides these, numerous other blotches not regularly arranged; first dorsal with two or three oblique black bands; second dorsal pale, with about four series of black dots; caudal spotted with black; pectoral yellowish; ventral black, its center yellowish (♂); anal pale. Dorsal VII–15. Anal 16 or 17 ..... GULOSUS, 41.

bb. Scales 65 or more.

c. Caudal fin more than one-third ($\frac{2}{5}$) length of body. Scales very small, cycloid, deciduous. Body elongate, much compressed, highest in front of ventrals, tapering regularly to the very narrow, short caudal peduncle. Greatest depth $4\frac{3}{4}$ in length, head $3\frac{1}{2}$. Head compressed, much higher than wide; snout very short, acute, preorbital not as wide as pupil; mouth terminal, very wide and oblique; jaws equal; maxillary reaching vertical from middle of orbit, 2 in head. Outer series of teeth enlarged. Eye 3 in head. Dorsals closely contiguous; spines very slender, the fifth slightly produced and filamentous; pectorals as long as head. Head and body translucent, overlaid by brilliant green luster, formed by minute, close-set green points; three conspicuous translucent bars wider than the interspaces, crossing body close behind head; head with two brilliant narrow blue and green lines running obliquely across cheeks below eye. Dorsal whitish, with two or three lengthwise series of large reddish-brown spots; spinous dorsal blackish at base. Upper caudal rays marked with red, the lower portion of caudal and most of the anal fin blackish, anal whitish at base, the anterior rays tipped with white. In spirits, body dusted with dark points; two light cross-bars towards head; lower part of caudal and anal black. Dorsal VII–16. Anal 15 ..... THALASSINUS, 42.

cc. Caudal fin less than one-third length of body. Scales small, cycloid, imbedded. Body very much compressed, more or less elongate, greatest depth at ventrals 4 (♀) to $6\frac{1}{2}$ (♂) in length; head $3\frac{1}{2}$ to 4. Head much compressed, much deeper than wide. Snout very short, acute, the anterior profile not decurved, not steep; preorbital not as wide as pupil; mouth very large, very oblique or almost vertical; maxillary extending to below pupil 2, in head (in ♂, $2\frac{1}{4}$ in ♀). Lower jaw projecting, the teeth of the outer series enlarged, recurved. Eye $3\frac{1}{4}$ to 4 in head. Dorsals contiguous, spines very fine, produced in filaments, the 3d highest, a little longer than head. Second dorsal and anal high. Head and nape naked. In female the depth is greater, mouth less oblique, smaller; profile from spinous dorsal oblique. First dorsal spine highest, $3\frac{1}{3}$ in length. Ventrals much shorter than in males. Dark gray; female with a short bright blue bar bordered by blackish above pectorals. A blotch of sky-blue and orange below eye; fins dusky, the ventrals pale in female, dusky in males. Males with the body plain bluish gray. Dorsal VII–17 to 20; anal 18 to 21. Scales 68 to 70.

SIGNATUS, 43.

aa. Anterior part of body naked. Teeth of upper jaw in one series. Body elongate compressed, heaviest forwards; depth 5 in length; head $3\frac{2}{3}$; snout short, rather broad, acute in profile; mouth terminal very oblique; gape wide, its length nearly half head; maxillary reaching to opposite middle of pupil; lower jaw projecting. Teeth in lower jaw partly in two series in front, forming a single row laterally; anterior teeth in both jaws strong, incurved. Eyes very large, about $\frac{1}{3}$ of head; snout less than orbit. Scales extremely small, cycloid, scarcely increasing in size toward caudal peduncle; head and anterior part of body to front of dorsal fin naked; a narrow naked strip along base of anterior half of spinous dorsal. Dorsal spines very slender and weak, some of the middle ones usually prolonged, sometimes reaching nearly to the base of caudal, sometimes little elevated. Second dorsal and anal similar to each other, the rays high, the last when depressed nearly reaching to the base of caudal. Caudal pointed, a little longer than head. Light olivaceous; above thickly punctate with pale dots; sides very thickly covered with golden-green specks; back with six pairs of golden-green spots on each side of the dorsal fin, each nearly as large as pupil. Sides of head and anterior half of body with wide streaks

and bars alternately of purplish-blue and golden bronze; those on cheeks longitudinal; those on opercle extending obliquely upwards and backwards, those on body vertical. First dorsal dusky, second dorsal with about 3 series of light-blue spots. Anal pale. Caudal yellowish-green below, dusky above, a very conspicuous narrow bright red streak from the lower end of the base to the tip of the 5th or 6th ray from the bottom, thus crossing the rays obliquely; ventrals bluish. In spirits plain light olive, with a silvery cross-bar behind pectorals. Head $3\frac{2}{3}$ in length; depth 5. Dorsal VII-16. Anal 17. About 65 scales in a median series.

EMBLEMATICUS, 44.

41. Microgobius gulosus.

Gobius gulosus Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169 (Indianola, Tex.); Girard, U. S. & Mex. Bound. Survey, 26, 1859 (Indianola, Tex.); Jordan & Gilbert, Syn. Fish. North America, 634, 1883 (copied).

Lepidogobius gulosus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 294 (Pensacola, Fla.); Jordan & Gilbert, Syn. Fish. North America, 945, 1883; Jordan, Proc. U. S. Nat. Mus., 1884, 324 (Indian River, Fla.); Jordan, Catalogue Fish. North America, 106, 1885.

Habitat.—Gulf of Mexico.

This strongly marked species has no near relative among our Gobies. The many specimens before us are all from Pensacola, where it is a common inhabitant of the grassy bays.

42. Microgobius thalassinus.

Gobius thalassinus Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 612 (Charleston, S. C.).

Lepidogobius thalassinus Jordan & Gilbert, Syn. Fish. North America, 947, 1883 (Charleston Harbor); Jordan, Catalogue Fish. North America, 106, 1885 (name only).

Habitat.—South Atlantic Coast of United States; Charleston.

This species is known, as yet, only from the original types taken by Professor Gilbert in Charleston Harbor.

43. Microgobius signatus.

Microgobius signatus Poey, Enumeratio Pisc. Cub., 127 Lám. v, fig. 3, 1875; (Cuba) Jordan, Proc. U. S. Nat. Mus., 1886, 49 (Havana, Cuba).

Habitat.—West Indian fauna; Cuba.

The numerous specimens of this species examined by us were obtained by Dr. Jordan in the Havana market. The sexual differences are in this species very strongly marked, as the foregoing analysis of the species shows.

44. Microgobius emblematicus.

Gobius emblematicus Jordan & Gilbert, Bull. U. S. Fish. Com., 1881, 330 (Bay of Panama).

Lepidogobius emblematicus Jordan & Gilbert, Bull. U. S. Fish. Com., 1882, 111 (Panama).

Habitat.—Pacific coast of Tropical America; Panama.

This singular species is thus far known only from the original types taken by Professor Gilbert at Panama.

16. GOBIOSOMA.

GOBIOSOMA Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169. (*Alepidotum=bosci.*)

Type *Gobius alepidotus* Bloch & Schneider=*Gobius bosci* Lacépède.

The typical species of this genus scarcely differ from the species of *Gobius*, except in the absence of scales. Two or three little-known species are, however, in some respects decidedly aberrant, and are perhaps not allied to the others. Of the numerous American species of this genus only one is as yet well represented in collections.

ANALYSIS OF SPECIES OF GOBIOSOMA.

a. Second dorsal short, its rays 10 to 14 in number; anal rays 10 to 12; mouth not very large, the maxillary not extending beyond orbit, not half length of head.

b. Dorsal spines seven.

c. Chin with a fringe of short barbels (shriveled and invisible in alcoholic specimen). Body slender, the depth nearly 7 times in length; head $3\frac{2}{3}$ times; head narrow and slender, depressed above. Eyes close together, 4 in head; snout not blunt; mouth terminal, oblique, the maxillary reaching to below eye, 3 in head. Vertical fins high, no rays filamentous. Upper half of head and body brown, finely speckled; four oblong colorless areas along base of dorsals and a smaller one on back of caudal peduncle; lower parts abruptly pale; back with 5 or 6 blackish cross-bars to middle of sides, below which they extend as 5 or 6 short V-shaped projections; a brownish streak below eye; a small brown bar on base of pectoral; a jet-black bar at base of caudal. D. VII-10. A. 10.....CEUTHŒCUM, 45.

cc. Chin without barbels.

d. Maxillary extending to below front of orbit; color blackish, with sharply defined cross-bars of whitish. Body rather short, the depth $5\frac{2}{5}$ in length; head $3\frac{1}{4}$. Snout low, little obtuse; mouth large, rather oblique, the maxillary $2\frac{2}{3}$ in head; teeth small, in few series above, in a band below, the outer enlarged. Fins low. Caudal $1\frac{1}{4}$ in head. Cross-bands on body as wide as eye, not quite meeting below; a dark blotch on base of pectoral, a fainter one on base of caudal; fins nearly plain. D. VII-13. A. 12.....HISTRIO, 46.

dd. Maxillary extending to below posterior part of orbit; coloration not sharply defined.

e. Body rather short, chubby, the depth about 4 in length; head about $3\frac{2}{5}$; head rounded above. Teeth in several series, slender, the outer ones somewhat elongate, none of the inner ones specially enlarged. Color olivaceous, with dark points; sides with narrow, alternating light and dark bars: a row of small linear dark spots along middle of sides; first dorsal with three oblique dark bars, second dorsal, caudal, and pectorals finely barred, base and edge of anal light, middle dark. Breast with many well-defined spots. A dark line running forward and downward from eye to angle of mouth, another extending straight down; a black bar on edge of preopercle, a black spot on upper edge of opercle. D. VII-13. A. 10. (Otherwise essentially as in *G. bosci*). MOLESTUM, 47.

ee. Body more elongate, its depth 5 to 6 in body. Head very broad, flattish above, with tumid cheeks, its length $3\frac{1}{3}$ in body. Eye small, longer than snout, 5 in head. Mouth large, little oblique, the jaws subequal.

the maxillary extending to below posterior part of orbit (at least in male), $2\frac{1}{3}$ in head. Teeth in few series, the outer considerably enlarged; two teeth on each side of inner series of lower jaw especially large canines. Dorsal spines slender, none filamentous; caudal rounded. Olivaceous, with darker cross-shades of rounded spots; vertical fins dusky, faintly barred. Teeth of the female similar to those of the male but smaller, head narrower, more slender. D. VII–14. A. 10 ..... Bosci, 48.

bb. [Dorsal spines six; anterior dorsal rays not produced in filaments. Head and body compressed; greatest depth $5\frac{2}{3}$ times in total length, head about 4 times. Angle of mouth little behind the center of the eye. Eye 4 in head. Teeth pointed, in several series, those of the outer series a little enlarged. Caudal rounded. Head light yellow; a carmine-red bar extending along the upper edge of head, from the upper corner of gill-opening to the snout, where it joins its fellow, ending behind over the pectoral in a small indigo-blue spot; body with 16–17 light green, well-defined cross-bars separated by narrow white stripes. Fins chiefly greenish. Dorsal VI–11. Anal 10.] (*Steindachner.*) Multifasciatum, 49.

bbb. Dorsal spines four, the anterior filamentous. Body long, slender, depth $6\frac{2}{3}$ in length: head long, slender, $3\frac{1}{3}$ in length; mouth large, the lower jaw projecting; maxillary extending slightly beyond posterior edge of orbit. Eye longer than snout $3\frac{2}{3}$ in head; snout rather pointed; interorbital space less than pupil. Teeth small in villiform bands, the outer series in the upper jaw slightly enlarged. Spinous dorsal high, the spines slender, the anterior filamentous, considerably more than greatest depth of body. Caudal short, $1\frac{2}{3}$ in head. Olivaceous, vaguely barred, everywhere closely punctate with darker: lower parts of head thickly punctate with dark dots like the sides: sides of body and head with some faint pale spots; caudal with two distinct black lengthwise bands; its upper and lower edges white, the middle part colored like the body; dorsal and anal largely black, with pale edgings. Dorsal IV–12. Anal 12 ..... Zosterurum, 50.

aa. Second dorsal long—of 15 to 17 rays; anal rays 12 to 17; mouth very large, the maxillary extending considerably beyond the orbit, its length more than half head.

f. [Body moderately slender, its depth 5 to $5\frac{1}{3}$ in body; head $3\frac{1}{3}$; snout slightly decurved in profile, $3\frac{1}{2}$ in head. Mouth a little oblique, the jaws equal. Maxillary extending beyond middle of head, to a distance behind eye, equal to an eye's diameter. Teeth in both jaws beserial laterally, in 3 series in front; those of the outer series somewhat enlarged; fins low, the longest dorsal spine half head; caudal shorter than head. Color brownish yellow; upper parts of head and body with small, irregularly placed brown spots and streaks; dorsals and caudal barred. D. IV to VI–16 or 17. A. 16 or 17.] (*Steindachner*) ..... Longipinne, 51.

ff. Body very long and slender, the depth $6\frac{2}{3}$ in length; head $4\frac{1}{6}$, long and low, rather pointed anteriorly. Mouth very large, oblique, the lower jaw slightly projecting; maxillary extending to middle of cheek, its length more than half head. Teeth in bands, slender, the outer somewhat enlarged. Eye $4\frac{1}{2}$ in head. Dorsal spines very slender and flexible. Caudal short. Light olivaceous; back, sides and upper fins speckled with dark olive; caudal with 3 or 4 dark cross-bars. D. VI–15. A. 12 ..... Ios, 52.

45. Gobiosoma ceuthœcum.

Gobiosoma ceuthœcum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 29 (Key West); Jordan, Proc. U. S. Nat. Mus., 1884, 141 (Key West); Jordan, Catalogue Fish. North America, 106, 1885 (name only).

Habitat.—West Indian fauna; Key West.

The single known specimen of this species was taken by Dr. Jordan from the cavity of a sponge at Key West. It has no intimate relation to the other species of the genus.

46. Gobiosoma histrio.

Gobiosoma histrio Jordan, Proc. U. S. Nat. Mus., 1884, 260 (Guaymas, Mexico); Jordan, Catalogue Fishes North America, 106, 1885 (name only).

Habitat.—Gulf of California.

The single known specimen of this species was sent to the U. S. National Museum from Guaymas, by Mr. H. V. Emeric. The species is closely related to the *Gobiosoma molestum* of the Gulf coast, differing chiefly in the more pronounced coloration.

47. Gobiosoma molestum.

Gobiosoma molestum Girard, Proc. Acad. Nat. Sci. Phila., 1858, 169 (Indianola, Tex.); Girard, U. S. & Mex. Bound. Survey, 27, plate 12, fig. 14, 1859, (Indianola, Tex.); Günther, Cat. Fish. Brit. Mus., iii, 556, 1861 (copied); Putnam, Amer. Nat. (Ohio R., near Louisville); Jordan, Man. Vert., Ed. 1, 1876, 246, Ed. 2–4, p. 257 (copied); Jordan & Gilbert, Syn. Fish. North America, 638, 1883 (copied).

Gobiosoma alepidotum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 297 (Laguna Grande, at Pensacola).

Gobiosoma bosci Jordan, Proc. U. S. Nat. Mus., 1884, 141 (Key West).

Habitat.—Gulf coast of United States.

This species seems to differ from *G. bosci* only in the less elongate form. A full series of specimens will doubtless show intergradations in this respect, and at the most *G. molestum* is probably only a southern representative or variety of *Gobiosoma bosci*. It is common in shallow waters along the coast from Key West to Texas. Professor Putnam's statement of its occurrence in the Ohio River is probably an error.

48. Gobiosoma bosci.

Gobius bosci Lacépède, Poissons, ii, 555, 1798, plate 16, fig. 1 (Charleston).

Gobiosoma bosci Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 613 (Charleston, S. C.); Jordan, Proc. U. S. Nat. Mus., 1884, 324 (Indian River, Fla.); Jordan, Catalogue Fish. North America, 106, 1885 (name only); Jenkins, Johns Hopkins Univ. Circular No. 43, 1885, 11 (Beaufort, N. C.); Jordan, Proc. U. S. Nat. Mus., 1886, 28 (Beaufort, N. C.).

Gobius alepidotus Bloch & Schneider, Syst. Ichth., 547, 1801 (after Lacépède); DeKay, Nat. Hist., New York, 160, plate xxiii, fig. 70, 1842 (New York); Uhler & Lugger, Fishes of Maryland, 84, 1876 (Sinepuxent Bay).

Gobiosoma alepidotum Gill, Cat. Fish. East Coast North America, 44, 1861; Gill, Proc. Acad. Nat. Sci. Phil., 1863, 269 (no specimen); Günther, Cat. Fish. Brit. Mus., iii, 85, 1861 (copied); Gill, Cat. Fish. East Coast North America, 21, 1873 (no specimen); Goode, Proc. U. S. Nat. Mus., 1879, 110 (east coast Florida); Jordan, Proc. U. S. Nat. Mus., 1880, 22 (St. John's River, Fla.); Jordan & Gilbert, Syn. Fish. North America, 638, 1883.

Gobius viridipallidus Mitchill, Trans. Lit. and Phil. Soc., New York, i, 379, plate i, fig. 8, 1814 (New York).

Habitat.—East coast of United States. Cape Cod to Florida.

This little fish is generally common on our Atlantic coast, especially southward in shallow grassy bays. The name *bosci*, first given it by Lacépède, has priority over the commonly used *alepidotum* of Bloch & Schneider.

49. Gobiosoma multifasciatum.

Gobiosoma multifasciatum Steindachner, Ichth. Beiträge, v. 183, 1870 (Lesser Antilles).

Habitat.—West Indian fauna; Lesser Antilles.

We know this species only from the description of Dr. Steindachner, who found it not uncommon about the Lesser Antilles.

50. Gobiosoma zosterurum.

Gobiosoma zosterurum Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 361 (Mazatlan); Jordan & Gilbert, Bull. U. S. Fish Com., 1882, 108 (Mazatlan); Jordan, Catalogue Fish. North America, 106, 1885 (name only).

Habitat.—Gulf of California; Mazatlan.

This species is known only from the type taken by Professor Gilbert at Mazatlan. The name *zosterurum* (belted tail) is intended to refer to the dark stripe on the caudal fin.

51. Gobiosoma longipinne.

Gobiosoma longipinne Steindachner, Ichth. Beiträge, viii, 27, 1879 (Las Animas, Gulf of California).

Habitat.—Gulf of California.

This species is known to us only from Dr. Steindachner's description. It differs widely from the foregoing species of the genus, and is probably an ally of the aberrant *G. ios.*

52. Gobiosoma ios.

Gobiosoma ios Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 437 (Vancouver's Island); Jordan & Gilbert, Syn. Fish. North America, 948, 1883 (Puget Sound); Jordan, Cat. Fish. North America, 106, 1885 (name only).

Habitat.—Waters about Puget Sound.

The types of this species, two in number, were taken by Professors Jordan and Gilbert in Saanich Arm, Vancouver's Island. They were found in the stomach of a specimen of *Hexagrammus asper*, taken in water of some depth.

The species has evidently very little affinity with the type of *Gobiosoma*, and when its skull is examined it may prove to be the type of a distinct genus, perhaps allied to *Gillichthys*.

17. GILLICHTHYS.

GILLICTHYS Cooper, Proc. Cal. Acad. Nat. Sci., 1863, 109 (*mirabilis*).
GILLIA Günther, Zoological Record, 1865 (name preoccupied), (*mirabilis*).
SACCOSTOMA (Guichenot MSS.), Sauvage, Bull. Sci. Philom. Paris, 1882, 171 (name preoccupied), (*gulosum*).

Type *Gillichthys mirabilis* Cooper.

This genus is distinguished not only by the prolongation of the maxillary, as in *Opisthognathus* and *Neoclinus*, but also by the form of the skull. Besides the single American species, the Asiatic *Gobius mystacinus* C. & V., and *Saccostoma gulosum* Guichenot, will probably be found to belong to it.

The clumsy name selected for this genus by Dr. Cooper can hardly be set aside on account of its barbarous construction, as Dr. Günther has suggested. Besides, the more euphonious substitute, *Gillia*, is preoccupied, as is also the still later *Saccostoma*.

ANALYSIS OF THE SPECIES OF GILLICHTHYS.

a. Body stout, somewhat compressed behind, broad and depressed anteriorly, its greatest depth 5 times in length. Head 3½ in length, broader than high, its width 1½; its depth 2 or more in its length. Eyes small, 6 to 7 in head; snout longer than eye, low, little decurved; interorbital area greater than eye. Maxillary variable, extending to base of pectoral in adults, broadened behind. Fold of lower lip extending its full length. Mouth very large, its angle extending to below posterior angle of orbit. Teeth all alike, small, fixed, in bands; the band of the lower jaw broader than that of upper. Scales small, cycloid, irregularly placed; largest from front of second dorsal backwards; decreasing in size forward. Head, breast, belly, and half of nape naked. Dorsal spines not filamentous, not as high as the soft rays, which are little more than half height of body. Caudal broad, short, rounded. Pectorals broad and rounded; their length half head, longer than ventrals. Dull olive, very finely marbled with darker; sides of head and maxillary finely punctate; fins olive; belly and ventrals yellowish. Dorsal, VI–12; anal, 12..... MIRABILIS, 51.

53. Gillichthys mirabilis.

Gillichthys mirabilis Cooper, Proc. Cal. Acad. Nat. Sci, 1863, 109; Steindachner, Ichth. Beiträge v. 147, 1876 (Oakland, Cal.); Lockington, Am. Naturalist, 1877, 474 (San Francisco, "Gulf of California"); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1880, 455 ("Puget Sound," San Francisco; Santa Barbara; San Pedro; San Diego); Rosa Smith, Fishes of San Diego Cal., 1880 (San Diego, Cal.); Jordan & Jouy, Proc. U. S. Nat., Mus. 1881, 9 (San Diego); Jordan & Gilbert, Proc. U. S. Nat. Mus, 1881, 53 (California, south of San Francisco); Jordan & Gilbert, Syn. Fish. North America, 636, 1883; Jordan, Catalogue Fish. North America, 106, 1885 (name only); Rosa Smith, West. American Scientist, 1885, 46 (San Diego, Cal.).

Habitat. Coast of California from San Francisco to San Diego.

This singular species is very abundant in the mud flats in shallow water along the coast of California. It burrows holes in the mud like a cray-fish, and it readily takes the hook baited with flesh or worm, when it is dropped into the mouth of the burrow. The locality, "Puget Sound," given in the above synonymy is based on error, and the locality "Gulf of California," given by Mr. Lockington, needs verification.

18. TYPHLOGOBIUS.

TYPHLOGOBIUS Steindachner, Ichth. Beitr., viii, 24, 1879 (*californiensis*).
OTHONOPS Rosa Smith, Proc. U. S. Nat. Mus., 1881, 19 (*eos=californiensis*).

Type, *Typhlogobius californiensis* Steindachner.

This singular group consists of blind gobies, living like slugs under rocks between tide marks. But one species is known.

ANALYSIS OF THE SPECIES OF TYPHLOGOBIUS.

a. Body subcylindrical, the males more compressed behind; greatest depth 6 times in length to base of caudal. Head very broad behind, its greatest width $\frac{2}{3}$ its length, which is $3\frac{1}{2}$ in body. Eye concealed, very small; distance from snout to anterior border of eye 5 in head. Interorbital space a mere ridge. Skin about mouth and eye very loose; a small papilla in front of nasal opening. Lower lip developed as a fold; another fold of skin behind it, bordered with fine cilia; behind this fold is a row of short, thick papillæ. Teeth in both jaws long, close set; those of the upper jaw in a broad band; the edge of the jaw rounded. Spinous dorsal remote from soft dorsal in male, connected with it by a low membrane; in female without any connection; soft dorsal much higher than spines; caudal broad, rounded; anal very short, inserted under sixth dorsal ray, coterminous with dorsal; pectorals little longer than ventrals, half head. Body naked; male with small tubercular plates irregularly placed. Dorsal II—12; anal 12; color uniform light pink ..... CALIFORNIENSIS, 54.

54. Typhlogobius californiensis.

Typhlogobius californiensis Steindachner, Ichth. Beiträge, viii, 24, 1879 (False Bay, San Diego, Cal.); Jordan & Gilbert, Syn. Fish. North America, 639, 1883 (San Diego, Cal.); Rosa Smith, Proc. U. S. Nat. Mus., 1883, 234 (Todos Santos Bay, Lower Cal.); Jordan, Catalogue Fish. North America, 106, 1885 (name only); Rosa Smith, West. American Scientist, 1885, 46 (San Diego, Cal.).

Othonops eos Rosa Smith, Proc. U. S. Nat. Mus., 1881, 19 (Point Loma, Cal.); Jordan and Gilbert, Proc. U. S. Nat. Mus., 1881, 53 (Point Loma, Cal.).

Habitat.—Coast of Southern California; vicinity of San Diego, and southward.

This little fish is very abundant under rocks at low-tide about Point Loma, near San Diego. Nearly all of the known specimens have been collected by Miss Rosa Smith. The specimens before us are from Pont Loma and Todos Santos.

19. TYNTLASTES.

TYNTLASTES Günther, Proc. Zool. Soc. London, 1862, 193 (Sagitta).

Type, *Amblyopus sagitta* Günther.

This genus consists of two species, both unknown to us.

ANALYSIS OF THE SPECIES OF TYNTLASTES.

a. [Dorsal, VI-15; anal, 15; depth, 8 in length to base of caudal; head, $4\frac{1}{2}$; eyes minute; jaws with a series of longish, wide set teeth; caudal fin black.] (*Günther*) ..... BREVIS, 55.

aa. [Dorsal, VI-21; anal, 21. Body and head elongate, compressed. Depth of body $9\frac{3}{5}$ in length, head, $5\frac{3}{5}$. Maxillary reaching to behind eye; teeth sub-horizontal, very small; scales becoming larger posteriorly. Caudal arrow-shaped, about one-fourth length of body; pectoral as long as ventral, half as long as head. Grayish, sides and below silvery; an ovate gray spot before each dorsal ray; caudal gray.] (*Günther*) ..... SAGITTA, 56.

55. Tyntlastes brevis.

Amblyopus brevis Günther, Proc. Zool. Soc., 1864, 151 (Pacific coast, **Panama**). Günther, Fish. Central America, 441, 1869 (copied).

Habitat.—Panama fauna.

This species is known to us only from the description of Dr. Günther.

56. Tyntlastes sagitta.

Amblyopus sagitta Günther, Proc. Zool. Soc., London, 1862, 193 (California).
Tyntlastes sagitta Jordan & Gilbert, Syn. Fish. North America, 639, 1883 (copied); Jordan, Catalogue Fish. North America, 106, 1885 (name only).

Habitat.—(Lower ?) California.

This species is known only from the description of Dr. Günther.

20. GOBIOIDES.

GOBIOIDES Lacépède, ii, 280, 1798 (*broussoneti*).

OGNICHODES Swainson, Nat. Hist., Class'n Anim., ii, 1839, 183 and 278 (*broussoneti*).

Type, *Gobioides broussoneti* Lacépède.

This genus seems to be represented within the region covered by this paper, by a single species, widely distributed in the tropical rivers. A second species, *Gobioides peruanus* Steindachner, occurs in Peru.

From *Taenioides* (=*Amblyopus*) the genus *Gobioides* seems to be distinguished by much smaller number of rays in its vertical fins.

ANALYSIS OF THE SPECIES OF GOBIOIDES.

a. Body elongate, head 5¼ to 7 in length; caudal 3½ to 5 in length. Mouth oblique, maxillary extending beyond eye. Teeth in bands; the outer series enlarged, shorter and closer set than in *Gobioides peruanus*. Eye small, 7 to 10 times in head (half as large as in specimens of *Gobioides peruanus* of same size); interorbital area 1 to 1⅔ diameter of eye. Scales twice as large as in *peruanus*, those of the anterior part of body not imbricated, much smaller than those of posterior part. Violet bars extending downward and forward on the upper half of body; sometimes a violet spot with a lighter or darker dot at the end of the bars. Head marbled or spotted with dark violet or brown. Dorsals united, vii, 16. Anal i, 16.....BROUSSONETI, 57.

57. Gobioides broussoneti.

Gobioides broussoneti Lacépède, ii, 280, 1798 (probably from Surinam); Cuvier, "Règne Anim. Ill., Poiss., plate 80, f. 3, 1818" (not of Cuv. & Val.? nor of Günther, whose species is the Pacific coast *G. peruanus*).
Amblyopus broussoneti Steindachner, Fisch-Arten um Guayaquil, 43, 1879 (Cuba, Amazon, Rio Janeiro).
? *Gobius brasiliensis* Bloch & Schneider, Syst. Ichth., 1801, 69 (on a drawing by Prince Maurice).
Gobius brasiliensis Cuv. & Val., Hist. Nat. Poiss., xii, 121, 1837 (Martinique).
Gobius oblongus Bloch & Schneider, Syst. Ichth., 548, 1801 (based on Lacépède).
Gobioides barreto Poey, Memorias de Cuba, 282, 1861 (Cuba); Poey, Synopsis Pisc. Cub., 394, 1868 (Cuba); Poey, Enum. Pisc. Cub., 125, 1876 (Cuba).
? *Amblyopus mexicanus* O'Shaughnessy, "Ann. Mag. of Nat. Hist., ser. iv, vol. xv, 1875, 147 (Mexico.").

Habitat.—Fresh waters of the West Indies, Eastern Mexico and South America.

We have had no opportunity to study this species, and have drawn our knowledge of it chiefly from Steindachner. The original type of the species, belonging to a collection "given by Holland to France," probably came from Surinam, and, therefore, probably belongs to this species, rather than to *G. peruanus*. The *Gobioides barreto* is doubtless the same, as Steindachner has shown. The description of *Amblyopus mexicanus* we have not seen, and we take the reference to it from Steindachner. The type of *Gobius brasiliensis* Cuvier & Valenciennes, examined by Dr. Jordan in Paris, apparently belongs to *Gobioides broussoneti*. It is probable that the *Gobius brasiliensis* of Bloch & Schneider is the same, although they give the fin rays of their specimen as D. XVIII–21, A. 19.

NOTES ON SKELETONS.

Lophogobius cyprinoides.

Skull very broad and short; distance from posterior edge of orbit to occiput $1\frac{2}{3}$ in its width; an angle formed at the occiput. A low, median crest, highest behind. Double crests of temporal region joining at the upper posterior angles of the eyes and forming a bridge over the interorbital area. The crests end abruptly above the anterior part of the orbit, forming a decided angle. The bridged interorbital leaves a large foramen in front of this angle. A slight ridge along the middle of the interorbital.

Vertebræ, 11+15.

Teeth in the upper jaw in a band, those of the outer series large, all of the same size, the inner series minute; those of the lower jaw in a band, the outer series somewhat enlarged, the innermost teeth strongly recurved, remote, somewhat enlarged; other teeth minute.

Gobius soporator.

Skull posteriorly much as in *L. cyprinoides*, but the median crest reduced to a slight ridge. The lateral crests very high and closely approximated, rising obliquely outwards; the inner crests meet behind the eye, the outer ones form a very high border about the orbit. Interorbital very narrow and deep, with a median ridge.

Vertebræ, 11 + 16.

Teeth of the upper jaw in a broad band, those of the outer series much enlarged, the inner ones minute, brush-like. Teeth of the lower jaw in a band, the inner and outer series equally enlarged, the median ones minute. A few of the teeth of the inner series near the angle of the mouth specially enlarged, those of the outer series in the same region smaller or absent.

Gobius boleosoma.

Skull rounded behind, no ridges nor crests. The crests at the side minute. Interorbital very narrow.

Gobius oceanicus.

Skull behind eye broad and short, its length 1½ in width, no decided ridges nor crests; lateral crests large and stout behind, minute forward. Interorbital area narrow, deeply grooved, with a median ridge.

Vertebræ, 11 + 15.

Chonophorus taiasica.

Skull rounded behind, with a very short crest in its middle; lateral crests high and thin, converging into one opposite the insertion of the suprascapula. The inner crests do not meet behind the eye; the outer ones extend around the orbit. A low, blunt ridge between the posterior corners of the orbit, becoming much higher forward, continued as the ethmoid and ending abruptly some distance in advance of the orbit.

Teeth in the upper jaw in a few series, those of the outer series many times larger than the others, which are minute; those of the lower jaw all alike small, in a band.

Microgobius gulosus.

Skull flattened behind, with a median ridge extending from the eyes back to end of skull. Double crests border the skull in front and on sides. The inner ones meet in front of median crest. Interorbital very narrow and deeply grooved, with a median ridge. Frontal bones very thin and fragile.

Vertebræ, 11 + 15.

Teeth on both jaws in narrow bands, all alike.

Microgobius signatus.

Skull rounded, very fragile. A median crest which is highest between the eyes. Lateral crests developed; the inner ones meeting above the posterior part of the eye. Interorbital comparatively broad, the median crest ending above the anterior part of the orbit.

Vertebræ, 14 + 15.

Teeth in both jaws, in two or three series, the outer series of the upper jaw enlarged and recurved, the inner ones minute. The outer series of the lower jaw smaller than those of the upper jaw, the one nearest angle of mouth an enlarged canine.

Gobiosoma molestum.

Skull flattish, with a slight median keel. Lateral crests developed, lower and stronger than in *Gobius*. Interorbital very narrow, bounded by two minute crests. Bones of the skull very weak and fragile.

Vertebræ, 12 + 15.

Teeth in both jaws recurved, in two or three series.

Gillichthys mirabilis.

Skull not abruptly widened behind eye, as in *Gobius*, being triangular posteriorly. No lateral ridges; a strong median keel; a short trans-

verse crest behind orbit. Interorbital not deeply grooved, with a blunt median ridge. Orbit not bordered by any prominent ridges.

Vertebræ 15 + 17.

Teeth in both jaws, close set, in bands, all alike.

Typhlogobius californiensis.

Skull highest at its posterior end, depressed forward; the bones all thick and strong. No lateral crests; a median keel which is lowest behind. Orbit not bounded by any ridges. Interorbital a mere ridge. Two keels diverge from the posterior end of the median keel to the insertion of the suprascapula. Premaxillaries and mandible very long.

Vertebræ 17 + 13.

Teeth of the upper jaw all alike, in a broad band, those of the lower jaw in a narrow band, the inner ones apparently larger.

List of nominal species of North American Gobies, with identifications.

[Tenable specific names are in italics.]

Nominal species.	Date.	Identification.
Gobius *oceanicus* Pallas	1769	Gobius oceanicus.
Gobius *cyprinoides* Pallas	1770	Lophogobius cyprinoides.
Gobius lanceolatus Bloch	1783	Gobius oceanicus.
Gobius *plumierii* Bloch	1786	Sicydium plumieri.
Gobius *pisonis* Gmelin	1788	Eleotris pisonis.
Sciæna *maculata* Bloch	1792	Dormitator maculatus.
Gobius amorea Walbaum	1792	Eleotris pisonis.
Gobius *bosci* Lacépède	1798	Gobiosoma bosci.
Gobioides *broussoneti* Lacépède	1798	Gobioides broussoneti.
Gobiomorus *dormitor* Lacépède	1798	Gobiomorus dormitor.
Gobius brasiliensis Bloch & Schneider	1801	? Gobioides broussoneti.
Batrachus gnavina Bloch & Schneider	1801	Gobiomorus dormitor.
Platycephalus dormitator Bloch & Schneider	1801	Gobiomorus dormitor.
Gobius alepidotus Bloch & Schneider	1801	Gobiosoma bosci.
Gobius oblongus Bloch & Schneider	1801	Gobioides broussoneti.
Gobius viridipallidus Mitchill	1814	Gobiosoma bosci.
Gobius *taiasica* Lichtenstein	1822	Chonophorus taiasica.
Eleotris *latifrons* Richardson	1837	Dormitator latifrons.
Gobius *soporator* Cuvier & Valenciennes	1837	Gobius soporator.
Gobius *flavus* Cuvier & Valenciennes	1837	Chonophorus flavus.
Gobius banana Cuvier & Valenciennes	1837	Chonophorus taiasica.
Gobius martinicus Cuvier & Valenciennes	1837	Chonophorus taiasica.
Gobius bacalaus Cuvier & Valenciennes	1837	Gobius oceanicus.
Gobius *smaragdus* Cuvier & Valenciennes	1837	Gobius smaragdus.
Gobius brasiliensis Cuvier & Valenciennes	1837	Gobioides broussoneti.
Gobius cristagalli Cuvier & Valenciennes	1837	Lophogobius cyprinoides.
Eleotris gyrinus Cuvier & Valenciennes	1837	Eleotris pisonis.
Eleotris *guavina* Cuvier & Valenciennes	1837	Guavina guavina.
Eleotris mugiloides Cuvier & Valenciennes	1837	Dormitator maculatus.
Eleotris *smaragdus* Cuvier & Valenciennes	1837	Eleotris smaragdus.
Eleotris sima Cuvier & Valenciennes	1837	Dormitator maculatus.
Gobius gracilis Girard	1854	Lepidogobius lepidus.
Gobius *newberrii* Girard	1856	Lepidogobius newberrii.
Ctenogobius *fasciatus* Gill	1858	Gobius fasciatus.
Gobionellus hastatus Girard	1858	Gobius oceanicus.
Gobius *lyricus* Girard	1858	Gobius lyricus.
Gobius würdemanni Girard	1858	? Gobius lyricus.
Gobius catulus Girard	1858	Gobius soporator.
Gobius *gulosus* Girard	1858	Microgobius gulosus.
Gobiosoma *molestum* Girard	1858	Gobiosoma molestum.
Eleotris somnolentus Girard	1859	Eleotris pisonis.
Evorthodus *breviceps* Gill	1859	Evorthodus breviceps.
Gobius *lepidus* Girard	1859	Lepidogobius lepidus.
Philypnus *lateralis* Gill	1860	Gobiomorus lateralis.
Gobius *mexicanus* Günther	1861	Chonophorus mexicanus.
Gobius *paradoxus* Günther	1861	Gobius paradoxus.
Gobius *seminudus* Günther	1861	Gobius seminudus.
Gobius *sagittula* Günther	1861	Gobius sagittula.
Eleotris omocyaneus Poey	1861	Dormitator maculatus.
Eleotris gundlachi Poey	1861	Dormitator maculatus.
Erotelis valenciennesi Poey	1861	Erotelis smaragdus.
Chonophorus bucculentus Poey	1861	Chonophorus taiasica.
Gobius mapo Poey	1861	Gobius soporator.

List of nominal species of North American Gobies, with identifications—Continued.

Nominal species.	Date.	Identification.
Gobius lacertus Poey	1861	Gobius soporator.
Sicydium siragus Poey	1861	Sicydium plumieri.
Smaragdus valenciennesi Poey	1861	Gobius smaragdus.
Smaragdus costalesi Poey	1861	Gobius lyricus.
Smaragdus *stigmaticus* Poey	1861	Gobius stigmaticus.
Gobioides barreto Poey	1861	Gobioides broussoneti.
Gobius lineatus Poey	1861	Gobius sp.
Rhinogobius contractus Poey	1861	Chonophorus taiasica.
Amblyopus *sagitta* Günther	1862	Tyntlastes sagitta.
Dormitator microphthalmus Gill	1863	Dormitator latifrons.
Coryphopterus *glaucofrænum* Gill	1863	Gobius glaucofrænum.
Gobius carolinensis Gill	1863	Gobius soporator.
Dormitator lineatus Gill	1863	Dormitator latifrons.
Gillichthys *mirabilis* Cooper	1863	Gillichthys mirabilis.
Eleotris picta Kner & Steindachner	1864	Eleotris pisonis.
Eleotris *seminuda* Günther	1864	Gymneleotris seminuda.
Eleotris *longiceps* Günther	1864	Gobiomorus longiceps.
Amblyopus *brevis* Günther	1864	Tyntlastes brevis.
Gobius *poeyi* Steindachner	1867	Gobius poeyi.
Gobius brunneus Poey	1868	Gobius sp.
Gobius dolichocephalus Cope	1869	Chonophorus taiasica.
Gobiosoma *multifasciatum* Steindachner	1869	Gobiosoma multifasciatum.
Eleotris *amblyopsis* Cope	1870	Eleotris amblyopsis.
Culius perniger Cope	1870	Eleotris pisonis.
Amblyopus mexicanus O'Shaughnessy	1875	Gobioides broussoneti.
Microgobius *signatus* Poey	1875	Microgobius signatus.
Gobius *kraussii* Steindachner	1879	Gobius kraussi.
Typhlogobius *californiensis* Steindachner	1879	Typhlogobius californiensis.
Gobiosoma *longipinne* Steindachner	1879	Gobiosoma longipinne.
Culius *belizanus* Sauvage	1879	Eleotris belizana.
Othonops eos Rosa Smith	1881	Typhlogobius californiensis.
Gobiosoma *zosterurum* Jordan & Gilbert	1881	Gobioson.a zosterurum.
Culius *æquidens* Jordan & Gilbert	1881	Eleotris æquidens.
Gobius *nicholsi* Bean	1881	Gobius nicholsi.
Gobius *emblematicus* Jordan & Gilbert	1881	Microgobius emblematicus.
Gobius *boleosoma* Jordan & Gilbert	1882	Gobius boleosoma.
Ioglossus *calliurus* Bean	1882	Ioglossus calliurus.
Gobius *stigmaturus* Goode & Bean	1882	Gobius stigmaturus.
Gobiosoma *ios* Jordan & Gilbert	1882	Gobiosoma ios.
Gobius *encæomus* Jordan & Gilbert	1882	Gobius encæomus.
Gobius *thalassinus* Jordan & Gilbert	1882	Microgobius thalassinus.
Gobiosoma *ceuthœcum* Jordan & Gilbert	1884	Gobiosoma ceuthœcum.
Gobiosoma *histrio* Jordan & Gilbert	1884	Gobiosoma histrio.
Sicydium antillarum Grant	1884	Sicydium plumieri.
Sicydium *gymnogaster* Grant	1884	Sicyopterus gymnogaster.
Sicydium *salvini* Grant	1884	Sicyopterus salvini.
Gobius *shufeldti* Jordan & Eigenmann	1886	Gobius shufeldti.

RECAPITULATION.

(U, Atlantic coasts of United States; C, California fauna; W, West Indian fauna; P, Panama fauna.)

1. IOGLOSSUS Bean.
   1. *Ioglossus calliurus* Bean. U.
2. GOBIOMORUS Lacépède.
   2. *Gobiomorus lateralis* Gill. P.
   3. *Gobiomorus dormitor* Lacépède. W, U.
   4. *Gobiomorus longiceps* Günther. W.
3. DORMITATOR Gill.
   5. *Dormitator maculatus* Bloch. W, U.
   6. *Dormitator latifrons* Richardson. P.
4. GUAVINA Bleeker.
   7. *Guavina guavina* Cuv. & Val. W.
5. ELEOTRIS Gronow.
   8. *Eleotris amblyopsis* Cope. W, U.
   9. *Eleotris pisonis* Gmelin. W, U.
   10. *Eleotris æquidens* Jordan & Gilbert. P.
   11. *Eleotris belizana* Sauvage. W.

6. EROTELIS Poey.
   12. *Erotelis smaragdus* Cuv. & Val. W, U.
7. GYMNELEOTRIS Bleeker. (Doubtful genus, imperfectly known.)
   13. *Gymneleotris seminuda* Günther. P.
8. SICYDIUM Cuvier & Valenciennes.
   14. *Sicydium plumieri* Bloch. W. (Perhaps includes two species.)
9. SICYOPTERUS Gill. (Genus not clearly defined.)
   15. *Sicyopterus gymnogaster* Grant. P.
   16. *Sicyopterus salvini* Grant. P.
10. EVORTHODUS Gill.
   17. *Evorthodus breviceps* Gill. W.
11. LOPHOGOBIUS Gill.
   18. *Lophogobius cyprinoides* Pallas. W.
12. GOBIUS (Artedi) Linnæus.
   19. *Gobius soporator* Cuv. & Val. W, U, P.
   20. *Gobius nicholsi* Bean. C. (Perhaps adult of the next.)
   21. *Gobius glaucofrænum* Gill. C.
   22. *Gobius stigmaturus* Goode & Bean. U.
   23. *Gobius shufeldti* Jordan & Eigenmann. U.
   24. *Gobius boleosoma* Jordan & Gilbert. U.
   25. *Gobius fasciatus* Gill. W. (Species imperfectly known.)
   26. *Gobius stigmaticus* Poey. W, U.
   27. *Gobius encœomus* Jordan & Gilbert. U.
   28. *Gobius lyricus* Girard. W, U.
   29. *Gobius smaragdus* Cuv. & Val. W, U.
   30. *Gobius poeyi* Steindachner. W.
   31. *Gobius kraussi* Steindachner. W.
   32. *Gobius sagittula* Günther. P.
   33. *Gobius oceanicus* Pallas. W, U.
   34. *Gobius paradoxus* Günther. P.
   35. *Gobius seminudus* Günther. P.
13. CHONOPHORUS Poey. (Perhaps identical with the Asiatic *Rhinogobius*.)
   36. *Chonophorus flavus* C. & V. W.
   37. *Chonophorus taiasica* Lichtenstein. W, P.
   38. *Chonophorus mexicanus* Günther. W.
14. LEPIDOGOBIUS Gill.

§ *Lepidogobius*.

   39. *Lepidogobius lepidus* Girard. C.

§ *Eucyclogobius* Gill.

   40. *Lepidogobius newberrii* Girard. C.
15. MICROGOBIUS Poey.
   41. *Microgobius gulosus* Girard. U.
   42. *Microgobius thalassinus* Jordan & Gilbert. U.
   43. *Microgobius signatus* Poey. W.
   44. *Microgobius emblematicus* Jordan & Gilbert. P.
16. GOBIOSOMA Girard.
   45. *Gobiosoma ceuthœcum* Jordan & Gilbert. U.
   46. *Gobiosoma histrio* Jordan. P.
   47. *Gobiosoma molestum* Girard. U. (Probably a variety of the next.)
   48. *Gobiosoma bosci* Lacépède. U.
   49. *Gobiosoma multifasciatum* Steindachner. W.
   50. *Gobiosoma zosterurum* Jordan & Gilbert. P.
   51. *Gobiosoma longipinne* Steindachner. P.
   52. *Gobiosoma ios* Jordan & Gilbert. C.

17. GILLICHTHYS Cooper.
    53. *Gillichthys mirabilis* Cooper. C.
18. TYPHLOGOBIUS Steindachner.
    54. *Typhlogobius californiensis* Steindachner. C.
19. TYNTLASTES Günther.
    55. *Tyntlastes brevis* Günther. P.
    56. *Tyntlastes sagitta* Günther. P.
20. GOBIOIDES Lacépède.
    57. *Gobioides broussoneti* Lacépède. W.

INDIANA UNIVERSITY, *September* 17, 1886.

DESCRIPTION OF A NEW SUBSPECIES OF CYCLORHIS FROM YUCATAN.

By ROBERT RIDGWAY.

Cyclorhis flaviventris yucatanensis, subsp. nov.

SUBSP. CHAR.—Similar to *C. flaviventris* LAFR., but lower parts much paler yellow, olive-green of upper parts duller, and ash on top of head without any brownish tinge.

Adult female (type, No. 37917, ♀ ad., U. S. Nat. Mus., Merida, Yucatan, Feb. 19, 1865; A. Schott): Crown, occiput, and hind neck dull ash-gray, bordered anteriorly and laterally by a broad superciliary stripe of light rufous, this crossing anterior portion of forehead; rest of upper parts uniform, rather light, grayish olive-green; sides of head (including malar region and auriculars) light ash-gray; entire lower parts pale yellow. Wing 3.25, tail 2.70, culmen .75, bill from nostril .42, tarsus .90.

The specimen selected as the type is decidedly the most deeply colored of three, two others collected by Mr. George F. Gaumer, one at Temax, in June, the other at Merida, in March, being still more unlike Mexican and Guatemalan specimens (four each) of *C. flaviventris* proper. In the example collected in June, the forehead and superciliary stripes are dull ochraceous, with only a slight rufous tinge; but in the one taken in March the color is deeper, being, in fact, exactly intermediate in tint between that of the other two specimens. The yellow of the lower parts, however, is exactly the same in all, and very much paler than in the palest of the eight examples of true *C. flaviventris* with which they have been compared.

DESCRIPTION OF A NEW SPECIES OF MYIARCHUS, PRESUMABLY FROM THE ORINOCO DISTRICT OF SOUTH AMERICA.

By ROBERT RIDGWAY.

Myiarchus coalei, sp. nov.

Sp. CHAR.—Most resembling *M. nigriceps* SCL., but much smaller, with throat and chest deeper ash, belly and flanks paler yellow, back darker olive, both webs of tail-feathers edged with fulvous, and middle wing-coverts conspicuously tipped with pale buffy or buffy whitish.

Adult (type No. 106040, U. S. Nat. Mus.): Entire pileum sooty black; back, scapulars, lesser wing-coverts, rump, and upper tail-coverts plain dark olive, darkest anteriorly; wings and tail blackish; middle wing-coverts abruptly and very distinctly tipped with buffy whitish; greater coverts edged with light olive, but without light tips; tertials edged with buffy white; secondaries edged, except near base, with pale rusty or fulvous; tail-feathers edged on both webs with pale rusty or fulvous; lores, malar region, chin, throat, and chest ash-gray, darkest laterally; rest of under parts pale sulphur-yellow; bill and feet wholly deep black. Length (skin) 5.50, wing 2.75, tail 2.75, exposed culmen .56, width of bill at frontal feathers .30, tarsus .70.

The type specimen was kindly presented to the National Museum by Mr. H. K. Coale, of Chicago, to whom I take great pleasure in dedicating the species.

ON A PROBABLE HYBRID BETWEEN DRYOBATES NUTTALLII (GAMB.) AND D. PUBESCENS GAIRDNERII (AUD.).

By ROBERT RIDGWAY.

No. 39456, U. S. National Museum collection of birds, is labeled and has always passed for, "*Picus nuttallii;*" but a recent critical examination of the extensive series of that species and its several allies in the national collection has resulted in the discovery of such a number of abnormal characters possessed by the specimen in question as to lead irresistibly to the conclusion that it cannot be referred, without qualification, to that, nor, indeed, to any other known species. That it is a new or distinct species is very strongly discredited by the circumstance that in every character wherein it departs from the diagnostic characters of *D. nuttallii* it agrees with *D. pubescens gairdnerii*—every feature of size, form, and coloration being exactly intermediate between the two, and thus justify the theory of its being a veritable hybrid between the two species. In order to render this more clear to the reader the facts may be tabulated as follows:

Measurements.

	Wing.	Tail.	Culmen.	Exposed culmen.
D. nuttallii (No. 98450, ♂ ad., Red Bluff, Cal.)	4.10	2.80	.98	.80
Supposed hybrid (No. 39456, ♂ ad., San Francisco, Cal.)	3.85	2.70	.85	.69
D. gairdnerii (No. 3898, ♂ ad., California)	3.70	2.40	.80	.65

Coloration.

	D. nuttallii.	Supposed hybrid.	D. gairdnerii.
Crown	Black, conspicuously streaked with white.	Black, with a few white streaks, next to red occipital patch.	Entirely uniform black.
Red occipital patch	.70–.75 wide at widest part.	.70–.80 wide at widest part.*	.30 wide at widest part.
Back	Regularly barred with black and white, the bars of the former color rather broader.	Irregularly barred and transversely spotted with white, the white bars considerably broader than the black ones, and anteriorly broken or modified into large spots, some of them longitudinal in direction.	Broadly striped down middle with white.
Middle wing-coverts	Conspicuously spotted with white.	Plain black	Plain black.
Greater wing-coverts	Crossed by two rows of large white spots (the first concealed by middle coverts).	The three or four middle feathers each with one small white spot, the rest plain black.	The two middle feathers each with one small white spot, the rest plain black.

* The apparently greater width of the red occipital patch in the supposed hybrid than in *D. nuttallii* is no doubt owing to the different position of the head in the two skins, that of the former having the head bent at a right angle to the body, while the latter has it straightened out on the same line. In two specimens of *D. nuttallii* which have the head bent in the same way as in the supposed hybrid, the width (lengthwise) of the red patch is 1.00 and 1.10 respectively.

Coloration—Continued.

	D. nuttallii.	Supposed hybrid.	D. gairdnerii.
Tertials	Broadly banded or transversely spotted with white, nearly all of the white spots crossing or touching the shaft.	Irregularly spotted with white, none of the spots touching the shaft.	With still fewer white spots, none of them touching the shaft.
Sides of breast	Marked with large wedge-shaped, tear-shaped, and otherwise formed spots and streaks of black.	Marked with a very few, mostly indistinct, black streaks.	Entirely immaculate.
Sides	Marked with large black spots, mostly of roundish form.	Sparsely and indistinctly streaked, like sides of breast.	Entirely immaculate.
Flanks	Conspicuously barred and transversely spotted with black.	Indistinctly spotted and streaked with blackish.	Entirely immaculate.
Under tail-coverts	Broadly barred with black.	More narrowly barred with black on longer feathers, marked with sagittate spots on shorter ones.	Marked with sagittate spots on longer feathers, the shorter ones immaculate.

DESCRIPTION OF AN APPARENTLY NEW SPECIES OF PICOLAPTES, FROM THE LOWER AMAZON.

By ROBERT RIDGWAY.

Picolaptes rikeri, sp. nov.

SP. CHAR.—*Adult male:* Head and neck streaked with deep black and pure white, the streaks narrowest on auriculars, the white ones narrower on pileum and cervix, broader on chin and throat, where the black is reduced to a narrow edging to the feathers; remaining lower parts black, varied with white, the markings changing gradually from an irregular rhomboid and guttate longitudinal form on chests, to regular transverse bars on lower tail-coverts, where the white bars are decidedly narrower than the black ones; back, scapulars, wing-coverts, tertials, rump, upper tail-coverts, and tail, uniform bright rufous, the feathers of back with slightly paler shafts; secondaries with outer webs partly or wholly rufous; alula, primary-coverts, primaries, and inner webs of secondaries, plain dull black. Length (skin), 8 inches; wing, 4.10; tail, 3.65; culmen (exposed), 1.20; bill from nostril, .78; tarsus, .80.

Type, No. 109, 221, U. S. National Museum, Diamantina, near Santarem, Lower Amazons, August 1, 1884; C. B. Riker, collector.

This handsome species, of very striking appearance, is entirely different in coloration from any Dendrocolaptine bird with which I am acquainted or of which I have been able to find a description. The type specimen, the only one obtained, was kindly presented to the National Museum by Mr. C. B. Riker, of New York City, after whom I take pleasure in naming it.

ON THE STATUS OF SYNTHLIBORAMPHUS WUMIZUSUME AS A NORTH AMERICAN BIRD.

By LEONHARD STEJNEGER.

The claim of *Synthliboramphus wumizusume* to be regarded a North American bird rests solely on the three specimens enumerated by Mr. Cassin in Baird's "Birds of North America," p. 917, and since Cooper and Suckley, in 1860 (Rep. Expl. Surv. R. R. Pacif., Vol. XII, Book II, part iii, p. 287), reported this species "quite common during the late fall and winter months on Puget Sound," and residing, "during winter, in the sound and bays of the Territory [Washington] in large numbers, though not gregarious," no trustworthy collector has met with Temminck's Murrelet in American waters, that I am aware of.

One of the specimens referred to above, a fragment received from the late Mr. J. Gould as coming from the "northwest coast of America," seems to be no longer in existence. The other two I have examined carefully, with the result that I find them to be nothing else than winter specimens of the common Starik, or "Ancient Murrelet" (*Synthliboramphus antiquus*). This is especially true of No. 5987, collected by Dr. J. G. Cooper at Fort Gamble, W. T., which in every respect, color and dimensions, closely agrees with typical *S. antiquus*. Equally typical is another specimen in the collection of the National Museum, No. 68351, from a much more southern locality, collected, as it was, by Prof. W. H. Dall, "off Monterey Bay, Cal.," January 24, 1874. No. 9911, collected by Dr. Cooper at Shoalwater Bay, W. T., has the bill slightly longer (about $1\frac{1}{2}^{mm}$) than the other specimens, and the middle toe a little shorter (about $1\frac{3}{4}^{mm}$) than usual; but otherwise it does not differ, and the shape of the bill is that of *S. antiquus*, being very compressed anteriorly.

Until authenticated and undoubted American specimens are found, it may be expedient to remove *Synthliboramphus wumizusume* to the "Hypothetical List" (A. O. U. Check L., p. 347). It is a case in many respects completely paraliel to that of *Cepphus carbo*.

SMITHSONIAN INSTITUTION, *October* 9, 1886.

Since the above was written, I have examined a specimen in the collection of the Philadelphia Academy of Sciences, labeled *S. wumizusume*. It was collected in Alaska, and presented by Professor George Davidson. It is undoubtedly a *S. antiquus*.

NOVEMBER 16, 1886.

NOTES ON TYPICAL SPECIMENS OF FISHES DESCRIBED BY CUVIER AND VALENCIENNES AND PRESERVED IN THE MUSÉE D'HISTOIRE NATURELLE IN PARIS.

By DAVID STARR JORDAN.

The writer spent two weeks of the month of July, 1886, in the museum at Paris, in the examination of the original types of species of fishes described by Cuvier and Valenciennes. The most important of the notes thus made, with the conclusions to be drawn from them, are given in the present paper. A few notes on specimens in the British Museum are also included.

The writer wishes again to express his many obligations to Dr. Léon Vaillant and to M. Alexandre Thominot, of the Musée d'Histoire Naturelle, for assistance in his work as well as for many personal favors.

1. Engraulis argyrophanus. (Cuv. & Val., xxi, 49, 1848.)

Five specimens in fair condition; length about .10^{m}. "Equatorial Ocean: Kühl and Van Hasselt."

Form resembling that of *Stolephorus ringens*. Body slender, not much compressed; the abdomen scarcely compressed and not serrate. Head slim and pointed, the snout much protruding. Teeth very small in both jaws. Opercle short, 3 in head. Snout 5 in head. Eye, 4½. Gill-rakers very long. Caudal peduncle slender. Insertion of dorsal scarcely nearer caudal than snout. Ventral short, inserted before dorsal. Sides of body abruptly silvery, the white band very wide, forming half the depth of the fish.

Head, 4 in length to base of caudal. Depth, 5⅘. Lat. l. about 45. Anal rays, 1.16.

These specimens agree with the types of *Stolephorus eurystole* from Wood's Holl, Mass., in all respects excepting the number of anal rays—1.16 in *S. argyrophanus* and 1.18 in *S. eurystole*.

It is not likely that this will prove to be a constant difference, and it is probable that all belong to one species, which should stand as STOLEPHORUS ARGYROPHANUS (Cuv. & Val.).

2. Saurus synodus. (Cuv. & Val., xxii, 477, 1849.)

Two specimens in fair condition, the largest about .18^{m} in length. Bahia: Blanchet.

This is apparently a species distinct from all those indicated by Meek (Proc. Ac. Nat. Sci. Phila., 1884, 130).

Top of head quite warty, marked with radiating and with cross streaks of warts. Interorbital space concave, marked with small warts. Supraorbital with a conspicuous bony ridge. Palatine teeth long and slender, much slenderer than the teeth in the jaw and almost in one series. Eye 5⅔ in head, snout 4. Maxillary 1⅗. Pectoral, 2¼. Ven-

tral $1\frac{1}{10}$. Head $3\frac{1}{2}$ in length, depth 7. Dorsal rays 1.11. Anal 1.8, its base being very short. Scales, 5 or 6–58–8.

Body much mottled and vermiculated with darker and crossed by about 15 dark half-bands, which are turned a little forward. Head dotted. A very little dusky on the scapular region, but apparently no distinct spot. Dorsal and anal somewhat mottled, the other fins plain.

The *Saurus gracilis* from the Sandwich Islands (type examined: Quoy and Gaimard) is quite different from this, being pale in color, with high dorsal and the palatine teeth in two bands. It is, in fact, as Dr. Günther has indicated, a species of *Saurida*.

Saurus synodus agrees fairly with Günther's description of the East Indian *Saurus varius*. It is not impossible that it is the original *Esox synodus* of Linnæus, the scanty description of which agrees with it in the small number of the anal rays. The *Saurus intermedius* of Spix agrees better with this species than with *Synodus anolis* in most respects, but in its number of anal rays (12) it corresponds better with the latter. The *Saurus atlanticus* of Johnson agrees also in many respects with this *Saurus synodus*.

The species called *Synodus intermedius* by Poey (Enum. Pisc. Cubens, 1875, 143) and by Meek (Proc. Ac. Nat. Sci. Phila., 1884, 133) is evidently not the original *intermedius* of Spix, and it is apparently as yet nameless. It may therefore stand as SYNODUS POEYI (sp. nov.), the specimens described by Mr. Meek and collected by myself in Havana being taken as its type.

The nomenclature of these fishes is still in a confused condition, and until better series can be compared, the *Saurus synodus* of Cuv. & Val. may stand under the oldest name supposed to belong to it, as SYNODUS SYNODUS (Linnæus).

The Southern range of *Synodus fœtens* is yet to be definitely ascertained. One or both of the West Indian names (*ruber*, *longirostris*), supposed to belong to it, may have been intended for *Synodus spixianus*.

Synodus saurus L. (*Saurus griseus* Lowe=*Saurus lacerta* Cuv. & Val.) is distinct from the American species, although allied to *Synodus fœtens*. Scales 4–64–5, the cross series being fewer than in *S. fœtens*.

3. **Fundulus fonticola.** (Cuv. & Val., xviii, 198, 1846.)

One specimen in poor condition, .05^{m} long, from Porto Rico; Plée.

A true *Fundulus*, the dorsal fin being inserted in front of the anal, and both fins quite small. Teeth in a broad band, the outer considerably larger and stout, but not long. Head broad, not very much depressed. Body plump, with long caudal peduncle. Colors entirely lost. Scales 37.

This larger specimen is apparently the type of the species. The smaller ones in the same bottle are apparently *Gambusias*. D. 8; A. 9. Scales 33; the dorsal inserted behind the anal.

The *Fundulus* being apparently a valid species, may still stand as FUNDULUS FONTICOLA.

4. Fundulus cingulatus. (Cuv. & Val., xviii, 197, 1846.)

One specimen in poor condition, .07m. North America: Castelnau.

A *Zygonectes*. Head broad and flat. Eye large, 3 in head. Distance from front of dorsal to caudal half the distance to front of eye. Teeth rather strong. Caudal long. D. 7; A. 8. Scales about 33–10, but as some are lost, this count is uncertain. Head, $3\frac{2}{3}$ in length; depth, $4\frac{1}{2}$.

Body crossed by (about 16) narrow cross-bands, which are quite distinct, and narrower than the interspaces. Region below eye silvery—not dark.

This is evidently different from the *Zygonectes chrysotus* Günther, described by Jordan & Gilbert (Proc. U. S. Nat. Mus., 1882, 586) under the name of *Zygonectes cingulatus*. The *Hydrargyra luciæ* of Baird is probably different from both. The *Fundulus zonatus* of C. & V. (not *Esox zonatus* Mitchill) may be this species, or, more likely, the very closely related *Zygonectes zonifer* Jordan and Meek, if indeed the latter prove to be different.

In any case, the present species should stand as ZYGONECTES CINGULATUS.

In this connection I may note that *Zygonectes notti* Agassiz, recently rediscovered by Professor Hay (Proc. U. S. Nat. Mus., 1885, 557), seems to be identical with *Zygonectes craticula* Goode & Bean.

Zygonectes manni Hay, as already noticed by Dr. Bean, is my *Heterandria ommata*. It is not a *Heterandria*, nor apparently a *Zygonectes*. The black caudal spot which is found in all species of *Rivulus* would indicate its affinity to that genus, with which it agrees in external characters. It may therefore be called provisionally *Rivulus ommatus*.

5. Exoccetus melanurus. (Cuv. & Val., xix, 101, 1846.)

Specimen somewhat shriveled; .27m in length. New York: Milbert.

Second ray of pectoral divided, the first more than half length of fin. Anal short, with 9 rays. Dorsal low. Head moderate, $4\frac{1}{2}$ in length. Eye $2\frac{2}{3}$ in head. Ventrals inserted at a point about midway between base of caudal and eye. Pectorals reaching to or beyond last ray of dorsal (the tips broken). Dorsal and ventrals pale. Pectorals plain, dusky behind. A black spot on lower side of caudal peduncle, its diameter $\frac{2}{3}$ that of eye. This is undoubtedly not a natural color-mark, as it is not alike on the two sides of the tail. There is a hole in its center, and the flesh within the dark area is also black. The fish seems to have been dried before being put into alcohol and it had doubtless been hung up by a black string or a nail through this hole.

As supposed by Jordan and Meek (Proc. U. S. Nat. Mus., 1885, 60), this is the species for which has been retained the name of EXOCŒTUS HETERURUS.

6. Exocœtus volitans. (Cuv. & Val., xix, 83, 1846. Not of L.)

Specimen in good order; .35m; collected by Le Sueur; belongs to the same species as the preceding.

7. Exoccetus gibbifrons. (Cuv. & Val., xix, 118, 1846.)

Specimen .23^{m} long, in fair condition. Atlantic Ocean: Dussumier.

Second ray of pectoral simple, the first $\frac{3}{5}$ length of the fin, which reaches to middle of last dorsal ray; ventrals not reaching quite so far. Insertion of ventrals midway between base of caudal (mesially) and back part of eye. Eye 3 in head. Head $4\frac{3}{5}$ in body. Depth, 6. Anal short, with 8 rays. D. 1.12. Head a little more gibbous than in other species, but not notably so; the interorbital area a little concave. Dorsal, anal, and caudal plain. Pectorals becoming dusky backwards. Ventrals posteriorly considerably dusky.

This is the species correctly identified by Jordan and Meek as EXOCŒTUS GIBBIFRONS.

8. Exoccetus cyanopterus. (Cuv. & Val., xix, 9, 1846.)

One specimen in poor order; rather stiff; .41^{m}. Rio Janeiro: Hombron & Jaquinot.

Second ray of pectoral divided, the first $\frac{3}{5}$ length of fin. Snout pointed; interorbital area transversely concave. Snout $3\frac{1}{2}$ in head. Eye, $3\frac{1}{3}$. Tail strong. Dorsal moderately high, its base one-third longer than that of the rather short anal. D. 12; A. 11. Insertion of anal considerably behind that of dorsal. Pectoral extending beyond tips of last ray of dorsal and anal. Ventrals not quite to the base of the last ray. Insertion of ventrals midway between base of caudal and edge of preopercle.

Fins all pale, except a round black blotch, about as large as eye, on tips of middle dorsal rays. Ventrals white.

This species is close to *E. bahiensis*, if, indeed, it is not the same. The greater number (11 instead of 9 or 10) of anal rays alone separates it. We may therefore provisionally regard *E. cyanopterus* with *E. albidactylus* as a synonym of EXOCŒTUS BAHIENSIS.

9. Exoccetus lineatus. (Cuv. & Val., xix., 92, 1846.)

In fair condition. .43^{m}. Gorée: Rang.

Second ray of pectoral divided, the first ray $\frac{3}{4}$ length of longest. Head rather pointed, the interorbital area flat. Snout 4 in head; eye $3\frac{1}{3}$. Head $4\frac{4}{5}$ in length; depth, $6\frac{1}{2}$. Pectoral extending to base of last anal ray, ventrals reaching nearly as far, their insertion midway between base of caudal and edge of preopercle. Anal short, its rays 1.10. Dorsal 13. Dark lines on sides of back conspicuous only where scales have been rubbed off, not forming an important feature of coloration. Fins mostly dusky; ventrals with faint dusky shades. Anal with an obscure dark shade. Dorsal and caudal somewhat dusky, but unmarked.

This species is close to *E. heterurus*, from which it is perhaps distinguished by the more backward insertion of its ventrals. It may stand provisionally as EXOCŒTUS LINEATUS.

10. Hemirhamphus browni. (Cuv. & Val., xix, 13, 1846.)

Specimens in fair condition. .32m. Plée: Martinique, 1821.

Scales 52 (not 65, as stated by Valenciennes). This is identical with *Hemirhamphus plcei*, as understood by Meek and Goss (Proc. Ac. Nat. Sci. Phila., 1884, 224), and the name *browni* is prior to that of *plcei*.

It is extremely doubtful whether the *Hemirhamphus balao, brasiliensis*, or *macrochirus* of authors be really a species distinct from this. We may therefore regard them as constituting a single species, for which we may employ the oldest tenable name used for a member of this group, HEMIRHAMPHUS BALAO Le Sueur.

The name *Esox brasiliensis* must, as stated by Meek and Goss, go with the *Timucu* of Maregrave, a *Tylosurus*, and not with the *Hemirhamphus*.

11. Belone caribbæa. (Cuv. & Val., xviii, 431, 1846.)

Three specimens, in good condition, the largest a little over two feet long. Martinique: Plée (not the original types of Le Sueur, which came from Guadeloupe).

Snout $2\frac{1}{2}$ times length of rest of head; the jaws very slender, not quite closing, there being a slight arch at base of upper jaw. Teeth comparatively weak. Eye $2\frac{7}{10}$ in postorbital part of head. Top of head striated, with median groove and the vertex covered by skin. Folds of skin across preopercle, as in *Tylosurus raphidoma*. Body broad, but compressed, the sides a little flattened. Breadth of body $\frac{2}{3}$ its depth, which is about equal to postorbital part of head. Keel on tail decidedly strong, stronger than in *T. raphidoma*, and black, the tail otherwise not much depressed.

Scales small, green, about 210 before dorsal. Ventrals inserted midway between base of caudal (mesially) and middle of eye. Anal inserted just a little before dorsal. Dorsal with its posterior rays elevated, especially in the smaller specimen; broken in the larger. D. 25; A. 22.

This is doubtless identical with the *Belone altipinna* of Poey, which species may therefore stand as TYLOSURUS CARIBBÆUS. Its distinction from *Tylosurus aeus* is questionable.

12. Belone timucu. (Cuv. & Val., xviii, 426, 1846.)

One specimen in poor condition, .23m in length, from Cayenne. A specimen with the same label and belonging to the same species is in the collection from Cuba; Ramon de la Sagra.

Body slender, little compressed, the caudal peduncle compressed, but with the lateral line so prominent as fairly to constitute a keel. Beak long and slender, the snout double the length of the rest of the head. Eye small, $3\frac{1}{4}$ in postorbital part of head. Ventrals midway between base of caudal and middle of opercle. D. 13 or 14, A. 15 or 16. Lateral band more distinct than in *T. marinus*.

It is not possible to say whether the original *Timucu* of Maregrave (= *Esox brasiliensis* L.) is the present species, or *T. subtruncatus*, or some

other of the slender ones. The name *brasiliensis* should therefore be disregarded as unidentified.

This species seems to correspond to the "southern variety of *Belone truncata*" (=*Tylosurus marinus*) mentioned by Dr. Günther (vi, 245). The original description of *Belone almeida*, Quoy & Gaimard, is wholly valueless, but as its types were among the original types of *B. timucu*, C. & V., and therefore presumably identical with the specimen noted above, we may retain for this species or variety the name of TYLOSURUS ALMEIDA.

The types of *Belone cigonella*, *ardeola*, *gerania*, and *galeata*, if existing, cannot now be found in the Museum.

13. Belone scolopacina. (Cuv. & Val., xviii, 428, 1846.)

Small specimens in bad condition from Rio de la Mana, Cayenne. Leschenault and Doumerc.

These belong apparently to the species described by Dr. Günther as *Belone taeniata*. The poor condition of the specimen has led Valenciennes to make a gross miscount of the fin-rays, the dorsal having apparently 29 rays, at any rate more than 25, and the anal apparently 25, certainly more than 20. Valenciennes says, "D. 14, A. 17." The *Belone guianensis* Schomburgk is said by Steindachner to be the same as the *Belone taeniata*. As this name (1842) has priority over that of *scolopacina* the species may stand as POTAMORRHAPHIS GUIANENSIS.

14. Atherina martinica. (Cuv. & Val., x, 459, 1835.)

Three specimens in fair condition from Martinique; Plée.

A species of *Menidia*.

Scales strongly laciniate. Soft dorsal and anal naked (possibly scaly in life?). Teeth rather strong. Pectorals long, extending past base of ventrals. Eye large, as long as snout, $3\frac{1}{5}$ in head. Head $4\frac{1}{5}$ in length; depth, $5\frac{1}{2}$. D. V–1, 7; A. 1, 21. Scales, 43.

This species is very close to *Menidia laciniata* Swain, and may prove to be the same. It should stand as MENIDIA MARTINICA.

15. Atherina boscii. (Cuv. & Val., x, 465, 1835.)

"États-Unis"; Le Conte.

Scales entire; anal fin scaleless. Body comparatively elongate. Teeth strong. Insertion of spinous dorsal midway between front of eye and upper base of caudal.

Head $4\frac{2}{5}$ in length; depth 6. D. IV–1, 8; A. 1, 26. Scales 43.

This agrees entirely with a specimen before us from Beaufort, North Carolina, belonging to the species called by me MENIDIA MENIDIA.

16. Mugil brasiliensis Agassiz.

The figure given of this species by Agassiz (in Spix Pisc. Brasil, tab. 72) agrees rather with *Mugil liza* C. & V. than with *Mugil trichodon* Poey, in color and in size. The anal fin is represented as scaly, which it is not in *Mugil liza*. We are informed, however, by Dr. Spangenberg

that the anal fin is dried down in the type, and this character of the anal may have been taken from the other specimens* examined by Agassiz, as may also have been the description of the teeth, which are shown larger than in *M. liza*. The scales in the figure are 35, the depth $4\frac{2}{5}$ in the length—both characters agreeing with *M. liza*. For these reasons I regard our former identification of *Mugil brasiliensis* Agassiz with *Mugil trichodon* Poey as erroneous, and I now consider *Mugil liza* Cuv. & Val. (=*Mugil lebranchus* Poey) as the original MUGIL BRASILIENSIS Agassiz.

17. Caranx bartholomæi. (Cuv. & Val., ix, 100, 1833.)

One example, 14^{m} in length, from St. Bartholomew Island.

As supposed by us (Proc. U. S. Nat. Mus., 1884, 33), this is fully identical with the *Cibi amarillo* of the Havana markets, the *Caranx cibi* of Poey and *Caranx beani* of Jordan. It has about 28 plates on its lateral line, besides some six smaller scales. It should stand as CARANX BARTHOLOMÆI.

18. Caranx sexfasciatus. Quoy & Gaimard (Zool. Voy. Freycinet Poiss., 358, pl. 65, f. 4, 1824.)

This species has been regarded as the young of *Caranx latus* Agassiz (=*C. fallax* C. & V.), and I have lately adopted the name *sexfasciatus* as a substitute for the latter.

The name is based on a very poor drawing of the very young of some *Caranx*, said to be from Papua. The figure shows the dorsal and anal scarcely falcate. D. 22, A. 19; plates about 22. The drawing may represent a young *latus*, or it may not, and the name *sexfasciatus* should be regarded as unidentifiable. The *Scomber kleini* of Bloch is still less likely to be this fish, which may therefore still stand as CARANX LATUS Agassiz.

19. Trachinotus argenteus. (Cuv. & Val., viii, 413, 1831.)

Specimen .32^{m} in length; America; D. 25, A. 23. Body a little deeper depth $2\frac{1}{10}$ (instead of $2\frac{2}{5}$) than in the ordinary Pompano, which it otherwise entirely resembles. It may stand as TRACHINOTUS CAROLINUS.

20. Trachinotus cayennensis. (Cuv. & Val., viii, 417, 1831.)

Very young specimen in poor condition, .06^{m} long, from Cayenne.

Form of *Trachinotus ovatus*, the body very deep, the snout short and very blunt. Dorsal lobe (in young) 2 in head. Eye very large; preopercle with strong spines. Depth of body 2 in length. D. 27, A. 26. Fins all pale. Apparently a valid species, distinguished from *Trachinotus ovatus* by its numerous fin-rays. It will stand as TRACHINOTUS CAYENNENSIS.

21. Trachinotus paitensis. (Cuv. & Val., viii, 438, 1831.)

Specimen in poor condition; .07^{m} long; from Paita, Peru.

*See Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 270.

Different from *T. cayennensis*, having the more elongate form of *T. rhodopus*. Fins low, but higher than in *T. cayennensis*, the dorsal lobe black, its length about half head. Snout low, bluntish at tip. Depth $2\frac{1}{2}$ in length. D. 28, A. 27. A valid species, apparently distinguished by the large number of fin-rays. It may stand as TRACHINOTUS PATENSIS.

22. Seriola rivoliana. (Cuv. & Val., ix, 207, 1833).

In fair condition, .25 m long; from the Greek Archipelago.

Form elliptical, compressed, the nape not very sharp; caudal keel weak. Snout blunt, compressed, not conical. Head a little longer than deep, $3\frac{1}{4}$ in length; depth, $3\frac{1}{12}$. Maxillary reaching to near middle of pupil, $2\frac{2}{5}$ in head; snout 3 in head. Dorsal lobe, $4\frac{4}{5}$ in length of body, $1\frac{3}{5}$ in depth, $1\frac{2}{5}$ in length of head, $2\frac{1}{6}$ in base of fin. D. 1, 29, A. 1, 20. A dark band from eye to soft dorsal; the body otherwise plain.

This agrees almost perfectly with a specimen about a foot in length from Pensacola. There is no doubt, I think, of the identity of *Seriola falcata*, *bonariensis*, and *rivoliana*. Unless, as is probable, *Seriola fasciata* (Bloch) is the young of the same species, it may stand as SERIOLA RIVOLIANA.

23. Serranus undulosus. (Cuv. & Val., ii, 295, 1828).

Small specimens (.08 m), in poor condition.

Brazil: Delalande.

These have many gill-rakers, large scales, the preopercle with salient angle, and the caudal subtruncate. They belong to the species called by us MYCTEROPERCA SCIRENGA.

24. Serranus niveatus.

A specimen a foot long (not type), collected at Rio Janeiro by Jobert.

This agrees with the description of Jordan & Swain (Proc. U. S. Nat. Mus., 1884, 386) except in color. There is no blotch on back of tail. The soft parts of the vertical fins are largely dusky with narrow pale edge. Moustache on maxillary very distinct; body with irregularly scattered pearly spots; breast plain. This specimen probably represents the transition from the young (*niveatus*) to the adult (*flavolimbatus*).

25. Centropristes atrobranchus. (Cuv. & Val., iii, 45, 1829.)

Brazil: Delalande.

Allied to *Serranus phœbe*, but well separated by the color. A large inky black blotch on inside of opercle, just behind the pseudobranchiæ and parallel with them, extending also on membranes of shoulder-girdle; about six dark vertical bands on sides, the second extending as a jet-black blotch on the spinous dorsal from the fourth to the ninth spine. Base of soft dorsal dark; upper part pale, as is also the anal and caudal.

Preorbital and maxillary narrow, the maxillary $2\frac{2}{5}$ in head. Teeth small; eye large, 3 in head, longer than the short snout, which is $4\frac{1}{2}$ in head. Head, 3 in length; depth, 3. Dorsal spines rather high, not filamentous; soft dorsal not scaly; a notch between spinous and soft

parts of dorsal; caudal well forked; second anal spine small, but larger than third, 3½ in head. Scales large and regular, 3–47–11. This species may stand as SERRANUS ATROBRANCHUS.

26. Centropristes brasiliensis. (Barneville, Rev. Zool., 1847, 131.)

Type, .095m, from Bahia, received in exchange from the Museum of Geneva.

This is very close to *Serranus dispilurus*, if really different. It has the same form, and same coloration of caudal and anal fin and of the region above and before the latter. The dusky blotch below the spinous dorsal and above the white pre-anal blotch is a little more conspicuous than in Pensacola specimens, and the dark blotch on and below first soft rays of dorsal is less so. There is, however, little, if any doubt, of the identity of this species with *C. dispilurus* Günther, and *C. subligarius* Cope. It may stand as SERRANUS BRASILIENSIS.

27. Centropristes rufus. (Cuv. & Val., iii, 47.)

Two specimens in fair condition, from Martinique: Plée.

This resembles very closely *Serranus atrarius* in all respects, the only difference that I can detect being that the caudal fin is quite regularly rounded instead of trilobate. Color uniform dark—in alcohol. Fourth dorsal spine longest, 2 in head. Scales, 5–50–13. Eye, 4½ in head. Pectorals extending beyond ventrals, 1½ in head. It will probably prove to be a variety of *Serranus atrarius*, but for the present it may stand as SERRANUS RUFUS.

28. Aylopon martinicensis. (Guichenot, Index, Gen. et. Spec. Anthiadidorum, p. 6.)

Four specimens, the largest 13m, from Martinique: Bélanger.

A true *Anthias*, the maxillary broad and provided with 5 or 6 rows of large scales. Head very blunt and short. Eye 3 in head; snout 5; maxillary 2½; mouth very oblique, the lower jaw projecting; no supplemental maxillary. Head above closely scaled; tongue with a band of villiform teeth; two canines in front of upper jaw on each side, the anterior turned forward, the posterior downward and backward; three canines on each side of front of lower jaw, the anterior directed forward and outward, the posterior two upward and backward. No lateral canines and no depressible teeth in either jaw. Preopercle finely serrate, and with coarser teeth at the angle, as in *Anthias vivanus*. Five rows of large scales on the cheek. Gill rakers slender and very long.

Scales large, 4–35–14; lateral line running high; scales on breast large.

Third dorsal spine elevated, 1⅓ times height of the next, 1½ in head; soft dorsal moderate; caudal lunate; anal rather high, its second and third spines moderate, subequal; pectorals rather long, as long as head; ventrals 1⅔ in head; head 3⅕ in length; depth 2⅚.

This species seems to be distinct from *Anthias asperilinguis* and *Anthias vivanus*. It may stand as ANTHIAS MARTINICENSIS.

29. Mesoprion cyanopterus. (Cuv. and Val., ii, 472, 1828.)

One specimen in fair condition, .27m long; Brazil: Delalande.

This agrees with *Lutjanus cubera* Poey, in all respects except that the axil of the pectoral is black on one side of the specimen and faintly brownish on the other. This color mark may perhaps be fallacious, or disappearing with age, as we have seen no *cubera* so small as the type of *cyanopterus*. I was unable to find the dried skin which was the type of *Mesoprion pargus*, but it is probably identical with the present species. As the name *cyanopterus* is prior to *pargus*, *canina*, *cubera*, or *dentatus*, this species may stand as LUTJANUS CYANOPTERUS.

30. Mesoprion litura. (Cuv. & Val., ii, 467.)

Cayenne: Poiteau.

As already supposed by Jordan & Swain, this is LUTJANUS JOCU.

31. Mesoprion flavescens. (Cuv. & Val., ii, 472.)

Martinique: Plée.

This is LUTJANUS CAXIS.

82. Mesoprion linea. (Cuv. & Val., ii, 468.)

Havana: Poey.

This is also LUTJANUS CAXIS.

33. Mesoprion mahogoni. (Cuv. & Val., ii, 447.)

Young specimens in rather poor condition. Martinique: Plée. Also similar specimens from Cuba: Desmarest.

These are, as supposed by Jordan & Swain, identical with *Lutjanus ojanco* Poey, which species should stand as LUTJANUS MAHOGONI.

34. Mesoprion ricardi. (Cuv. & Val., ii, 448.)

This specimen is also the young of LUTJANUS MAHOGONI.

35. Mesoprion cynodon. (Cuv. & Val., ii, 465.)

Martinique: Plée.

This is a large example of LUTJANUS CAXIS.

36. Lutjanus dentatus Duméril. ("A Duméril, Archiv. du Mus., T. 10, 245.")

Brazil: Delalande. Specimen .35m long.

This is the young of *Lutjanus cubera*. Axil dusky. It should stand as LUTJANUS CYANOPTERUS.

37. Mesoprion vivanus. (Cuv. & Val., ii, 454.)

Three specimens: the largest, .19m long: the others, .10m.

The largest of these specimens has the dark lateral spot obscure; the depth $2\frac{2}{3}$ in length, equal to length of head. Maxillary $2\frac{1}{2}$ in head. Dorsal rays X, 13 (not X, 14, as usual in *L. aya*). Anal fin lower than usual in *L. aya*, its longest rays about half head. In spite of certain small differences, I still hold my opinion that these specimens are the young of our common Red Snapper, which I call LUTJANUS AYA.

38. Aprion virescens. (Cuv. & Val., vi, 542, 1830.)

This species is fully congeneric with the American *Aprion* (or *Platyinius*) *macrophthalmus*. It has the same form of head, the vertex and interorbital area being perfectly flat. The body is more slender (depth 4) than in *Aprion macrophthalmus*, the teeth a little stronger, and the preorbital broader, 6 in head.

39. Apsilus fuscus. (Cuv. & Val., vi, 548.)

This is fully congeneric with the American *Apsilus* (*Tropidinius*) *dentatus*. It has the same form of the skull, but the body is slenderer (depth 3 in length), the teeth smaller, and the caudal lobes more pointed. The generic name *Tropidinius* is therefore a synonym of *Apsilus* as *Platyinius* is of *Aprion*. (See Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 465.)

40. Hæmulon canna. (Cuv. & Val., v, 233, 1830; not of Agassiz, 1829.)

A specimen of 20^{c} long. Martinique: Plée.

This is the *Hæmulon parra* of Jordan and Swain, as Dr. Günther has supposed, and it should stand as HÆMULON BONARIENSE.

41. Hæmulon canna. (Agassiz, Spix. Pisc., Brazil, 1829, 130, pl. 69.)

A careful recomparison of Agassiz's description and figure of *Hæmulon canna*, with different species of *Hæmulon*, leads me to the conclusion that it can be no species other than the *Hæmulon acutum*. This use of the name *canna* (by Agassiz in 1829) is prior to its use by Cuv. & Val. (in 1830) for another species. The species of Agassiz may stand as HÆMULON PARRA.

Agassiz's *Hæmulon schranki* I must still regard as unidentifiable, though it most resembles *Hæmulon steindachneri*, from which it would appear to differ in color and in the very small size of the anal fin—both very doubtful characters.

42. Hæmulon caudimacula. (Cuv. & Val., v, 236.)

Specimen of .12^{m}. Brazil: Delalande.

This is the young of the species called by us *Hæmulon acutum*.

The name *Hæmulon caudimacula*, however, first appears in the Règne Animal, where it is based, without description, on the scarcely identifiable Uribaco of Maregrave and the *Diabasis parra* of Desmarest.

The name *Hæmulon caudimacula* Cuvier, becomes thus either unidentifiable or else a a synonym of *Hæmulon parra*.

The *Diabasis parra* is itself not very satisfactory. The rough figure given by Desmarest, as well as his description, best fit the *Hæmulon acutum*, and we have the statement of Cuvier & Valenciennes that Desmarest's fish does not seem to differ from their *caudimacula* from Brazil, which is *acutum*. They do not, however, say whether they have examined Desmarest's type or not.

Dr. Sauvage, however (Bull. U. S. Fish Comm., 1881, 322), gives an account of a specimen in the Museum at Paris, said to be a type of Desmarest as well as Cuvier & Valenciennes. This description is not

very explicit, but the coloration seems best to represent the species with continuous stripes, the *H. bonariense* of Cuv. & Val. This specimen I failed to find when in Paris.

Since the above was in type, M. Thominot informs me that he has found this specimen, and that in the direction of its scales, as well as in other characters, it agrees with the *Hæmulon chromis* C. & V., not with *Hæmulon bonariense*. The *Diabasis parra* Desmarest is therefore identical with *Hæmulon acutum* Poey. The earliest certain name for the present species (*acutum*) is therefore HÆMULON PARRA Desmarest.

43. Hæmulon xanthopteron.

I failed to find the type of this species. A specimen from Bahia, labelled *Hæmulon xanthopterum*, belongs to the species called *Hæmulon acutum*, the *Hæmulon parra* of this paper.

44. Hæmulon bonariense. (Cuv. & Val., v, 234, 1830.)

A small specimen (.15[m]) from Buenos Ayres: Baillon.

This is the *Hæmulon parra* of Jordan and Swain, having the series of scales from the scapular scale extending to the front of the second dorsal, and the color marks on the scales forming continuous stripes. As this species is not the original *Diabasis parra*, it may stand as HÆMULON BONARIENSE.

45. Hæmulon macrostoma. (Günther i, 308.)

Specimens from St. Croix (Stephens) and from Bermuda (Jones) labelled *Hæmulon macrostoma*, in the British Museum, belong to the *Hæmulon carbonarium* of Poey. It is, however, not probable that the original type—a dried skin from Jamaica—belonged to this species, as the original description agrees neither with *H. carbonarium* nor with *H. fremebundum*.

46. Hæmulon chromis. (Cuv. & Val., v, 242, 1830.)

Specimen in poor order, 17[m]; Jamaica; from the faculty of Montpelier.

This is a very pale specimen (*albidum* Poey) of the species called *Hæmulon acutum*, by Jordan & Swain.

It should stand as HÆMULON PARRA.

47. Hæmulon chrysargyreum. (Günther, i, 314.)

Several specimens examined in the British Museum; among them the type *b*. (Trinidad; J. B. Richardson.) Others are from St. Croix and Fernando Noronha.

These are identical with *Hæmulon taniatum* of Poey, although some of these are larger in size than any of the latter obtained by me. The depth in the large examples is somewhat greater, $3\frac{1}{5}$ in the length, and the maxillary is longer, $2\frac{11}{12}$ in head. The species should then stand as HÆMULON CHRYSARGYREUM.

The nomenclature of the species of *Hæmulon* is still somewhat unsettled. The following list may be substituted for that given by Jordan & Swain (Proc. U. S. Nat. Mus., 1884, 317*):

1. *Hæmulon sexfasciatum* Gill.
2. *H. gibbosum* Walbaum.
3. *H. bonariense* Cuv. & Val. (*parra* of J. & S.; *canna* of C. & V.).
4. *H. parra* Desmarest (*acutum* of J. & S.; ? *canna* of Agassiz).
5. *H. scudderi* Gill.
6. *H. fremebundum* Goode & Bean.
7. *H. macrostoma* Günther. (?)
8. *H. carbonarium* Poey.
9. *H. steindachneri* Jordan & Gilbert (? = *H. schranki* Agassiz).
10. *H. melanurum* L.
11. *H. sciurus* Shaw.
12. *H. plumieri* Lacépède.
13. *H. flavolineatum* Desmarest.
14. *H. chrysargyreum* Günther.
15. *H. rimator* Jordan & Swain (? = *H. striatum* (L.)).
16. *H. aurolineatum* Cuv. & Val.
17. *H. quadrilineatum* Cuv. & Val. (? = *H. tirittatum* (Bl. & Schn.)).
18. *H. flavogattatum* Gill.
19. *H. maculicauda* Gill.

48. Calamus plumatula. (Guichenot, Révision des Pagels, 119.)

Martinique; Plée; in poor order, .26[m] long.

As supposed by Jordan & Gilbert (Proc. U. S. Nat. Mus., 1884, 20), this is the young of CALAMUS BAJONADO.

49. Calamus microps. (Guichenot, in Ramon de la Sagra, Hist. Cuba, 188, tab. 8, fig. 1.)

Specimen in fair condition, .32[m] long, from Cuba; Ramon de la Sagra.

Very close to *Calamus penna*, from which it may be distinguished by the very small size of the eye, which is $4\frac{1}{3}$ in head. Canines small, irregular, about $\frac{3}{4}$ on each side. Preorbital breadth $2\frac{1}{2}$ in head. Maxillary $2\frac{1}{2}$ in head. Depth of body $2\frac{1}{4}$ in length. Form of *Calamus*

* *Hæmulon hians* Haly (Ann. Nat. Hist., 1875, xv, 268), from Bahia, was overlooked in our review of this genus. The scanty original description does not distinguish it from *H. sciurus*. The following is the original description of *Hæmulon hians:*

"D. $\frac{12}{15}$. A. $\frac{3}{9}$. L. lat. 50 L. transv. $\frac{6}{12}$.

"The height of the body equals the length of the head, and is contained three times and a half in the total. The snout is of moderate length, rather longer than the eye, which is contained three times and a half in the length of the head. The cleft of the mouth is very wide, the maxillary reaching to the vertical from the center of the eye. Præoperculum with the posterior limb nearly vertical, obtusely denticulated, the denticulations somewhat stronger at the angle. Dorsal deeply notched; the fourth spine longest, nearly half the length of the head, the last spine longer than the eleventh. Caudal forked. Second anal spine stronger but scarcely longer than the third, as long as the sixth dorsal spine. Pectoral one-fifth of the total length. The fish appears to have been longitudinally striped.

"Two specimens in spirits from Bahia, and a young stuffed specimen from the same locality. The adults are $7\frac{1}{2}$ inches long."

penna, the back with a regular arch. Ventrals dusky. A dark spot in axil of pectoral, as in *C. penna*. Scales 49.

This species may be distinct, but it will probably be found inseparable from CALAMUS PENNA.

50. Sargus argenteus. (Cuv. & Val., vi, 60.)

Specimen from Brazil; Delalande; .15^{m}.

This is identical with the *Sargus caudimacula* of Poey, a species distinct from the *Diplodus holbrooki* of Bean.

Depth 2 in length; scales 8–70–16.

Little or no black on opercular membranes.

A specimen of this species from Saint Augustine, Fla., was sent to the museum of the Indiana University by Mr. W. P. Shannon. This is the first record of its occurrence on the United States coast.

The species should stand as DIPLODUS ARGENTEUS.

51. Sargus ascensionis. (Cuv. & Val., vi, 61.)

Ascension Island; Quoy & Gaimard; .30^{m}.

The type of this species much resembles *Diplodus holbrooki*.

Depth $2\frac{1}{3}$ to $2\frac{2}{5}$ in length; scales 8–61–16.

Anterior profile steep. Black on the opercular membranes. Axil dusky. No cross-bands. Dorsal, anal, and ventrals somewhat dark. Anterior profile steep, the dorsal outline being more angular than in *D. argenteus*, the ventral outline less so. It should stand as DIPLODUS ASCENSIONIS.

52. Sargus flavolineatus. (Cuv. & Val., vi, 60.)

San Iago de Cuba; Choris; .26^{m} in length, in bad condition.

Teeth broad and scarcely notched. Incisors $\frac{3}{4}$. Procumbent dorsal spine scarcely evident. Second anal spine *very* strong, much larger and longer than third.

Head $3\frac{1}{5}$ in length; depth $2\frac{1}{11}$.

Longest dorsal spine $1\frac{1}{5}$ in head.

D. XIII, 11. A. III, 9. Scales 7–45–14.

This species is very close to *Diplodus unimaculatus*, but it seems to be distinct, having the body deeper than in the latter. It should stand as DIPLODUS FLAVOLINEATUS.

This species occurs in abundance at Key West, but the true *Diplodus unimaculatus* has not yet been definitely recorded from the coast of the United States.

53. Sargus aries. (Cuv. & Val., vi, 58, 1830.)

Specimen .30^{m} long, from Brazil; Delalande.

This is very close to *Diplodus probatocephalus*, with seven dark cross-bands, similar in position to those of the latter species. The teeth are, however, distinctly narrower, the width of one being about two-fifths its height, from the gums. Spines strong, the longest dorsal spine $1\frac{3}{8}$ in head. Second anal spine $1\frac{3}{4}$. Procumbent spine before dorsal present.

Head 3½ in length; depth 2. D. XII, 12. A. III, 10. Scales 7–44–14. Scales on breast small.

The species may stand as DIPLODUS ARIES.

54. Sargus lineatus. (Cuv. & Val., vi, 59.)

Dried skin, .30[m] long, from the "Cabinet de Lisbonne."

Four or five narrow black cross-bars, as wide as pupil; a black blotch on back of caudal; apparently some black on opercle. Body deep, the depth 2⅓ in length; second anal spine longest and strongest, 2½ in head. Profile steep; snout 3 in head. Incisors broad, ¼. Scales on breast large. D. XII, 13.

The species is unknown to me, and the type, in poor condition, from unknown locality, should not have received a name.

55. Sargus fasciatus. (Cuv. & Val., vi, 59.)

Dried skin, .35[m] long, from the "Cabinet de Lisbonne."

Body more elongate. Color now entirely faded. Incisors very narrow, entire, ¼. Snout sharp, rather long, 2½ in head, forming an angle above eye. Second and third anal spines subequal. Scales about 45. A species of *Diplodus*, otherwise unknown to me, and not in fit condition for description.

56. Upeneus martinicus. (Cuv. & Val., iii, 483, 1829.)

Martinique; Garnot.

As supposed by Hall & McCaughan (Proc. Ac. Nat. Sci. Phila., 1885, 154), this species is identical with the *Upeneus bulteatus* C. & V. and *Upeneus flavovittatus* Poey. The *Upeneus parvus* of Poey, included by Hall & McCaughan in the synonymy of *U. martinicus*, is probably different.

The species may stand as UPENEUS MARTINICUS.

57. Umbrina martinicensis. (Cuv. & Val., v, 186.)

Two specimens, .24[m] long, from Martinique; Plée.

Color plain, the lower lobe of caudal not black. Snout bluntish, 3½ in head, projecting beyond premaxillary for two-ninths its length. Maxillary 3 in head, reaching a little beyond front of eye. Posterior nostril narrow-ovate, rather large. Outer teeth above moderately enlarged. Gill-rakers very small, tubercle-like. Eye 5¼ in head. Head 3⅖ in length; depth 4. D. X–I, 25. A. I, 8. Lateral line with 55 pores. Scales on breast large, irregular. Lower lobe of caudal the longer.

This species is very close to *Menticirrus alburnus*, but apparently somewhat different. It may stand as MENTICIRRUS MARTINICENSIS.

58. Umbrina gracilis. (Cuv. & Val., v, 189.)

A stuffed skin in alcohol (Brazil; Aug. St. Hilaire), its apparent slenderness of form being due to distortion. It belongs to the species above noted as MENTICIRRUS MARTINICENSIS.

59. Otolithus guatucupa. (Cuv. & Val., v, 75.)

Two specimens (.45m); Montevideo; D'Orbigny.

This species has oblique dark streaks along the back, following the rows of scales, much as in *C. reticulatum*. Soft dorsal mostly covered with small scales. Head compressed. Maxillary $2\frac{2}{5}$ in head. Canines rather small. Eye $5\frac{1}{2}$ in head. Gill-rakers long and slender, about 14 in number. Caudal subtruncate, emarginate when not spread open. D. X–I, 21. A. I, 8. Lateral line, with 56 pores. A valid species, allied to *Cynoscion regale*. It may stand as CYNOSCION GUATUCUPA.

60. Otolithus leiarchus. (Cuv. & Val., v, 78.)

A dried skin of a young example, .23m long, from Brazil, the color faded and the fins all broken.

A species of *Cynoscion*. Soft dorsal scaleless. Scales quite small, there being about 90 pores in the lateral line. Maxillary $2\frac{1}{4}$ in head. Dorsal IX–I, 24. Anal shriveled, its spine covered by varnish. The species may stand as CYNOSCION LEIARCHUS.

61. Otolithus nebulosus. (Cuv. & Val., v, 79.)

Type .27m long, in moderate condition. No locality.

This is the *Otolithus carolinensis* of Cuv. & Val., and should stand as CYNOSCION MACULATUM.

62. Corvina trispinosa. (Cuv. & Val., v, 109, 1830.)

Two dried skins fastened to glass, .13m long; Brazil; Delalande.

A genuine member of the subgenus *Stelliferus*. Head $3\frac{2}{3}$ in length; depth $3\frac{1}{4}$. Eye $3\frac{1}{2}$ in head; maxillary $2\frac{1}{4}$; space between eyes $3\frac{1}{2}$. Preopercle with three strong divergent spines near its angle, and smaller spines above it. Mouth very oblique. Maxillary extending to middle of eye; premaxillary in front, on level of pupil. Second anal spine $1\frac{3}{4}$ in head; pectoral $1\frac{1}{4}$; longest dorsal spine $1\frac{1}{3}$. Dorsal rays not readily counted, apparently X–I, 19.

This is the species called by Steindachner (Ichth. Notizen, i, 6) *Corvina stellifera*, and it is distinct from the *Corvina stellifera* of Günther, which is the *Corvina microps* of Steindachner. It seems probable, as supposed by Cuvier & Valenciennes, that this is the original *Bodianus stellifer* of Bloch, in which case it may stand as SCIÆNA (or STELLIFERUS) STELLIFERA.

63. Julis detersor. (Cuv. & Val., xiii, 408.)

Two small specimens, in poor condition, from Martinique; Plée.

These belong to the species called by Jordan & Hughes (Proc. U. S. Nat. Mus., 1884, 68) THALASSOMA BIFASCIATUM.

64. Julis psittaculus. (Cuv. & Val., xiii, 387, 1839.)

Two specimens, in fair condition, from Surinam. They belong to PLATYGLOSSUS BIVITTATUS.

65. Julis crotaphus. (Cuv. & Val., xiii, 395; not of Cuvier.)

Brazil; Delalande (stuffed specimen).

Color entirely faded. Caudal injured. Dorsal scales not crossing the median line. Ventrals short. Snout rather long and pointed, $2\frac{1}{3}$ in head. Depth about 5 in length. This seems to be PLATYGLOSSUS CAUDALIS.

Another specimen (.18^{m} long), also from Delalande, is evidently *Platyglossus caudalis*. The caudal ends in three blunt points, and the black spot behind eye is distinct. Ventrals $1\frac{4}{5}$ in head; eye 7. Depth $4\frac{1}{3}$ in length.

66. Julis garnoti. (Cuv. & Val., xiii, 390.)

Three young specimens, from Martinique; Belanger.

These belong to the species called *Platyglossus cinctus* by Poey, and should stand as PLATYGLOSSUS GARNOTI.

67. Xyrichthys martinicensis. (Cuv. & Val., xiv, 49.)

Eight specimens, about .135^{m} long, in poor condition; Martinique; Garnot.

Color faded; one specimen (male) with dark fins. Anterior profile rather less trenchant than in *X. psittacus*. Canines strong, $\frac{1}{1}$ on each side. No scales on head. Anterior dorsal spines not produced; none of the spines pungent. Head $3\frac{4}{5}$ in length; depth about the same. Scales 29. Till the species of this group are critically examined the present one may stand as XYRICHTHYS MARTINICENSIS.

68. Xyrichthys vitta. (Cuv. & Val., xiv, 51.)

From the "Cabinet du Stadhouder"; .14^{m} long.

Specimen a little deeper than the types of *X. martinicensis* (head $3\frac{2}{5}$; depth $5\frac{1}{5}$), but apparently not otherwise different. A yellowish streak along sides where the muscles join (perhaps not evident in life). This is doubtless identical with XYRICHTHYS MARTINICENSIS.

69. Xyrichthys uniocellatus. (Cuv. & Val., xiv, 48.)

Two specimens, in fair order, .16^{m} long, from Bahia.

Head short, deep, its profile steep and trenchant, its length 4 in body; depth $3\frac{1}{3}$. Canines strong. Scales 27. Blue vertical stripes on side of head. A jet-black ocellus, like an ink-spot, as large as pupil, behind sixth dorsal spine.

A valid species, XYRICHTHYS UNIOCELLATUS.

70. Callyodon ustus. (Cuv. & Val., xiv, 286.)

A dried skin, somewhat distorted; .23^{m} long. Brazil. Delalande.

Color all faded. Lower lateral teeth very regularly arranged; some teeth not dissimilar outside of these in front. Lower teeth growing rather stronger backward. Upper lateral teeth very fine and even, close set. One canine near middle of jaw turned outward and backward. No other canines evident on left side; the right side broken.

This species may stand as CRYPTOTOMUS USTUS.

71. Calliodon auropunctatus. (Cuv. & Val., xiv, 290.)

In fair condition; .17m long; from San Domingo. Ricord.

Body rather elongate; the snout sharp, the front not steep. Eye, 5 in head; Snout, 2⅔. Head, 3; depth, 3.

Teeth on edge of each jaw regular, those of lower jaw twice as large, the front series standing outside of the lateral series. Upper jaw with one strong canine hooked outward and backward, a little behind the middle of its side. Anterior canines small; those of the lower jaws scarcely unlike the ordinary teeth. Upper lip not double for its whole length.

The other specimen, .13m long, also from San Domingo, mentioned by Cuvier, lacks the posterior canine, but seems to be otherwise similar.

This species should stand as CRYPTOTOMUS AUROPUNCTATUS.

72. Scarus frondosus. (Cuv. & Val., xiv, 204.)

A dried skin, .22m long, and a small rotten specimen in alcohol; both from Brazil. Delalande.

The specimen in alcohol has the caudal faintly banded, and belongs to the species called by Jordan & Swain *Sparisoma flavescens* (Proc. U. S. Nat. Mus., 1884, 92). The other is scarcely identifiable, but is probably the same.

The name *Scarus frondosus* Cuvier first appears in Agassiz, Pisc. Brasil., p. 93, pl. LIV. This figure is a poor one, but it, too, was probably intended for SPARISOMA FLAVESCENS.

The *Sparisoma frondosum* of Jordan & Swain, (l. c.) 93 should probably stand as SPARISOMA BRACHIALE.

73. Scarus quadrispinosus. (Cuv. & Val. xiv, 197.)

A dried skin .40m long. Martinique. Plée.

Color entirely faded, possibly blue in life. Four distinct posterior canines on right side of upper jaw (the left side broken). Snout rather long. Caudal simply lunate. Cheek scales in 2½ rows. Seven scales before dorsal. Axil pale. Fins apparently pale and plain.

This is apparently a valid species, and may stand as CALLIODON* (OR SCARUS) QUADRISPINOSUS.

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* In accordance with the code of nomenclature adopted by the American Ornithologists' Union, the genera established by Gronow in his Zoophylaceum in 1763, should be regarded as tenable. This will necessitate the accrediting to Gronow of several genera, as *Albula*, *Synodus*, *Eleotris*, &c., usually assumed to date from Bloch and Schneider. It will also necessitate the following changes of name in the current nomenclature of our fishes:

Apogon Lacépède to *Amia* Gronow; *Amia* Linnæus (1766) to *Amiatus* Rafinesque; *Muræoides* Lacépède to *Pholis* Gronow; *Zoarces* Cuvier to *Enchelyopus* Gronow; *Liparis* Cuvier to *Cyclogaster* Gronow; *Scarus* Forskal to *Calliodon* Gronow.

The *Scarus* of Gronow, prior to that of Forskal, is based on a species of *Labrus* and two *Cichlidæ*. It would be a synonym of *Labrus*. The original *Calliodon* of Gronow is apparently the *Scarus croicensis*. It is therefore equivalent to *Pseudoscarus* of Bleeker.

74. Scarus tæniopterus. (Desmarest, Dict. Classique, xv, 244, pl. 12, 1831.)

Specimen .27m long, in very bad condition; the color entirely faded. Cuba. Desmarest. The dorsal shows faintly two colors, with a spot at the base of each membrane.

Another specimen (also a type?) from the museum at Geneva, .30m long, is in better condition. The colors on the dorsal show more plainly, and there are two dusky bands on the anal. The outer ray of caudal above and below is paler than the others.

This is identical with the other specimen, and both, I think, belong to the species called *Scarus virginalis*, by Jordan & Swain (Proc. U. S. Nat. Mus., 1884, 88), which species, if this view is correct, must stand as CALLIODON TÆNIOPTERUS.

75. Scarus cœlestinus. (Cuv. & Val., xiv, 180.)

A large stuffed skin, .60m long, from St. Thomas. Plée.

Color now plain dusky (perhaps blue in life). Teeth apparently dark green. Forehead fat. A single canine on right side of upper jaw; none on left. Cheeks with $2\frac{1}{2}$ rows of scales. Seven scales before dorsal. Caudal rounded, but with the outer rays much produced, about one-third their length being exserted. Next the last rays of dorsal and anal similarly prolonged into a point. Ventrals long, pointed. Form rather robust. Head, $3\frac{2}{5}$; depth, $3\frac{1}{6}$.

This seems to be a valid species, and it may stand as CALLIODON CŒLESTINUS.

76. Scarus turchesius. (Cuv. & Val., xiv, 181.)

A dried skin, .40m long, from Porto Rico. Plée.

Color faded to a plain brown, paler than in *S. cœlestinus*. No canines. Forehead not very fleshy (young). Caudal with its lobes exserted for $\frac{1}{4}$ to $\frac{1}{5}$ their length. Dorsal, anal, and ventrals less produced than in the type of *Scarus cœlestinus*. Scales on cheeks in two rows. Head, $3\frac{2}{5}$ in length; depth, $3\frac{1}{5}$. Teeth faded, but still partly green.

This is the *Guacamaia* of Parra, the *Scarus guacamaia* of Cuvier, but not of Cuv. and Val. It may stand as CALLIODON GUACAMAIA.

77. Gobius banana. (Cuv. & Val., xii, 103.)

In bad condition; .14m long; from San Domingo. Ricord.

This is identical with the species called by Poey, *Rhinogobius bucculentus*, and by us CHONOPHORUS TAIASICA.

78. Gobius martinicus. (Cuv. & Val., xii, 105.)

Larger specimens (.20m), from Martinique. Garnot. They belong also to CHONOPHORUS TAIASICA.

79. Gobius flavus. (Cuv. & Val., xii, 60.)

Specimens, .075m long, from Surinam. Diepering.

This is a species of *Chonophorus*, with fleshy appendages on the shoulder-girdle. Color faded, the fins all pale. Body plumper, the eye larger, and snout shorter than in *Ch. taiasica*. Scales also larger.

Mouth similar in form, but the lower jaw more flat. Teeth small; those of the outer row above enlarged; maxillary extending to middle of eye, $2\frac{1}{3}$ in head. Eye, 4 in head, about as long as snout; scales 53, less crowded forward than in *Ch. taiasica;* 21 before the dorsal on the nape.

Head, 4 in length; depth, $5\frac{2}{3}$. D. VI—1, 12, A. 1, 10.

This species may stand as CHONOPHORUS FLAVUS.

80. **Gobius brasiliensis.** (Cuv. & Val., xii, 121.)

Specimen .50[m] long, in very bad condition. Martinique. Plée.

This is a specimen of GOBIOIDES BROUSSONNETI.

81. **Eleotris sima.** (Cuv. & Val., xii, 232.)

Two specimens in poor order, from Vera Cruz, .09[m] long.

Snout a little more steep and convex than usual in *Dormitator maculatus.* Head, $3\frac{1}{3}$ in length; depth, $3\frac{1}{4}$. Eye, $4\frac{1}{2}$ in head. D, VII–9, A, 11. Scales, 31–11. Soft dorsal very high, with round black spots. Caudal and anal plain. This seems to be inseparable from DORMITATOR MACULATUS.

82. **Eleotris grandisquama.** (Cuv. & Val., xii, 229.)

One specimen in fair condition, .14[m] long, from "Amérique Méridionale?"

Head slenderer than in *D. maculatus*, and much depressed; its depth at the eyes less than its width, which is less than that of body. Anterior profile almost concave. Caudal fin large; other fins moderate. D, VI–9, A, 1, 9. Scales about 29–11. A few dusky spots on dorsal and anal.

A valid species, though probably not North American. It may stand as DORMITATOR GRANDISQUAMA.

83. **Blennius pantherinus.** (Cuv. & Val., xi, 262.)

A specimen in good condition. Brazil. Gaudichaud.

A true *Blennius*, with fringed cirri over eyes and stout canines in both jaws. Gill membranes free from isthmus. Dorsal fin continuous; the spines not very dissimilar from the soft rays. D, XI, 21, A, 22. Body freckled with blackish in coarse pattern. It may stand as BLENNIUS PANTHERINUS.

84. **Prionotus punctatus.** (Cuv. & Val., iv., 93.)

Specimen .20[m] long, from Bahia. Castelnau.

Head large, $2\frac{4}{5}$ in length; depth $2\frac{4}{5}$. Eye, 6 in head. Interorbital space rather broad and deep, nearly equal to eye. Maxillary $2\frac{1}{2}$ in head. A spine on each bone from side of snout to preopercle, the latter having two. Sculpture on bones of head very conspicuous. A slight cross-furrow behind eye. Pre-ocular and post-ocular spines conspicuous. Gill-rakers, about 10; the upper rather long and slender.

Pectoral $2\frac{3}{5}$ in body, reaching middle of soft dorsal. Third dorsal spine longest, $2\frac{2}{5}$ in head; anterior edge of first spine smooth. Caudal truncate, scarcely emarginate when closed. Soft dorsal rather high, $2\frac{1}{3}$

in head. Both dorsals faintly spotted, the spot behind the fourth spine diffuse and faint. Caudal with bars of spots. Back obscurely spotted. Pectorals blackish and clouded. A whitish area on back between dorsals.

This seems to be the species usually called PRIONOTUS PUNCTATUS.

There is also a specimen in the Museum, labeled, apparently in the handwriting of Valenciennes:

"*Trigla punctata* nobis, Bl., 253. *Tr. carolina*, Bl., 252. *Prionotus evolans* Lacèp. *Rubio volador* Párra, tab. 38, du Brésil. Quoy et Gaimard, exp'n Freycinet."

This specimen, .25^{m} long, in good condition, is of the same species as the one described above. Longest dorsal spine $2\frac{1}{6}$ in head. Pores in lateral line 85 to 90.

85. Scorpæna scrofina. (Cuv. & Val. ix, 465.)

Specimen .21^{m} long, from Brazil. Gay.

Color in spirits pale (red ?), marked only with numerous round black spots on head, dorsal, caudal, anal, and pectorals; a few on body. Axil whitish, with some whiter spots; a row of 6 dark spots from above axil to anal, not in a straight line. Spots largest and most distinct on pectorals and caudal, where they form irregular bands.

Occipital pit deep, broader than long; spines on head high and sharp; four over eye, two behind occipital pit, two on temporal region, and two behind these. Suborbital stay strong, with 4 or 5 spines. No coronal spines. Cirrus over eye low, about as long as pupil. Gill-rakers very small and short. Opercle scaled; some scales on cheeks. Breast scaly; scales large; some of them provided with flaps. About 31 pores in the lateral line. Second anal spine longest, $2\frac{1}{2}$ in head. Third dorsal spine $2\frac{2}{5}$. D. XII, 9.

This seems to be a valid species, allied to *Scorpæna grandicornis*. It may stand as SCORPÆNA SCROFINA.

86. Scorpæna brasiliensis. (Cuv. & Val., iv, 305.)

A dried skin, .22^{m} long, from Brazil. Delalande.

The color is faded, but otherwise, so far as I can see, this specimen agrees with the species from Florida, heretofore called by us SCORPÆNA BRASILIENSIS.

87. Scorpæna inermis. (Cuv. & Val., iv, 311.)

A small specimen from Martinique. Ricord.

Spines on top of head all low and smooth; no occipital pit; no cirrus above eye; suborbital stay strong. Lowest spines of preopercle directed a little forward; breast scaly.

Color brownish and mottled, much as in *S. brasiliensis*. Axil pale. Three dark bands on caudal. A dark band across head behind eye.

This is probably identical with *S. occipitalis* Poey and *S. calcarata* Goode & Bean, in which case it should stand as SCORPÆNA INERMIS.

88. Batrachus cryptocentrus. (Cuv. & Val., xii, 485.)

A specimen, .35[m] long, from Bahia. Musée de Genève.

Color mottled-brown, apparently without spots. Dorsal spines nearly hidden in the loose skin. No foramen in axil, but the skin of the axil covered with small parallel folds of skin, which are occasionally connected by cross-folds. Spines of head nearly hidden. Teeth short and very blunt. Rays of dorsal and anal enveloped in skin, and not easily counted; 28 to 30 soft rays in the dorsal and 22 to 24 in the anal. Cirrus over eye conspicuous.

This is a valid species, and, with *B. grunniens*, *B. diemensis*, and other species without foramen in the axil, it should probably constitute a new genus. This genus may receive the name of MARCGRAVIA, in tardy recognition of the work of the original discoverer of the species, Georg Maregrav, of Liebstad, author of the "Historia Rerum Naturalium Brasiliæ" (1648), and one of the ablest of the early writers on American natural history. The species may stand as MARCGRAVIA CRYPTOCENTRA.

INDIANA UNIVERSITY, *October* 2, 1886.

DESCRIPTIONS OF TEN SPECIES AND ONE NEW GENUS OF ANNELIDS FROM THE DREDGINGS OF THE U. S. FISH COMMISSION STEAMER ALBATROSS.

By JAMES E. BENEDICT.

(With six plates.)

SERPULIDÆ.

The ten species described in this paper were collected on the Albatross expeditions during the years 1883–'85. Five are well known, and five are believed to be new. Other species of the family in the collection remain to be described in another paper.

The Serpulidæ are not among the easiest annelids to collect. The tubes are nearly always attached to dead shells and stones, which from their nature are likely to be left to the last for preservation, and then, if the tubes are not broken with much care, the inhabitants are likely to be badly mutilated, while as a rule those left in the tubes are not well preserved. Altogether there is no family of animals more likely to be neglected in dredging, when more showy, and apparently more delicate, forms are abundant.

PROTULA Risso.

Protula diomedeæ, n. sp.

(Plate xx, figs. 1–6.)

The branchial filaments are inserted on a spiral of about $1\frac{1}{4}$ turns, and are about 40 in number. Eye-like spots are exposed to view when the branchiæ are detached.

The thoracic lamellæ are broad and thin, with entire edges.

The thoracic setæ are long and slender, outer third limbate (fig. 3). The uncini of this region are shorter and broader than those of the abdomen (figs. 1 and 2). The anterior abdominal setæ are short, with broad, flat, and slightly falcate blades. The inner edges of the blades are serrate (fig. 4). The extreme posterior abdominal setæ, as is common in species of this genus, are very long and hair-like, with curved points.

The tubes (fig. 6) are from 4 to 5 inches in length, and are attached by the base to objects on the bottom. The lines of growth are not conspicuous. The surface is very rough to the touch, reminding one of shark skin.

The average length of specimens in alcohol is 40^{mm}; breadth, 3^{mm}. Length of thorax, 11^{mm}; from collar to end of branchiæ, 10^{mm}.

Dredged in great numbers at station 2307, in 43 fathoms, off Cape Hatteras; and one or two at a time at other stations.

RECORD OF SPECIMENS.

Off the eastern coast of the United States:

Latitude 36° 38′ 30″ N., longitude 74° 40′ 10″ W., 81 fathoms; station 2011, one specimen (981).

Latitude 36° 41′ 05″ N., longitude 74° 38′ 55″ W., 373 fathoms; station 2014, two specimens (982).

Latitude 39° 29′ 00″ N., longitude 72° 19′ 55″ W., 74 fathoms; station 2031, two specimens (983).

Latitude 39° 29′ 00″ N., longitude 72° 19′ 40″ W., 74 fathoms; station 2032, one specimen (984).

Latitude 42° 32′ 00″ N., longitude 68° 17′ 00″ W., 99½ fathoms; station 2055, one specimen (985).

Latitude 40° 16′ 50″ N., longitude 67° 05′ 15″ W., 1,290 fathoms; station 2084, one specimen (986).

Latitude 40° 05′ 00″ N., longitude 70° 34′ 45″ W., 70 fathoms; station 2085, one specimen (987).

Latitude 40° 05′ 05″ N., longitude 70° 35′ 00″ W., 69 fathoms; station 2086, one specimen (988).

Latitude 40° 06′ 50″ N., longitude 70° 34′ 15″ W., 65 fathoms; station 2087, two specimens (989).

Latitude 40° 01′ 50″ N., longitude 70° 59′ 00″ W., 117 fathoms; station 2091, one specimen (990).

Latitude 39° 57′ 30″ N., longitude 69° 41′ 10″ W., 78 fathoms; station 2199, one specimen (991).

Latitude 35° 42′ 00″ N., longitude 74° 54′ 30″ W., 43 fathoms; station 2307, very numerous (992).

Latitude 37° 08′ 30″ N., longitude 74° 33′ 30″ W., 85 fathoms; station 2422, two specimens (994).

Latitude 44° 27′ 30″ N., longitude 57° 10′ 45″ W., 137 fathoms; station 2472, two specimens (995).

Latitude 44° 07′ 30″ N., longitude 57° 16′ 45″ W., 116 fathoms; station 2481, one specimen (996).

Gulf of Mexico:

Latitude 28° 36′ 00″ N., longitude 85° 33′ 30″ W., 111 fathoms; station 2402, two specimens (993).

Two species of Protula have already been described from practically the same region, *P. media* Stimpson,* and *P. americana* McIntosh.†

From these *P. diomedeæ* is readily distinguished, living as it does in a comparatively straight tube attached only at the base, while they both construct coil tubes attached more or less throughout their entire length. A much more important difference in the case of *P. media* is its deeply scalloped lamellæ described by Stimpson and figured in Smith and Harger's Saint George's Banks Dredgings, pl. vi, as compared with the entire margin of the thoracic lamellæ of *P. diomedeæ*. In the case of *Protula americana* the uncini are very different. Compare fig. 2 with fig. 7 of McIntosh.

* Marine Invert., Grand Manan, p. 30, 1853.

† Challenger Reports, vol. 12, p. 512, pl. liv, fig. 3; pl. xxxi*a*, figs. 19 and 20; 1885.

Protula alba, n. sp.

(Plate xx, figs. 8, 9.)

Branchiæ spiral of about one turn; filaments, twenty-five. When the branchiæ are removed at the base two dark spots are exposed to view, as described by Stimpson as a character of *P. media*.

The thoracic lamellæ are broad and very thin, continuous with the collar, which is entire.

The setæ of the thorax are long and slender, outer third limbate. The uncini of the thorax and abdomen are alike in form; their teeth are exceedingly minute (fig. 8). The falcate setæ of the abdomen have also very minute teeth on their inner edges (fig. 9). The extreme posterior abdominal setæ are of the usual form, long, hair-like, and curved at the ends. Color white.

Length of large specimens 25^{mm}; breadth of thorax, including lamellæ, 6^{mm}; breadth of abdomen 2.5^{mm}.

Saint Thomas, West Indies; shallow water. Ten specimens (979).

HYDROIDES Gunner.

Hydroides dianthus Verrill.

(Plate xx, fig. 10.)

Serpula dianthus Verrill, Invert. Animals of Vineyard Sound, p. 620, 1874.
Hydroides dianthus Verrill, Proc. Acad. Nat. Sci., Phila., for 1878, p. 300.
Hydroides dianthus Webster, Annel. Chæt. of the Virginian Coast, p. 66, 1879; and Annel. Chæt. of New Jersey, p. 28, 1879.

The branchiæ are composed of about eighteen filaments. There are three concentric circles of spines on the operculum, the outer one being formed by the denticles on the edge. These denticles are from 21 to 27 in number, short and pointed, curving outward from the center. The next circle is composed of ten long spines (ten on four specimens and nine on one), curving either outward from the center or towards it; in none of the specimens examined did more than five point outward. The third and inner circle is composed of short conical projections arising from the base of the long spines of the second circle (fig. 10); these conical projections or spines are close down to the floor of the operculum, and are usually concealed by dirt.

The only color remaining is a wide band of dark green a little below the edge of the operculum.

Tubes convoluted, calcareous, on living oysters, shells, and stones.

Five small specimens from the oyster beds of Chesapeake Bay (997).

Hydroides spongicola, n. sp.

(Plate xx, figs. 11, 12. Plate xxi, figs, 13–16.)

Branchiæ large, composed of about thirty slender filaments.

Operculum armed with three concentric circles of spines, the outer one on the edge of the operculum comprising sixty-five slender-pointed denticles curving outward from the center. The next and most prominent circle arises from inside the cup of the operculum and extends upward perpendicularly to the floor; it is composed of from fourteen to

eighteen spines, their points curving invariably inward (fig. 12). The inner circle of spines arises from the base of the long spines, near the bottom of the cup, and are slightly curved towards the center (fig. 11).

The collar-setæ have two conical points at the head of the main shaft (13). The uncini of the thorax have from six to eight teeth; those of the abdomen are smaller, with the same number of teeth (figs. 14 and 15).

The setæ and uncini of this and the preceding species are so nearly alike that they fail to be characteristic.

Very thin and frail calcareous tubes in living sponges.

Length of large specimen, 40mm; breadth, 2.5mm.

Gulf of Mexico, latitude 27° 04′ N., longitude 83° 21′ 15″ W., 26 fathoms; station 2409, ten specimens (975).

Hydroides protulicola, n. sp.

(Plate xx, fig. 17. Plate xxi, figs. 18–23.)

The branchiæ are small, having from ten to twelve filaments with long, naked ends; the pinnæ are large.

The opercula have about twenty-six conical points forming the edge. Twelve stout spines, with their points invariably bent outward from the center, form the inner and prominent armature (fig. 18). These spines have stout, decurved processes on their inner bases, corresponding to the spines forming the inner circle in the preceding species (fig. 17).

As compared with *H. dianthus*, the points at the head of the main shaft are a little longer and not quite so stout, and have prominent markings below them (fig. 19).

The thoracic uncini, having from six to eight teeth, are much narrower than the abdominal, which have five or six teeth (figs. 20 and 21).

Found living in coiled tubes fastened to the tubes of *Protula diomedeæ*.

Length of large specimens, 16mm; width, 2mm.

Off Cape Hatteras, latitude 35° 42′ N., longitude 74° 54′ 30″ W., 43 fathoms; station 2307, 20 specimens (972).

CRUCIGERA, new gen.

Serpulidæ with the operculum infundibuliform and calcareo-cartilaginous, bearing radii more or less branched, with rounded apices crenulating the periphery; inner surfaces beset with conical teeth. Peduncle with four digital processes just below the operculum, forming a cross.

Crucigera Websteri, n. sp.

(Plate xxi, figs. 24, 25. Plate xxii, figs. 26–30.)

The branchiæ are composed of about eighteen filaments.

The operculum is bell-shaped, with a strong peduncle; four digital processes arise on the peduncle just below the cup and form a cross. The disk is composed of a number of radii, branching so as to form fifty well rounded apices (figs. 24 and 25). The radii, on their inner surfaces, are armed with short, conical, horny teeth.

The collar-setæ are long and very stout (figs. 26 and 27).

The thoracic uncini are like the abdominal, but much larger (figs. 29 and 30).

The tubes, on their upper surfaces, have two or three very irregular, thin ridges; their under surfaces, usually attached for the greater part of their length to dead shells and stones, are, when free, round and smooth.

Length of large specimen, 16mm.

Gulf of Mexico, latitude 29° 16′ 30″ N., longitude 85° 32′ W., 26 fathoms; station 2369, eight specimens (974).

POMATOSTEGUS Schmarda.

Pomatostegus stellatus Schmarda.

(Plate xxii, figs. 32–35. Plate xxiii, figs. 36, 37.)

Terebella stellata Abildg., Schriften Naturf., Freunde, ix, p. 142.
Serpula stellata Savigny, Syst. des Ann., p. 75.
Pomatostegus stellatus Schmarda, Neue wirbellose Thiere, p. 32, 1859.

The opercula have from two to five disks, the upper ones often much worn and broken, those nearest the peduncle usually quite perfect. The upper disks are readily detached, leaving the projecting stem of the one below surmounted by the usual crown of radial points. The specimens show, in some cases, a partial cleavage of the soft head of the peduncle from the lowest disk (figs. 32–34). It would appear from this that the disks were successively secreted, and that they grow out, keeping the operculum in good repair.

The collar-setæ are long and slender, slightly constricted, and then enlarged just below the head of the main shaft (fig. 35).

The thoracic setæ are limbate: the uncini are large and have twelve or thirteen teeth (fig. 36). The abdominal uncini are the same in shape, but have only nine or ten teeth (fig. 37).

The branchiæ are spiral, of little more than one turn. They retain their color in alcohol, varying from a dark blue, with only a trace of white, to a blue with white bands. One specimen has white branchiæ with only very narrow bands of blue.

Length of large specimens, 45mm; width, 4mm.

Ten specimens (969 and 998).

Jamaica and Curaçao; shallow water.

SPIROBRANCHUS Blainville.

Spirobranchus giganteus (Pall.) Mörch.

(Plate xxiii, figs. 38–42. Plate xxiv, figs. 43–47.)

Serpula gigantea Pallas, Misc. Zool., p. 139, pl. 10, figs. 2–10.
Serpula gigantea Savigny, Syst. des Ann., p. 74.
Serpula gigantea Grube, Fam. der Ann., p. 90.
Cymospira gigantea Blainville, Dict. des Sci. Nat., Art. Vers.
Cymospira gigantea Schmarda, Neue wirbellose Thiere, p. 31.
Cymospira gigantea Quatrefages, Hist. Nat. des Ann., tome ii, p. 543.
Spirobranchus giganteus **Mörch**, Rev. Crit. Serp., p. 56, pl. ii, figs. 18–20.

There are eight specimens of this species in the collection, four from St. Thomas and four from Curaçao. The St. Thomas specimens are somewhat darker and smaller than those from Curaçao. The operculum of a small specimen from St. Thomas is nearly circular (fig. 38). A slightly larger specimen shows a ridge running back from the horns to the center of the disk, as is the case with specimens of the same size from Curaçao.

Figs. 41 and 42 show an operculum of a large specimen from Curaçao, in which the ridge runs back to the posterior edge of the disk and is elevated, having four short horns projecting at the end.

The branchiæ of the large specimens are eight-spiral; those of the small, five-spiral.

The collar-setæ are of two varieties (figs. 43 and 44). The points of setæ represented by fig. 43 were invariably broken. The figure shows the point restored by producing the outlines to an intersection beyond the break.

The thoracic uncini (fig. 45) have from sixteen to eighteen teeth; the abdominal (fig. 46), from ten to thirteen.

The collars of all the specimens are of a deep blue; the branchiæ are rose-red, variegated with flesh-color.

As is well known, this species lives in tubes formed in coral. The mouths of the tubes are made smooth by a secretion of carbonate of lime of a light-purple tinge. A single curved spine of the same substance projects over the entrance of the tube (fig. 40). This is undoubtedly secreted by the worm.

The largest specimen is about 75^{mm} in length and 9^{mm} in breadth; the smallest about 40^{mm} in length, and 5^{mm} in breadth.

Colors and sizes taken from specimens in strong alcohol.

Coral reefs; shallow water (961-964).

Spirobranchus incrassatus (Kröyer) Mörch.

(Plate xxiii, fig. 48. Plate xxiv, fig. 49.)

Cymospira incrassata Kröyer, Mus. Reg.
Cymospira incrassata Quatrefages, Hist. Nat. des Ann., t. ii, p. 545.
Spirobranchus incrassatus Mörch, Rev. Crit. Serp., p. 59, pl. xi, figs. 21-23.

A single specimen of this species was placed in the collection by a member of the Mexican Geographical Commission. It agrees quite well with Mörch's description and figures, except that the unpaired horn arises from the operculum (fig. 49) at the same angle as the large pair, and all are much nearer the center. The true outline of the operculum is shown in fig. 48. The branchiæ are eight-spiral.

It is probable that a large series of specimens would show this to be a variety of *S. giganteus*, or even a form due to age. The species was described originally from the Pacific Ocean.

The long collar-setæ are the same in size and shape as those figured from *S. giganteus*. It was impossible to compare the small collar-setæ

The thoracic uncini have from eighteen to twenty teeth; the abdominal, eleven to thirteen. The capillary setæ from the abdomen are a little more enlarged at the end.

Length, 90mm; breadth, 9mm, in alcoholic specimens. No color remains.

Collected at Vera Cruz. Teste Señor J. G. Aguilera (999).

Spirobranchus dendropoma Mörch.

(Plate xxiv, figs. 57, 58. Plate xxv, figs. 50–56.)

Spirobranchus dendropoma Mörch, Rev. Crit. Serp., p. 60, 1863.
Cymospira litigera Quatrefages, Hist. Nat. des Ann., tome ii, p. 545, 1865.

Many specimens of this species were collected at St. Thomas, Jamaica, and Curaçao. They agree quite well with Mörch's description except that the horns, five or six in number, are situated nearer the center than he describes them.

The branchiæ differ from the two preceding species of the genus in having but one turn on a circular rather than on a spiral base, and in the structure of the branchial filaments, which have a cirrus at the base of the free portion (fig. 50).

While in these respects it differs from the leading species of the genus, the structure of the opercula and the form of the setæ and uncini show it to be closely related to it. The opercula vary in shape, and range in color from dark blue to white. The horns of some of the larger specimens (fig. 53) are short and stumpy, while others are long and have numerous branches (figs. 51 and 52). Specimens with large horns have, as a rule, more slender peduncles. The digital processes on the inner margin of the wings of the peduncles are often well marked.

No unbroken specimens of the collar-setæ were found. The markings on the head of the main shaft are more distinct than those on similar setæ of *S. giganteus* (fig. 54.)

The uncini of the thorax are similar to those of the abdomen but larger, and average one or two teeth more, the former having from twelve to fifteen, and the latter from ten to thirteen, according to their position in the row (figs. 55 and 56). The abdominal setæ are scarcely distinguishable from those of the preceding species (fig. 57).

The specimens when first collected were placed in strong alcohol, and still retain some color, as is often the case under these circumstances.

The branchiæ vary from a light to a dark blue banded with white. The lamellæ of the thorax are in most cases a dark violet-blue. The thorax and anterior part of the abdomen are dark.

Length of large specimens, 40mm; breadth, 2.5mm.

In tubes; coral reefs; shallow water (967, 968, and 977).

A PRELIMINARY LIST OF THE FISHES OF THE WEST INDIES

By DAVID STARR JORDAN.

In this list I have endeavored to represent the present condition of our knowledge of the fish-fauna of the West Indies. I have included in it all species which have been accredited by good authority to the waters of the West Indies proper and the Bermudas, as well as to the Atlantic coasts of Mexico, Central America, Venezuela, and Guiana. I have excluded from it all species which have not yet been found farther south than the Florida Keys and the "Snapper Banks" of the Gulf, as well as all those as yet known only from Brazil, although, as a matter of course, many of each of these categories will be found to be genuine members of the West Indian fauna, the "Snapper Bank" fauna especially being entirely West Indian in its general character. In most of the families an attempt has been made to exclude purely nominal species, but in some groups (*Siluridæ*, *Syngnathidæ*, *Muræniдæ*, etc.), in which no critical studies have yet been made, this has been impossible.

Throughout the list reference has been made to Günther's Catalogue of the Fishes of the British Museum, and in case of species described under one name or another in the writings of Professor Poey, this fact is indicated by the letter P.

It should be clearly understood that this is simply a preliminary list, which must needs be greatly modified when the species of the different groups receive thorough study. It is probable that comparatively few of the larger shore-fishes are to be added to the list, but of the smaller fishes, and especially of those found in deep water, it is not unlikely that the majority are still undescribed.

This list may be compared with a similar list of the species described from the Pacific Coast of Tropical America, published by me in these Proceedings for 1885, pp. 361–394.

In matters of nomenclature, I have endeavored to follow exactly the rules laid down in the code recently published by the American Ornithologists' Union, with the exception of Canons XVII and XVIII, both of which I repudiate, as likely to be productive only of confusion.

Family I.—BRANCHIOSTOMIDÆ.

1. BRANCHIOSTOMA Costa.

1. **Branchiostoma lanceolatum** (Pallas). (G. viii, 513.)
(*Branchiostoma caribæum* Sundevall: possibly a valid species.)

Family II.—HEXANCHIDÆ.

2. HEXANCHUS Rafinesque.

2. **Hexanchus griseus** (Gmelin). (G. viii, 397. P.)

Family III.—SQUALIDÆ.

3. SQUALUS (Linnæus) Rafinesque.

3. **Squalus acanthias** L. (G. viii, 418. P.)

4. ETMOPTERUS Rafinesque.

(*Spinax* Cuvier.)

4. **Etmopterus spinax** (Linnæus). (G. viii, 424. P.)
(*Spinax hillianus* Poey.)

Family IV.—SCYLLIORHINIDÆ.

5. GINGLYMOSTOMA Müller & Henle.

5. **Ginglymostoma cirratum** (Gmelin). (G. viii, 408. P.)
(*? Ginglymostoma fulvum* Poey: probably a color-variety.)

Family V.—GALEORHINIDÆ.

6. GALEUS (Rafinesque) Leach.

(*Mustelus* Cuvier.)

6. **Galeus canis** (Mitchill). (G. viii, 386. P.)

7. GALEOCERDO Müller & Henle.

7. **Galeocerdo maculatus** (Ranzani). (G. viii, 378. P.)
(*Galeocerdo tigrinus* Müller & Henle.)

8. CARCHARHINUS Blainville.

(*Carcharias* Cuvier: not of Rafinesque.)
§ *Eulamia* Gill.

8. **Carcharhinus lamia** (Risso). (G. viii, 372. P.)
(*Eulamia longimana* Poey.)

9. **Carcharhinus platyodon** (Poey). (P.)
(*Eulamia obtusa* Poey.)

10. **Carcharhinus falciformis** (Bibron). (P.)
(*Squalus tiburo* Poey: not of L.)

11. **Carcharhinus acronotus** (Poey). (P.)

12. **Carcharhinus perezii** (Poey). (P.)

13. **Carcharhinus porosus** (Ranzani). (G. viii, 365.)
(*? Carcharias fissidens* Bennett, 1830: *Carcharias henlei* Valenciennes.)

14. **Carcharhinus leucos** (Valenciennes).
(*Carcharias leucos* Val. in Müller & Henle, Plag. 42.)

15. **Carcharhinus remotus** (Valenciennes).
(*Carcharias remotus* Val. Duméril, Elasmobr., 1870, 364.)

16. **Carcharhinus maculipinnis** (Poey). (P.)

17. Carcharhinus nicaraguensis (Gill).
(*Eulamia nicaraguensis* Gill, Proc. Ac. Nat. Sci., Phila.)

§ *Hypoprion* Müller & Henle.

18. Carcharhinus brevirostris (Poey). (G. viii, 362. P.)
19. Carcharhinus signatus (Poey). (G. viii, 362. P.)
20. Carcharhinus longirostris (Poey). (P.)

§ *Isogomphodon* Gill.

21. Carcharhinus limbatus (Müller & Henle). (G. viii, 373.)
(*Carcharias mülleri* Steindachner; *Prionodon cuvieri* Castelnau.)
22. Carcharhinus oxyrhynchus (Müller & Henle). (G. viii, 375.)

§ *Aprionodon* Gill.

23. Carcharhinus isodon (Müller & Henle). (G. viii, 361. P.)
(*Carcharias punctatus* Günther: not *Sq. punctatus* Mitchill.)

§ *Scoliodon* Müller & Henle.

24. Carcharhinus terræ-novæ (Richardson). (G. viii, 360. P.)
(? *Squalus punctatus* Mitchill, the name *punctatus* preoccupied; *Carcharias* (*Scoliodon*) *lalandi* Müller & Henle; *Scoliodon porosus* Poey.)

Family VI.—SPHYRNIDÆ.

9. SPHYRNA Rafinesque.

§ *Reniceps* Gill.

25. Sphyrna tiburo (Linnæus). (G. viii, 382. P.)

§ *Sphyrna*.

26. Sphyrna tudes (Cuvier). (G. viii, 382.)
27. Sphyrna zygæna (Linnæus). (G. viii, 381. P.)

Family VII.—ALOPIIDÆ.

10. ALOPIAS Rafinesque.

23. Alopias vulpes (Gmelin). (G. viii, 393. P.)

Family VIII.—LAMNIDÆ.

11. ISURUS Rafinesque.

29. Isurus dekayi Gill. (P.)

Family IX.—PRISTIDIDÆ.

12. PRISTIS Latham.

30. Pristis pectinatus Latham. (G. viii, 437. P.)
(? *Pristis acutirostris* Duméril.)
31. Pristis perrotteti Müller & Henle. (G. viii, 466.)

Family X.—RHINOBATIDÆ.

13. RHINOBATUS Bloch & Schneider.

32. Rhinobatus spinosus Günther. (G. viii, 513: "Mexico.")

Family XI.—RAJIDÆ.

14. RAJA Linnæus.

33. Raja ackleyi Garman. (Garman, Bull. Mus. Comp. Zoöl., xi, 235, 1881.)

Family XII.—TORPEDINIDÆ.

15. TORPEDO Duméril.

34. Torpedo occidentalis Storer. (G. viii, 448. P.)

16. NARCINE Henle.

35. Narcine brasiliensis (Olfers). (G. viii, 453.)
(*Narcine umbrosa* Jordan.)

Family XIII.—DASYATIDÆ.

17. UROLOPHUS Müller & Henle.

36. Urolophus torpedinus (Desmarest). (G. viii, 485. P.)

18. DASYATIS Rafinesque.

37. Dasyatis say (Le Sueur). (P.)
38. Dasyatis hastata (De Kay). (G. viii, 476.)
39. Dasyatis tuberculata (Lacépède). (G. viii, 480.)

19. TÆNIURA* Müller & Henle.

(*? Ellipesurus* Schomburgk: *Potamotrygon* Garman.)
40. Tæniura dumérili (Castelnau). (G. viii, 484.)
(*? Ellipesurus spinicauda* Schomburgk.)
41. Tæniura motoro (Müller & Henle). (G. viii, 484.)
42. Tæniura hystrix (Müller & Henle). (G. viii, 482.)
(*? Pastinaca humboldti* Roulin.)
43. Tæniura magdalenæ (Valenciennes).
(Duméril, Elasmobranches, 1870, 625: Steindachner, Zur Fisch-fauna des Magdelenen-Stromes, 1878, 56.)

20. PARATRYGON Duméril.

(*Discus* Garman.)

44. Paratrygon strongylopterus (Schomburgk). (G. viii, 476.)

* For an account of the species of these genera of fluviatile Sting-rays, *Tæniura* and *Paratrygon*, see Garman, Proc. Bost. Soc. Nat. Hist., 1877, 210, and Steindachner, Zur Fisch-fauna des Magdelenen-Stromes, 1878.

21. PTEROPLATEA Müller & Henle.

45. Pteroplatea maclura (Le Sueur). (G. viii, 487.)

Family XIV.—MYLIOBATIDÆ.

22. STOASODON Cantor.

46. Stoasodon narinari (Euphrasen). (G. viii, 492. P.)

23. MYLIOBATIS (Constant) Duméril.

47. Myliobatis freminville (Le Sueur). (G. viii, 488.)
48. Myliobatis goodei Garman.
(Garman, Proc. U. S. Nat. Mus., 1885, 39.)

Family XV.—MANTIDÆ.

24. MANTA Bancroft.

49. Manta birostris (Walbaum). (G. viii, 498. P.)

25. MOBULA Rafinesque.

(*Cephaloptera* Duméril preoccupied: *Diecrobatis* Blainville.)
50. Mobula hypostoma (Bancroft). (G. viii, 497. P.)
(*Cephaloptera olfersi* Müller.)

Family XVI.—CHIMÆRIDÆ.

26. CHIMÆRA Linnæus.

51. Chimæra monstrosa (Linnæus). (G. viii, 349. P.)

Family XVII.—LEPISOSTEIDÆ.

27. LEPISOSTEUS Lacépède.

52. Lepisosteus tristœchus (Bloch & Schneider). (G. viii, 329. P.)
(*Lepidosteus manjuari* Poey; *Lepisosteus spatula* Lacépède.)

Family XVIII.—SILURIDÆ.

28. GALEICHTHYS Cuv. & Val.

§ *Arius* Cuv. & Val.

53. Galeichthys melanopus (Günther). (G. v, 172.)
54. Galeichthys variolosus (Cuv. & Val.). (G. v, 173.)
55. Galeichthys fissus (Cuv. & Val.). (G. v, 172.)
(? *Pimelodus spixi* Agassiz; ? *Pimelodus albidus* Spix: the name *albidus* preoccupied.)
56. Galeichthys arenatus (Cuv. & Val.). (G. v, 172.)
57. Galeichthys laticeps (Günther). (G. v, 171.)

58. Galeichthys nuchalis (Günther). (G. v, 171.)
59. Galeichthys luniscutis (Cuv. & Val.). (G. v, 152.)
60. Galeichthys parkeri (Traill). (G. v, 152.)
(*Arius quadriscutis* Cuv. & Val.)

§ *Hexanematichthys*,* *Netuma*, etc.

61. Galeichthys assimilis (Günther). (G. v, 146.)
62. Galeichthys barbus (Lacépède). (G. v, 143.)
(*Pimelodus barbus* and *commersoni* Lacépède.)
63. Galeichthys herzbergi (Bloch). (G. v, 144.)
(*Bagrus cœlestinus* Müller & Troschel.)
64. Galeichthys dubius (Bleeker). (G. v, 144.)
65. Galeichthys mesops (Cuv. & Val.). (G. v, 145.)
66. Galeichthys surinamensis (Bleeker). (G. v, 148.)
67. Galeichthys proops (Cuv. & Val.). (G. v, 148.)
68. Galeichthys passany (Cuv. & Val.). (G. v, 149.)
69. Galeichthys emphysetus (Müller & Troschel). (G. v, 150.)
70. Galeichthys albicans (Cuv. & Val.). (G. v, 150.)
(*Arius valenciennesi* Günther.)
71. Galeichthys flavescens (Cuv. & Val.). (G. v, 151.)
72. Galeichthys temminckianus (Cuv. & Val.) (G. v, 151.)
73. Galeichthys felis (Linnæus). (G. v, 155, 173.)
(*Arius milberti* Cuv. & Val.; *Arius equestris* Baird & Girard.)
74. Galeichthys rugispinis (Cuv. & Val). (G. v, 156.)
(*? Galeichthys dieperinki* Bleeker.)
75. Galeichthys phrygiatus (Cuv. & Val). (G. v, 156.)
76. Galeichthys grandicassis (Cuv. & Val). (G. v, 153.)
77. Galeichthys stricticassis (Cuv. & Val). G. v, 154.)

29. ÆLURICHTHYS Baird & Girard.

78. Ælurichthys marinus (Mitchill). (G. v, 178.)
(*Galeichthys parræ* and *blochi* Cuv. & Val.)
79. Ælurichthys longispinis Günther. (G. v, 178.)
80. Ælurichthys bagre (Linnæus). (G. v, 178.)
(*Galeichthys gronovii* C. & V.)

30. PIMELODUS Lacépède.

§ *Rhamdia* Bleeker. (=*Pimelonotus* Gill.)
81. Pimelodus vilsoni (Gill). (G. v, 122.)

Family XIX.—LORICARIIDÆ.

31. CALLICHTHYS Gronow.

(*Cataphractus* (Bloch) Lacépède: preoccupied in mammalia.)
82. Callichthys kneri (Gill). (G. v, 227.)
83. Callichthys littoralis Hancock. (G. v, 227.)
(*Callichthys lævigatus* and *subulatus* C. & V.; *Hoplosternum stevardi* Gill.)
84. Callichthys thoracatus Cuv. & Val. (G. v, 228.)

* Doubtful species are: *Bagrus pemecus* Cuv. & Val., and *Bagrus couma* Cuv. & Val. (G. v, 138.)

32. **CORYDORAS** Lacépède.

85. Corydoras æneus Gill. (G. v, 230.)

33. **PLECOSTOMUS** (Artedi). Bleeker.

(*Hypostomus* Cuv. & Val.: not of Lacépède.)

86. Plecostomus ? robini (Cuv. & Val.*) (G. v, 236.)

34. **CHÆTOSTOMUS** (Heckel) Tschudi.

§ *Ancistrus* Kner.

87. Chætostomus guacharote Cuv. & Val. (G. v, 245.)

88. Chætostomus trinitatis Günther. (G. v, 246.)

Family XX.—ERYTHRINIDÆ.

35. **ERYTHRINUS** Gronow.

89. Erythrinus cinereus Gill. (G. v, 283.)

36. **MACRODON** Müller & Troschel.

90. Macrodon ferox Gill. (G. v, 281.)

37. **STEVARDIA** Gill.

§ *Stevardia.*

91. Stevardia albipinnis Gill. (G. v, 287.)

§ *Corynopoma* Gill.

92. Stevardia riisei (Gill). (G. v, 287.)

93. Stevardia veedoni (Gill). (G. v, 287.)

§ *Nematopoma* Gill.

94. Stevardia searlesi (Gill). (G. v, 288.)

Family XXI.—CHARACINIDÆ.

38. **CURIMATUS** Cuvier.

95. Curimatus argenteus Gill. (G. v, 344.)

39. **TETRAGONOPTERUS** (Artedi) Cuvier.

§ *Astyanax* Baird & Girard.

96. Tetragonopterus brevoortii (Gill). (G. v, 317.)

97. Tetragonopterus tæniurus (Gill). (G. v, 317.)

98. Tetragonopterus pulcher (Gill). (G. v, 317.)

§ *Hemigrammus* Gill.

99. Tetragonopterus unilineatus (Gill.) (G. v, 317.)

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*_Hypostomus robini_ Gill, Ann. Lyc. Nat. Hist., vi, 46. According to Günther, this is probably a different species from that described by Valenciennes.

Family XXII.—ALBULIDÆ.

40. ALBULA Gronow.

100. Albula vulpes (Linnæus). (G. vii, 468. P.)

Family XXIII.—ELOPIDÆ.

41. ELOPS Linnæus.

101. Elops saurus Linnæus. (G. vii, 470. P.)

42. MEGALOPS Lacépède.

102. Megalops atlanticus Cuv. & Val. (G. vii, 472. P.)

Family XXIV.—CLUPEIDÆ.

43. CLUPEA Linnæus.

§ *Sardinia* Poey.

103. Clupea pseudohispanica Poey. (G. vii, 442. P.)

104. Clupea apicalis Müller & Troschel. (G. vii, 441.)

(*? Alosa bishopi* Müller & Troschel.)

§ *Sardinella* Cuv. & Val.

105. Clupea anchovia (Cuv. & Val). (G. vii, 421.)

§ *Harengula* Cuv. & Val.

106. Clupea sardina Poey. (P.)

107. Clupea macrophthalma Ranzani. (G. vii, 421.)

(*Clupea maculosa* C. & V.)

108. Clupea callolepis (Goode).

(Goode, Proc. U. S. Nat. Mus., 1879, 152: Bermuda.)

109. Clupea clupeola (Cuv. & Val). (G. vii, 422. P.)

(*? Harengula latulus* Cuv. & Val.; *Harengula clupeola* Poey; *Clupea humeralis* Gthr.; *? Alausa striata* Cuv. & Val.)

110. Clupea humeralis (Cuv. & Val.) (P.)

(*? Harengula jaguana* Poey. *?Harengula pensacolæ* Goode & Bean.)

44. OPISTHONEMA Gill.

111. Opisthonema oglinum (Le Sueur). (G. vii, 432. P.)

45. BREVOORTIA Gill.

112. Brevoortia tyrannus aurea (Agassiz). G. vii, 437.)

46. PELLONA Cuv. & Val.

113. Pellona bleekeriana Poey. (P.)

114. Pellona flavipinnis Valenciennes. (G. vii, 464.)

47. PRISTIGASTER Cuvier.

115. Pristigaster cayanus Cuvier. (G. vii, 463.)

(*Pristigaster martii* Agassiz: *Pristigaster phæthon* Cuv. & Val.)

48. **ODONTOGNATHUS** Lacépède.

116. Odontognathus mucronatus Lacépède. (G. vii, 462.)

49. **CHIROCENTRODON** Günther.

117. Chirocentrodon tæniatus Günther. (G. vii, 463.)

50. **DUSSUMIERIA** Cuv. & Val.

118. Dussumieria? lamprotænia. (Gosse). (G. vii, 465.)

Family XXV.—STOLEPHORIDÆ.

51. **STOLEPHORUS** Lacépède.

119. Stolephorus browni (Gmelin). (G. vii, 389. P.)
120. Stolephorus perfasciatus (Poey). (G. vii, 381. P.)
121. Stolephorus productus (Poey). (G. vii, 388. P.)
122. Stolephorus argyrophanus (Cuv. & Val.)
(? *Stolephorus curystole* Swain & Meek.)
123. Stolephorus cubanus (Poey). (P.)
124. Stolephorus mitchilli (Cuv. & Val.) (? G. vii, 391.)
125. Stolephorus spinifer (Cuv. & Val.) (G. vii, 394.)
126. Stolephorus surinamensis (Bleeker). (G. vii, 393.)
127. Stolephorus chœrostomus (Goode).
(*Engraulis chœrostomus* Goode, Am. Journ. Sci. Arts, 1874, 125, Bermuda.)

52. **PTERENGRAULIS** Günther.

128. Pterengraulis atherinoides (Linnæus). (G. vii, 398.)

53. **LYCENGRAULIS** Günther.

129. Lycengraulis grossidens (Cuvier). (G. vii, 399.)

54. **CETENGRAULIS** Günther.

130. Cetengraulis edentulus (Cuvier). (G. vii, 383. P.)
(*Cetengraulis brevis* Poey.)

Family XXVI.—ALEPISAURIDÆ.

55. **ALEPISAURUS** Lowe.
(*Plagyodus* (Steller) Günther.)

131. Alepisaurus altivelis Poey. (G. v, 423. P.)
(*Caulopus poeyi* (Gill.)

Family XXVII.—PARALEPIDIDÆ.

56. **SUDIS** Rafinesque.

132. Sudis intermedius Poey. (P.)

Family XXVIII.—SYNODONTIDÆ.*

57. **SYNODUS** Gronow.

§ *Synodus*.

133. Synodus fœtens (Linnæus). (G. v, 396.)
134. Synodus saurus (Linnæus). (G. v, 394.)
135. Synodus spixianus Poey. (G. v, 397. P.)
136. Synodus anolis (Cuv. & Val.). (G. viii, 396. P.)
(*Synodus cubanus* Poey.)
137. Synodus synodus (Linnæus).
(*Saurus intermedius* Spix; *Saurus atlanticus* Johnson.)
138. Synodus poeyi Jordan. (P.)
(*Synodus intermedius* Meek: not of Spix.)

§ *Trachinocephalus* Gill.

139. Synodus myops (Forster). (G. v, 398: 397. P.)
(*Trachinocephalus brevirostris* Poey.)

58. **BENTHOSAURUS** Goode & Bean.

140. Benthosaurus grallatus Goode & Bean.
(Goode & Bean, Bull. Mus. Comp. Zool., xii, 5, No. 169, 1886.)

Family XXIX.—SCOPELIDÆ.

59. **MYCTOPHUM** Rafinesque.

141. Myctophum nocturnum Poey. (P.)

Family XXX.—STOMIATIDÆ.

60. **ASTRONESTHES** Richardson.

142. Astronesthes niger Richardson. (G. v, 425.)
143. Astronesthes richardsoni Poey. (P.)

Family XXXI.—CYPRINODONTIDÆ.

61. **HETERANDRIA** Agassiz.

(*Girardinus* Poey.)
144. Heterandria uninotata (Poey). (G. vi, 351. P.)
145. Heterandria metallica (Poey). (G. vi, 351. P.)
146. Heterandria versicolor (Günther). (G. vi, 352.)
147. Heterandria guppii (Günther). (G. vi, 353.

* See a review of the American species of *Synodus* by Meek, Proc. Ac. Nat. Sci. Phila., 1884, 130.

62. **LEBISTES** De Filippi.

148. **Lebistes pœcilioides** De Filippi. (G. vi, 355.)

63. **PŒCILIA** Bloch & Schneider.

(*Limia* Poey.)

149. **Pœcilia vittata** Guichenot. (G. vi, 339, 340. P.)
(*Limia cubensis* Poey.)
150. **Pœcilia vivipara** Bloch & Schneider. (G. vi, 345.)
151. **Pœcilia melanogaster** Günther. (G. vi, 345.)
152. **Pœcilia dominicensis** Cuv. & Val. (G. vi, 346.)
153. **Pœcilia pavonina** (Poey). (P.)

64. **ANABLEPS** (Artedi) Bloch.

154. **Anableps anableps** (Linnæus). (G. vi, 337.)
(*Anableps tetrophthalmus* Bloch.)
155. **Anableps microlepis** Müller & Troschel. (G. vi, 338.)
(*Anableps coarctatus* and *? A. elongatus Cuv. & Val.*)

65. **GAMBUSIA** Poey.

156. **Gambusia punctata** Poey. (G. vi, 334. P.)
157. **Gambusia puncticulata** Poey. (G. vi, 334. P.)
158. **Gambusia picturata** Poey. (P.)
159. **Gambusia melapleura** (Gosse). (G. vi, 317. Jamaica).

66. **BELONESOX** Kner.

160. **Belonesox belizanus** Kner. (G. vi, 333.)

67. **RIVULUS** Poey.

161. **Rivulus cylindraceus** Poey. (G. vi, 327. P.)
162. **Rivulus marmoratus** Poey. (P.)
163. **Rivulus micropus** Steindachner. (G. vi, 327.)
164. **Rivulus elegans** Steindachner.
(Denkschr. Akad. Wiss. Wein, 1880, 33 Rio Cauca.)

68. **FUNDULUS** Lacépède.

165. **Fundulus fonticola** Cuv. & Val.
(*Cuv. & Val.*, xviii, 198.)
166. **Fundulus bermudæ** Günther.
(Günther Ann. Mag. Nat. Hist., 1874. Bermuda: ***Fundulus rhizophoræ*** **Goode;** Amer. Jour. Sci. Arts, 1877, 298.)

69. **CYPRINODON** Lacépède.

(*Trifarcius* Poey.)

167. **Cyprinodon variegatus riverendi** (Poey). (P.)
168. **Cyprinodon felicianus** (Poey). (P.)
169. **Cyprinodon martæ** Steindachner.
(Ichth. Beitr., iv, 62, 1875. Mouth of Rio Magdalena.)

Family XXXII.—GYMNOTIDÆ.

70. GITON (Kaup) Duméril.

(*Carapus* Müller & Troschel, not of Rafinesque.)

170. Giton fasciatus (Pallas). (G. viii, 9.)

Family XXXIII.—SYMBRANCHIDÆ.

71. SYMBRANCHUS Bloch.

171. Symbranchus marmoratus Bloch. (G. viii, 15. P.)

Family XXXIV.—MURÆNIDÆ.

72. ENCHELYCORE Kaup.

172. Enchelycore nigricans (Bonnaterre). (G. viii, 135.)

73. CHANNOMURÆNA Richardson.

173. Channomuræna vittata Richardson. (G. viii, 134. P.)

(*Channomuræna cubensis* Poey.)

74. ECHIDNA Forster.

(*Pœcilophis* Kaup.)

174. Echidna catenata (Bloch). (G. viii, 130. P.)

(*Echidna flavofasciata* and *fuscomaculata* Poey.)

PYTHONICHTHYS Poey.

175. Pythonichthys sanguineus Poey. (G. viii, 126. P.)

75. SIDERA* Kaup.

(*Gymnothorax* Poey: not Bloch.)

176. Sidera funebris (Ranzani). (G. viii, 123. P.)

(*Gymnothorax infernalis* Poey; *Muræna afra* Günther, not Bloch; *Gymnothorax crebus* Poey; *Thyrsoidea concolor* Abbott.)

177. Sidera aterrima (Kaup). (G. viii, 134.)

178. Sidera nigrocastanea (Cope).

(Cope, Trans. Am. Phil. Soc., 1870, 483.)

179. Sidera virescens (Poey). (P.)

180. Sidera flavoscripta (Poey). (P.)

181. Sidera vicina (Castelnau). (G. viii, 121.)

182. Sidera polygonia (Poey). (P.)

183. Sidera umbrosa (Poey). (P.)

184. Sidera obscurata (Poey). (P.)

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* Many of the species of *Sidera* here admitted are of very doubtful value.

185. Sidera miliaris (Kaup). (G. viii, 100. P.)
(*Gymnothorax scriptus* Poey; *Muræophis punctata* Castelnau, both these names preoccupied.)

186. Sidera elaborata (Poey). (P.)
(*? Thyrsoidea flavopicta* Kaup; *Muræna multiocellata* Poey.)

187. Sidera conspersa (Poey). (P.)

188. Sidera moringa (Cuvier). (G. viii, 120. P.)
(*Gymnothorax rostratus* Agassiz; *?Gymnothorax versipunctatus* Poey; *Gymnothorax picturatus* Kaup.)

189. Sidera maculipinnis (Kaup).

190. Sidera ocellata (Agassiz). (G. viii, 102.)

191. Sidera variegata (Castelnau). (G. viii, 103.)

192. Sidera sanctæ-helenæ (Günther). (G. viii, 115.)

76. MURÆNA Linnæus.

193. Muræna melanotis (Kaup). (G. viii, 98.)

Family XXXV.—OPHISURIDÆ.

77. ICHTHYAPUS Barneville.

194. Ichthyapus acutirostris Barneville. (G. viii, 90.)

78. CŒCULA Vahl.

(*Sphagebranchus* Bloch.)

195. Cœcula rostrata (Bloch).
(*Sphagebranchus rostratus* Bloch, Tafel 419. Surinam.)

79. OPHISURUS Lacépède.

(*Pisoodonophis* Kaup.)

196. Ophisurus acuminatus (Gronow). (G. viii, 83. P.)
(*Ophisurus longus* Poey; *? Pisoodonophis guttulatus* Kaup; *? Ophichthys pisivarius* Poey.)

197. Ophisurus pardalis (Valenciennes). (G. viii, 82. P.)
(*Pisoodonophis oculatus* Kaup; *? Ophisurus latimaculatus* Poey.)

198. Ophisurus breviceps (Richardson). (G. viii, 82.)

80. OPHICHTHYS Ahl.

199. Ophichthys ocellatus (Le Sueur). (G. viii, 68.)

200. Ophichthys triserialis (Kaup). (G. viii, 58.)

201. Ophichthys havanensis (Bloch & Schneider). (G. viii, 67. P.)
(*Uranichthys brachycephalus* Poey.)

202. Ophichthys parilis (Richardson). (G. viii, 59.

203. Ophichthys macrurus (Poey). (P.)

204. Ophichthys magnioculis (Kaup). (G. viii, 59.)

205. Ophichthys chrysops (Poey). (G. viii, 60. P.)
(*?Leptorhinophis gomesii* Kaup.)

206. Ophichthys pauciporus (Poey). (G. viii, 60. P.)

207. Ophichthys brachyurus (Poey). (P.)
(*Oxyodontichthys limbatus* Poey.)

208. Ophichthys puncticeps (Kaup). (G. viii, 60.)

209. Ophichthys intertinctus (Richardson). (G. viii, 57.)

210. Ophichthys punctifer (Kaup). (G. viii, 56. P.)
(*Macrodonophis mordax* Poey).

211. Ophichthys schneideri Steindachner.
(Steindachner, Ichth. Beitr., viii, 67, 1879.)

Family XXXVI.—CONGRIDÆ.

81. CHILORHINUS Lütken.

212. Chilorhinus suensoni Lütken. (G. viii, 52. P.)

82. MYROPHIS Lütken.

213. Myrophis punctatus Lütken. (G. viii, 51, in part. P.)
(*Myrophis microstigmius* Poey; *? Myrophis lumbricus* Jordan & Gilbert, young.)

83. HOPLUNNIS Kaup.

214. Hoplunnis schmidti Kaup. (G. viii, 49.)

84. LEPTOCONGER Poey.

215. Leptoconger perlongus Poey. (P.)

85. MURÆNESOX McClelland.

(*Cynoponticus* Costa.)

216. Muræneso x savanna (Cuvier). (G. viii, 47. P.)
(*? Muræneso x curvidens* Richardson.)

86. CONGROMURÆNA Kaup.

(*Ophisoma* Swainson: preoccupied.)

217. Congromuræna balearica (De la Roche). (G. viii, 41. P.)
(*? Ophisoma impressa* Poey.)

218. Congromuræna analis (Poey).

87. CONGER Cuvier.

219. Conger conger (Linnæus). (G. viii, 38. P.)
(*Conger esculentus* Poey.)

220. Conger caudilimbatus Poey. (G. viii, 40. P.)
(*Conger macrops* Günther.)

221. Conger multidens Castlenau. (G. viii, 40.)

Family XXXVII.—ANGUILLIDÆ.

88. ANGUILLA Thunberg.

222. Anguilla anguilla rostrata (Le Sueur). (G. viii, 31, 32. P.)
(*Anguilla cubana* Kaup.)

222 (*b*). Anguilla anguilla latirostris (Risso). (G. viii, 32.)

Family XXXVIII.—BELONIDÆ.

89. TYLOSURUS Cocco

§ *Tylosurus.*

223. Tylosurus notatus (Poey). (G. vi, 248. P.)

224. Tylosurus subtruncatus (Poey). (P.)

(*Belone depressa* Poey; *Tylosurus sagitta* Jordan & Gilbert.)

225. Tylosurus euryops Bean & Dresel.

226. Tylosurus diplotænia (Cope.)

(Cope, Trans. Am. Phil. Soc., 1871, 481.)

227. Tylosurus microps (Günther). (G. vi, 237.)

228. Tylosurus ardeola (Cuv. & Val.). (G. vi, 235. ?)

(? *Belone cigonella* Cuv. & Val.; ? ? *Belone argalus* Le Sueur; ? *Belone depressa* Günther, not of Poey.)

229. Tylosurus almeida (Quoy & Gaimard.)

(? ? *Esox brasiliensis* L.; *Belone timucu* Cuv. & Val.)

230. Tylosurus galeatus (Cuv. & Val.)

(Cuv. & Val., xviii, 429.)

231. Tylosurus raphidoma (Ranzani.)

(*Belone gerania* Cuv. & Val.; *Belone crassa* Poey; *Tylosurus gladius* Bean.)

232. Tylosurus acus (Lacépède.) (G. vi, 249. P.)

(? *Sphyræna acus* Lacépède; *Belone latimana* Poey; *Belone melanochira* Poey; *Belone jonesi* Goode; *Belone jonesi* Günther, ? *Esox imperialis* Rafinesque; ? *Tylosurus cantraini* Cocco.)

233. Tylosurus caribæus (Le Sueur). (G. vi, 241. P.)

(*Belone altipinna* Poey; ? same as preceding.)

§ *Athlennes* Jordan & Fordice.

234. Tylosurus hians (Cuv. & Val.). (G. vi, 248. P.)

(*Belone maculata* Poey.)

Family XXXIX.—SCOMBERESOCIDÆ.

90. HEMIRHAMPHUS* Cuvier.

§ *Hemirhamphus.*

235. Hemirhamphus balao Le Sueur. (G. vi, 269, 270.)

(*Hemirhamphus browni* and *plèei* Cuv. & Val.; *Hemirhamphus brasiliensis* Günther; *Hemirhamphus filamentosus* Poey; ? *Hyporhamphus macrochirus* Poey.)

§ *Hyporhamphus* Gill.

236. Hemirhamphus unifasciatus Ranzani (G. vii, 262. P.)

(*Hemirhamphus fasciatus* Poey; *Hemirhamphus poeyi* Günther; *Hemirhamphus richardi* C. & V.; *Hyporhamphus tricuspidatus* Gill.)

236 (*b*). Hemirhamphus unifasciatus roberti Cuv. & Val. (G. vi. 262, 263. P.)

*For the synonymy of the species of this genus, see a paper by Meek and Goss, Proc. Ac. Nat. Sci. Phila., 1884; 220.

91. EULEPTORHAMPHUS Gill.

237. **Euleptorhamphus longirostris** (Cuvier). (G. vii, 276. P.)
(*Euleptorhamphus velox* Poey.)

92. FODIATOR Jordan & Meek.

238. **Fodiator acutus** (Cuv. & Val). (G. vi, 281.)

93. PAREXOCŒTUS Bleeker.

239. **Parexocœtus mesogaster** (Bloch). (G. vi, 284. P.)

94. HALOCYPSELUS Weinland.

240. **Halocypselus evolans** (Linnæus). (G. vi, 281, 282. P.)

95. EXOCŒTUS* Linnæus.

241. **Exocœtus exiliens** Gmelin.
(*Exocœtus lamellifer* Kner & Steind. Neue Fische Goddeffr. Mus. 1866, 29.)
242. **Exocœtus rondeleti** Cuv. & Val.
(*Exocœtus volador* Jordan, Proc. U. S. Nat. Mus. 1884, 34.)
243. **Exocœtus vinciguerræ** Jordan & Meek.
(Jordan & Meek, Proc. U. S. Mus. 1885. 56.)
244. **Exocœtus volitans** Linnæus.
(G. vi, 287, 288.)
245. **Exocœtus rufipinnis** Cuv. & Val. (G. vi, 294.)
(§ *Exocœtus scylla* Cope.)
246. **Exocœtus heterurus** Rafinesque. (G. vi, 293.)
247. **Exocœtus furcatus** Le Sueur. (G. vi, 286.)
248. **Exocœtus nigricans** Bennett. (G. vi, 290.)
249. **Exocœtus bahiensis** Ranzani. (G. vi, 293, 294. P.)
(*Exocœtus cyanopterus* Cuv. & Val.; *vermiculatus* Poey; *? E. albidactylus* Gill.)

Family XL.—SYNGNATHIDÆ.

96. SIPHOSTOMA* Rafinesque.

250. **Siphostoma fistulatum** (Peters). (G. viii, 164.)
251. **Siphostoma affine** (Günther). (G. viii, 163.)
252. **Siphostoma cayennense** (Sauvage.)
(Bull. Sci. Philom. vi, 176, 1882, Cayenne.)
253. **Siphostoma rousseaui** (Kaup). (G. viii, 163.)
254. **Siphostoma jonesi** (Günther.)
(*Syngnathus jonesi* Günther, Ann. Mag. Nat. Hist. 1874, Bermuda.)
255. **Siphostoma pelagicum** (Osbeck). (G. viii, 165.)
256. **Siphostoma elucens** (Poey). (P.)

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*For synonymy and characters of the species of *Exocœtus*, see Jordan & Meek, Proc. U. S. Nat. Mus., 1885, 44.

† Several of the species here mentioned are extremely doubtful.

257. **Siphostoma flavirostre** (Poey). (P.)
258. **Siphostoma picturatum** (Poey). (P.)
259. **Siphostoma linea** (Poey). (P.)
260. **Siphostoma marmoreum*** (Poey). (P.)
261. **Siphostoma ascendens** (Poey). (P.)
262. **Siphostoma brachycephalum*** (Poey). (P.)
263. **Siphostoma crinigerum** Bean & Dresel.
(Proc. Biol. Soc. Wash., 1884, 99.)

264. **Siphostoma zatropis** Jordan & Gilbert. (G. viii, 170.)
(? *Syngnathus albirostris* Kaup.)

97. SYNGNATHUS Linnæus (Rafinesque).

(*Nerophis* Rafinesque.)

265. **Syngnathus heckeli** (Kaup). (G. viii, 192.)
266. **Syngnathus martinicensis** (Kaup.)

98. DORYRHAMPHUS Kaup.

§ *Doryichthys* Kaup.

267. **Doryrhamphus lineatus** Kaup. (G. viii, 183.)

99. HIPPOCAMPUS Linnæus.

268. **Hippocampus punctulatus** Guichenot. (P.)
269. **Hippocampus marginalis** Heckel.
(Kaup, Lophobranchs, 15.)
270. **Hippocampus fascicularis** Heckel.
(Kaup, Lophobranchs, 15.)
271. **Hippocampus stylifer** Jordan & Gilbert.
(Proc. U. S. Nat. Mus., 1882, 265.)

Family XLI.—FISTULARIIDÆ.

100. FISTULARIA Linnæus.

272. **Fistularia tabaccaria** Linnæus. (G. iii, 529. P.)
273. **Fistularia serrata** Cuvier. (G. iii, 533.)
(Cuvier Règ. Anim.; Günther, Rept. Shore Fishes, Challenger, 1880, 69.)

Family XLII.—AULOSTOMIDÆ.

101. AULOSTOMA Lacépède.

274. **Aulostoma maculatum** Valenciennes. (G. iii, 536. P.)
(*Aulostoma coloratum* M. & T.)
275. **Aulostoma cinereum** Poey. (P.)

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* Poey's name, *Syngnathus tenuis*, is preoccupied in this genus.

Family XLIII.—MACRORHAMPHOSIDÆ.

102. MACRORHAMPHOSUS Lacépède.

276. Macrorhamphosus scolopax (Linnæus). (G. iii, 518.)

Family XLIV.—MUGILIDÆ.

103. MUGIL* Linnæus.

§ *Mugil.*

277. Mugil cephalus Linnæus. (G. iii, 417, 420.)
(*Mugil albula* L.)

278. Mugil brasiliensis Agassiz. (G. iii, 423. P.)
(*Mugil liza* Cuv. & Val.; *Mugil lebranchus* Poey.)

279. Mugil incilis Hancock.
(Hancock, Loud Quart. Journ. Sci., 1830, 127.)

280. Mugil gaimardianus (Desmarest) Poey. (P.)

281. Mugil curema C. & V. (G. iii, 431. P.)
(*Mugil brasiliensis* Günther, not of Agassiz.)

282. Mugil trichodon Poey. (P.)

104. AGONOSTOMUS Bennett.

283. Agonostomus microps (Günther). (G. iii, 462.)

284. Agonostomus monticola (Bancroft). (G. iii, 464.)

285. Agonostomus percoides Günther. (G. iii, 464.)

105. JOTURUS Poey.

286. Joturus pichardi Poey. (P.)
(*Joturus stipes* Jordan & Gilbert.)

Family XLV.—ATHERINIDÆ.

106. ATHERINA Linnæus.

287. Atherina stipes Müller & Troschel (G. iii, 400. P.)
(*Atherina laticeps* Poey; *Atherina relipana* Goode & Bean.)

288. Atherina microps Poey. (P.)

289. Atherina harringtonensis Goode.

107. MENIDIA Bonaparte.

290. Menidia martinica (Cuv. & Val.). (G. viii, 395.)

291. Menidia brasiliensis (Quoy & Gaimard). (G. iii, 404.)
(*Atherina macrophthalma* Agassiz.)

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* For the synonymy of the species of *Mugil*, see Jordan & Swain, Proc. U. S. Nat. Mus., 1884.

Family XLVI.—SPHYRÆNIDÆ.

108. SPHYRÆNA Bloch.

292. Sphyræna picuda Bloch & Schneider. (G. ii, 336. P.)
(*Sphyræna barracuda* Shaw.)

293. Sphyræna guachancho Cuv. & Val. (P.)

294. Sphyræna picudilla Poey. (P.)

295. Sphyræna sphyræna Linnæus. (G. ii, 334.)

Family XLVII.—POLYNEMIDÆ.

109. POLYNEMUS Linnæus.

296 Polynemus virginicus Linnæus. (G. ii. 321. P.)
(*Polydactylus plumieri* Lacépède.)

297. Polynemus oligodon Günther. (G. ii, 322.)

110. PENTANEMUS (Artedi) Günther.

298. Pentanemus quinquarius (Linnæus). (G. ii, 331.)

Family XLVIII.—ECHENEIDIDÆ.

111. ECHENEIS Linnæus.

299. Echeneis naucrates Linnæus. (G. ii, 382, 384. P.)
(*Leptecheneis metallica* Poey.)

112. PHTHEIRICHTHYS Gill.

300. Phtheirichthys lineatus (Menzies). (G. ii, 382. P.)
(*Echeneis apicalis* Poey; ? *Phtheirichthys sphyræenarum* Poey.)

113. REMORA Gill.

301. Remora remora (Linnæus). (G. ii, 378. P.)
(*Echeneis postica* Poey.)

114. RHOMBOCHIRUS Gill.

302. Rhombochirus osteochir (Cuv. & Val.). (G. ii, 381. P.)
(*Rhombochirus tetrapturorum* Poey.)

Family XLIX.—ELACATIDÆ.

115. ELACATE Cuvier.

303. Elacate canada (Linnæus). (G. ii, 375. P.)

Family L.—TRACHYPTERIDÆ.

116. TRACHYPTERUS Gonau.

304. Trachypterus trachyurus Poey. (P.)

Family LI.—REGALECIDÆ.

117. REGALECUS Brünnich.

305. Regalecus gladius (Walbaum). (G. iii, 308.)

Family LII.—STYLEPHORIDÆ.

118. STYLEPHORUS Shaw.

306. Stylephorus chordatus Shaw. (G. iii, 306.)

Family LIII.—XIPHIIDÆ.

119. XIPHIAS Linnæus.

307. Xiphias gladius Linnæus. (G. ii, 511. P.)

120. TETRAPTURUS Rafinesque.

308. Tetrapturus albidus Poey. (P.)

309. Tetrapturus amplus Poey. (P.)

121. ISTIOPHORUS Lacépède.

310. Istiophorus americanus Cuv. & Val. (P.)

Family LIV.—TRICHIURIDÆ.

122. TRICHIURUS Linnæus.

311. Trichiurus lepturus Linnæus. (G. ii, 356.)

123. EVOXYMETOPON Poey.

312. Evoxymetopon tæniatus Poey. (P.)

124. NEALOTUS Poey.

313. Nealotus ophidianus Poey. (P.)

125. GEMPYLUS Cuv. & Val.

314. Gempylus serpens (Solander). (G. ii, 252).

126. THYRSITES Cuv. & Val.

315. Thyrsites niger Poey. (P.)

127. RUVETTUS Cocco.

316. Ruvettus pretiosus Cocco. (G. ii, 351. P.)

(*Thyrsites scholaris* Poey.)

317. Ruvettus (?) **prometheus** (Cuv. & Val.). (G. ii, 351. P.)

(*Prometheus atlanticus* Poey: the generic name *Prometheus* is preoccupied in Insects.)

128. EPINNULA Poey.

318. Epinnula magistralis Poey. (G. ii, 349.)

Family LV.—SCOMBRIDÆ.

129. SCOMBER Linnæus.

(§ *Pneumatophorus* Jordan & Gilbert.)

319. Scomber colias (Gmelin). (G. ii, 359, 361. P.)

130. AUXIS Cuv. & Val.

320. Auxis thazard (Lacépède). (G. ii, 369.)

131. SCOMBEROMORUS Lacépède.

(*Cybium* Cuvier.)

321. Scomberomorus regalis (Bloch). (G. ii, 372. P.)

322. Scomberomorus cavalla (Cuvier). (G. ii, 373. P.)

132. ACANTHOCYBIUM Gill.

323. Acanthocybium solandri (Cuv. & Val.). (G. ii, 373. P.)
(*Acanthocybium petus* Poey; *Cybium sara* Bennett.)

133. ORCYNUS Cuvier.

324. Orcynus thynnus (Linnæus). (G. ii, 362. P.)

325. Orcynus alalonga (Gmelin). (G. ii, 366. P.)

326. Orcynus subulatus Poey. (P.)

134. EUTHYNNUS Lütken.

327. Euthynnus alliteratus (Rafinesque). (G. ii, 364. P.)
(*Orcynus thunnina* Poey.)

328. Euthynnus pelamys (Linnæus.) (G. ii, 364. P.)

Family LVI.—CARANGIDÆ.

135. DECAPTERUS Bleeker.

329. Decapterus punctatus (Cuv. & Val.) (G. ii, 426. P.)

330. Decapterus sanctæ-helenæ (Cuv. & Val). (P.)

331. Decapterus macarellus (Cuv. & Val). (G. ii, 426. P.)

136. TRACHURUS Rafinesque.

332. Trachurus picturatus (Bowdich).
(Jordan & Gilbert,* Proc. U. S. Nat. Mus., 1883, 191.)

333. Trachurus trachurus (Linnæus).

137. TRACHUROPS Gill.

334. Trachurops crumenophthalmus (Bloch). (G. ii, 429. P.)

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*For the synonymy of all the American species of *Caranginæ*, see the paper above mentioned.

138. CARANX Lacépéde.

? Hemicaranx Bleeker.

335. Caranx amblyrhynchus. Cuv. & Val. (G. ii, 441. P.)
(*Caranx secundus* and *heteropygus* Poey.)

§ *Uraspis* Bleeker.

336. Caranx ruber (Bloch). (G. ii, 430. P.)
(*Caranx iridinus* Poey; *Caranx blochi* Cuv. & Val.)

337. Caranx bartholomæi. Cuv. & Val. (P.)
(*Caranx cibi* Poey.)

338. Caranx dentex Bloch & Schneider.

§ *Caranx.*

339. Caranx chrysos (Mitchill). (G. ii, 445. P.)
(*Paratractus pisquetus* Poey.)

340. Caranx latus Agassiz. (G. ii, 449. P.)
(*Caranx lepturus* Agassiz; *Caranx fallax* and *C. aureus* Poey.)

341. Caranx hippos (Linnæus). (G. ii, 448.)

342. Caranx lugubris Poey. (G. ii, 432. P.)
(*Caranx frontalis* Poey; *Caranx ascensionis* Cuv. & Val., not of Osbeck.)

343. Caranx ciliaris (Bloch). (G. ii, 454, 455. P.)
(*Zeus crinitus* Mitchell; *Scyris analis* Poey; *Zeus gallus* Bloch, not of L.)

344. Caranx cubensis (Poey). (P.)

139. VOMER Cuvier.

345. Vomer setipinnis (Mitchill). (G. ii, 459. P.)

346. Vomer dorsalis (Gill); (doubtful species). (G. ii, 459, var. B.)

140. SELENE Lacépède.

347. Selene vomer (Linnæus). (G. ii, 458. P.)

141. CHLOROSCOMBRUS Girard.

348. Chloroscombrus chrysurus (Linnæus). (G. ii, 460. P.)

142. TRACHINOTUS* Lacépède.

349. Trachinotus cayennensis Cuv. & Val. (G. viii, 417.)

350. Trachinotus carolinus (Linnæus). (G. ii, 484.)

351. Trachinotus rhodopus Gill.
(Proc. Ac. Nat. Sci. Phila., 1863, 85.)
(*Trachinotus carolinus* Poey.)

352. Trachinotus falcatus (Linnæus). (G. ii, 481. P.)
(*Trachinotus rhomboides* Bloch; *Labrus falcatus* L.; *? Gasterosteus ovatus* L.)

353. Trachinotus glaucus (Bloch). (G. ii, 483. P.)

143. NAUCRATES Rafinesque.

354. Naucrates ductor (Linnæus). (G. ii, 374. P.)

*For synonymy of the species of *Trachinotus*, see Meek and Goss, Proc. Ac. Nat. Sci. Phila., 1884.

144. SERIOLA* Cuvier.

355. **Seriola zonata carolinensis** (Holbrook). (G. ii, 465. P.)
(? *Seriola dubia* Poey.)

356. **Seriola dumérili** Risso. (G. ii, 462.)

356 (*b*). **Seriola dumérili lalandi** (Cuv. & Val.). (G. ii, 463. P.)
(? *Seriola gigas* Poey.)

357. **Seriola proxima** Poey. (P.)

358. **Seriola coronata** Poey. (P.)

359. **Seriola semicoronata** Poey. (P.)

360. **Seriola rivoliana** Cuv. & Val. (G. ii, 464. P.)
(*Seriola fasciata* and *S. bonariensis* Cuv. & Val.: *Seriola ligulata* Poey.)

361. **Seriola fasciata** Bloch. (G. ii, 464. P.)

145. ELAGATIS Bennett.

(*Seriolichthys* Bleeker; *Decaptus* Poey.)

362. **Elagatis pinnulatus** (Poey). (G. ii, 468.)

146. OLIGOPLITES Gill.

363. **Oligoplites saurus** (Bloch & Schneider). (G. ii, 475. P.)
(*Oligoplites occidentalis* Poey.)

364. **Oligoplites saliens** (Bloch). (G. ii, 475.)

Family LVII.—POMATOMIDÆ.

147. POMATOMUS Lacépède.

365. **Pomatomus saltatrix** (Linnæus). (G. ii, 479. P.)

Family LVIII.—NOMEIDÆ.

148. NOMEUS Cuvier.

366. **Nomeus gronovii** (Gmelin). (G. ii, 487. P.)
(*Nomeus oxyurus* Poey.)

Family LIX.—GRAMMICOLEPIDIDÆ. (?)

149. GRAMMICOLEPIS Poey.

367. **Grammicolepis brachiusculus** Poey. (P.)

Family LX.—STROMATEIDÆ.

150. STROMATEUS Linnæus.

§ *Rhombus* Lacépède.

368. **Stromateus paru** Linnæus. (G. ii, 399.)
(*Stromateus alepidotus* (L.))

369. **Stromateus orbicularis** Guichenot.

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* "These species of *Seriola* are probably reducible to three: *S. zonata*, *S. dumerili*, and *S. fasciata*, the latter being the young of *S. rivoliana*." (R. L. Green, MSS.)

Family LXI.—LAMPRIDIDÆ.

151. LAMPRIS Retzius.

370. Lampris guttatus (Brünnich). (G. ii, 416. P.)

Family LXII.—PSENIDÆ. (?

152. PSENES Cuv. & Val.

371. Psenes javanicus Cuv. & Val. (G. ii, 494. P.)

372. Psenes regulus Poey. (P.)

153. ANTIGONIA Lowe.

373. Antigonia capros Lowe. (G. ii.)

(*Caprophonus aurora* Müller & Troschel.)

Family LXIII.—BRAMIDÆ.

154. BRAMA* Bloch & Schneider.

374. Brama agassizii Poey. (P.)

375. Brama brevoortii Poey. (P.)

376. Brama saussurii Lunel. (P.)

Family LXIV.—PEMPHERIDÆ.

155. PEMPHERIS Cuv. & Val.

377. Pempheris schomburgki Müller & Troschel. (P.)

(*Pempheris mülleri* Poey; not of Klunzinger, a name of later date than that of Poey.)

378. Pempheris poeyi Bean.

(Bean, Proc. U. S. Nat. Mus., 1885, 229.)

Family LXV.—CORYPHÆNIDÆ.

156. CORYPHÆNA Linnæus.

379. Coryphæna hippurus Linnæus. (G. ii, 405. P.)

380. Coryphæna equisetis Linnæus. (G. ii, 407. P.)

Family LXVI.—BERYCIDÆ.

157. POLYMIXIA Lowe.

(*Dinemus* Poey.)

381. Polymixia lowei Günther. (G. i, 17. P.)

(*Dinemus venustus* Poey.)

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* These species of *Brama* are of doubtful value. Possibly all are based upon forms of *B. raji*, but the anal rays in all are said to be fewer than in the latter species.

158. BERYX Cuvier.

382. Beryx decadactylus Cuv. & Val. (G. i, 16. P.)

159. ANOPLOGASTER Günther.

383. Anoplogaster cornutus (Cuv. & Val.). (G. i, 12.)

Family LXVII.—HOLOCENTRIDÆ.

160. HOLOCENTRUS* (Artedi) Bloch.

384. Holocentrus ascensionis (Osbeck). (G. i, 28. P.)
(*Holocentrum matajuelo* Poey; *Holocentrum pentacanthum, longipinne, rufum* and *sogo* authors.)

385. Holocentrum marianus Cuv. & Val.
(Cuv. & Val. iii, 219.)

386. Holocentrus osculus Poey. (P.)
(? *Holocentrum perlatum* Poey; *Holocentrum brachypterum* Poey.)

387. Holocentrus coruscus Poey. (P.)

388. Holocentrus vexillarius Poey. (P.)
(? *Holocentrum riparium* Poey.)

389. Holocentrus productus Poey. (P.)

390. Holocentrus siccifer Cope.
(Cope, Trans. Am. Philos. Soc., 1870, 465).

391. Holocentrus sancti-pauli Günther.
(Günther, Shore Fishes Challenger 1880, 4, St. Paul's Rocks.)

161. PLECTRYPOPS Gill.

392. Plectrypops retrospinis (Guichenot.)
(*Plectrypops prospinosus* Poey.)

162. MYRIPRISTIS Cuvier.

393. Myripristis jacobus Cuv. & Val. (G. i, 19. P.)
(*Myripristis lychnus* Poey; ? *Rhinobcryx chryseus* Cope, Trans. Am. Phil Soc. 1870, 464.)

394 Myripristis trachypoma Günther (G. i, 25. P.)
(*Myriopristis fulgens* Poey.)

Family LXVIII.—CENTROPOMIDÆ.

163. CENTROPOMUS Lacépède.

395. Centropomus undecimalis (Bloch). (G. i, 79. P.)
(*Centropomus appendiculatus* Poey.)

396. Centropomus pedimacula Poey. (P.)
(*Centropomus medius* Günther.)

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* *Holocentrum rostratum* Poey, probably a valid species, is preoccupied by *Holocentrus rostratus* Gronow, also a West Indian species. Several of the species here enumerated are very doubtful.

397. Centropomus ensifer Poey. (P.)
(*Centropomus affinis* Steindachner.)

398. Centropomus pectinatus Poey. (P.)

399. Centropomus parallelus Poey. (P.)

Family LXIX.—SERRANIDÆ.

164. CENTROPRISTES Cuvier.

400. Centropristes atrarius rufus (Cuv. & Val.). (C. & V., ii, 47.)

165. DIPLECTRUM Holbrook.

401. Diplectrum radiale (Quoy & Gaimard). (G. ii, 83.)
(*Centropristis ayresi* Steindachner; *C. macropoma* Gthr.: *? Serranus birittatus* C. & V.)

402. Diplectrum formosum (Linnæus). (G. ii, 83. P.)
(*Centropristis radians* Quoy & Gaimard; *Serranus fasciularis* Cuv. & Val.)

166. SERRANUS Cuvier.

§ *Prionodes* Jenyns.

403. Serranus flavescens Cuv. & Val.
(Cuv. & Val., vi, 506.)

404. Serranus phœbe (Poey). (G. i, 85. P.)

405. Serranus brasiliensis (Barneville). (G. i, 85.)
(*Centropristis dispilurus* Günther, Proc. Zool. Soc. Lond., 1867, 99; *Centropristis subligarius* Cope.)

406. Serranus tigrinus (Bloch). (G. i, 85. P.)
(*Serranus præstigiator* Poey.)

407. Serranus tabacarius (Cuv. & Val.). (G. i, 85. P.)
(*Serranus jacome* Poey.).

408. Serranus fusculus (Poey). (P.)

§ *Mentiperca* Gill.

409. Serranus luciopercanus (Gill). (G. i, 84. P.)

167. HYPOPLECTRUS* Gill.

410. Hypoplectrus puella (Cuv. & Val.). (G. i, 155. P.)
(*? Plectropoma vitulinum* Poey.)

411. Hypoplectrus indigo Poey. (G. i, 166. P.)
(*? Hypoplectrus bovinus* Poey.)

412. Hypoplectrus gummigutta Poey. (G. i, 166. P.)

413. Hypoplectrus guttavarius Poey. (G. i, 166. P.)
(*Plectropoma melanorhinum* Guichenot; *Hypoplectrus pinnivarius* Poey.)

414. Hypoplectrus maculiferus Poey. (P.)

415. Hypoplectrus aberrans Poey. (P.)

416. Hypoplectrus nigricans Poey. (P.)

417. Hypoplectrus accensus Poey. (P.)

* Most of the species of *Hypoplectrus* here mentioned are of very doubtful value.

418. Hypoplectrus chlorurus (Cuv. & Val.). (G. i, 167. P.)
(? *Hypoplectrus affinis* Poey.)

419. Hypoplectrus crocotus Cope.
(Cope, Trans. Am. Phil. Soc., 1870, 466.)

168. GONIOPLECTRUS Gill.

420. Gonioplectrus hispanus (Cuv. & Val.). (G. i, 165. P.)

169. ANTHIAS Bloch.

(*Aylopon* (Rafinesque) Guichenot.)

421. Anthias martinicensis (Guichenot).
(*Aylopon martinicensis* Guichenot, Ann. Soc. Linn. Maine et Loire, 1868, 6.)

170. PARANTHIAS Guichenot.

422. Paranthias furcifer (Cuv. & Val.). (G. i, 100. P.)
(*Brachyrhinus creolus* Gill.)

171. MYCTEROPERCA* Gill.

423. Mycteroperca falcata (Poey). (P.)

424. Mycteroperca tigris (Cuv. & Val.). (G. i, 112. P.)

425. Mycteroperca interstitialis (Poey). (P.)

426. Mycteroperca calliura (Poey). (P.)

427. Mycteroperca dimidiata (Poey). (P.)

428. Mycteroperoa microlepis (Goode & Bean).
(*Trisotropis microlepis* and *stomias* Goode & Bean, Proc. U. S. Nat. Mus., 1879, 141; 1882, 427.)

429. Mycteroperca scirenga (Rafinesque). (G. i, 135, 143.)

430. Mycteroperca bonaci (Poey). (P.)

431. Mycteroperca reticulata (Gill).
(*Trisotropis reticulatus* Gill, Proc. Ac. Nat. Sci., Phila., 1865, 105.)

432. Mycteroperca venenosa (Linnæus). (P.)

432 (*b*). Mycteroperca venenosa apua (Bloch). (G. i, 115. P.)

172. PROMICROPS Gill.

433. Promicrops itaiara (Lichtenstein). (G. i, 130. P.)

173. EPINEPHELUS† Bloch.

434. Epinephelus nigritus (Holbrook). (P.)
(*Centropristes morus* Poey.)

435. Epinephelus morio (Cuv. & Val.). (G. i, 142. P.)

436. Epinephelus mystacinus (Poey). (G. i, 109. P.)

437. Epinephelus striatus (Bloch). (G. i, 110. P.)

438. Epinephelus niveatus (Cuv. & Val.). (G. i, 130. P.)
(*Epinephelus flavolimbatus* Poey.)

*For the synonymy of the species of *Myeteroperca* and other genera related to *Epinephelus*, see Jordan & Swain. Proc. U. S. Nat. Mus., 1884, 358.

† *Serranus augustifrons* Steindachner, Verh. Zool. Bot. Gesell. Wien., 1864, 230, from Cuba, is a species of this genus, perhaps identical with *E. niveatus*.

439. Epinephelus drummond-hayi Goode & Bean. (Goode & Bean, Proc. U. S. Nat. Mus., 1878, 173.)

440. Epinephelus catus (Cuv. & Val.).
(*Serranus apua* C. & V., not of Bloch. (G. i, 140. P.)

441. Epinephelus adscensionis (Osbeck). (G. i, 142. P.)

174. ALPHESTES Bloch & Schneider.

442. Alphestes afer (Bloch). (G. i, 164. P.)

175. ENNEACENTRUS Gill.

§ *Petrometopon* Gill.

443. Enneacentrus guttatus (Linnæus). (G. i, 124. P.)

443 (*b*). Enneacentrus guttatus coronatus (Cuv. & Val.). (G. i, 124. P.)

§ *Enneacentrus.*

454. Enneacentrus tæniops (Cuv. & Val.). (G. i, 121.)

445. Enneacentrus fulvus (Linnæus). (P.)

445 (*b*). Enneacentrus fulvus ruber (Bloch & Schneider). (G. i, 120. P.)

445 (*c*). Enneacentrus fulvus punctatus (Linnæus). (P.)

§ *Menephorus* Poey.

446. Enneacentrus dubius (Poey). (P.)
(*? Menephorus punctatus* Poey.)

176. DERMATOLEPIS Gill.

447. Dermatolepis inermis (Cuv. & Val.). (G. i, 153. P.)

177. CHORISTISTIUM * Gill.

448. Chorististium rubrum Poey. (P.)

178. LIOPROPOMA * Gill.

449. Liopropoma aberrans Poey.

Family LXX.—RHYPTICIDÆ.

179. RHYPTICUS Cuvier.

§ *Rhypticus.*

450. Rhypticus nigromaculatus Steindachner.
(Ichth. Notiz. vi, 42.)

451. Rhypticus saponaceus (Bloch & Schneider). (G. i, 172.)
(*Eleutheractis coriaceus* Cope.)

452. Rhypticus arenatus Cuv. & Val.
(G. i, 173. Steindachner, Ichth. Notiz., vi, 42.)

§ *Promicropterus* Gill.

453. Rhypticus bistrispinus (Mitchill). (G. i, 173.)
(*Rhypticus maculatus* Holbrook; *Rhypticus pituitosus* Goode & Bean.)

* These genera, perhaps, do not belong to the Serranidæ.

Family LXXI.—PRIACANTHIDÆ.

180. PRIACANTHUS Cuvier.

454. Priacanthus catalufa Poey. (G. i, 215. P.)

455. Priacanthus arenatus Cuv. & Val.
(Cuv. & Val. iii, 101.)

456. Priacanthus cepedianus Desmarest. (P.)

457. Priacanthus cruentatus Lacépède. (P.)

181. PSEUDOPRIACANTHUS Bleeker.

458. Pseudopriacanthus altus (Gill). (P.)

Family LXXII.—LOBOTIDÆ.

182. LOBOTES Cuvier.

459. Lobotes surinamensis (Bloch). (G. i, 337. P.)

Family LXXIII.—GRAMMIDÆ.

183. GRAMMA Poey.

460. Gramma loreto Poey. (P.)

Family LXXIV.—SPARIDÆ.

184. LUTJANUS* Bloch.

461. Lutjanus caxis (Bloch & Schneider). (P.)
(Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 435.)

462. Lutjanus jocu (Bloch & Schneider). (P.)
(Jordan & Swain l. c., 437.)

463. Lutjanus griseus (Linnæus). (G. i, 194.)

464. Lutjanus cyanopterus (Cuv. & Val.). (P.)
(*Lutjanus cubera* Poey; (*Genyoroge canina* Steindachner, Ichth. Notizen. ix, 16, 1869; ? *Mesoprion pargus* C. & V.).

465. Lutjanus profundus Poey. (G. i, 198. P.)

466. Lutjanus buccanella (Cuv. & Val.). (G. i, 198. P.)

467. Lutjanus brachypterus Cope.
(Cope, Trans. Am. Phil. Soc., 1871, 470; hybrid?)

465. Lutjanus synagris (Linnæus). (G. i, 202. P.)

469. Lutjanus ambiguus Poey. (P). (hybrid?)

470. Lutjanus mahogoni (Cuv. & Val.). (G. i, 203. P.)

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* For the synonymy of the species of *Lutjanus* and related genera, see Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 427.

471. Lutjanus aya (Bloch). (P.)
(*Mesoprion vivanus* C. & V. *Lutjanus campechianus* Poey.)
472. Lutjanus analis (Cuv. & Val.). (G. i, 209. P.)
473. Lutjanus lutjanoides Poey. (P). (hybrid?)

185. OCYURUS Gill.

474. Ocyurus chrysurus (Bloch). (G. i, 186. P.)

186. RHOMBOPLITES Gill.

475. Rhomboplites aurorubens (Cuv. & Val.). (G. i, 207. P.)

187. APSILUS Cuv. & Val.

476. Apsilus dentatus Guichenot. (G. i, 188. P.)

188. APRION Cuv. & Val.

477. Aprion macrophthalmus (Müller & Troschel). (P.)
(Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 407.)

189. ETELIS Cuv. & Val.

478. Etelis oculatus (Cuv. & Val.). (G. i, 192. P.)

190. VERILUS Poey.

479. Verilus sordidus Poey. (P.)

191. DENTEX Cuvier.

480. Dentex macronemus Günther. (G. i, 380.)
(*Dentex filamentosus* C. & V., not of Valenciennes nor of Rüppell.)

192. CONODON Cuv. & Val.

481. Conodon nobilis (Linnæus). (G. i, 304, 297.)

193. ORTHOPRISTIS Girard.

482. Orthopristis chrysopterus (Linnæus). (G. i, 301. P.)
(*Orthopristis poeyi* Scudder.
483. Orthopristis bennetti (Lowe). (G. i, 298.)
(*? Pristipoma ronchus* Val.)

194. POMADASYS Lacépède.

484. Pomadasys cultrifer (Poey). (P.)
(*? Pomadasys approximans* Bean & Dresel.)
485. Pomadasys productus (Poey). (P.)
486. Pomadasys ramosus (Poey). (P.)
487. Pomadasys viridensis (C. & V.).
488. Pomadasys crocro (C. & V.). (G. i, 296.)
489. Pomadasys boucardi (Steindachner).

195. ANISOTREMUS Gill.

490. Anisotremus serrula (Cuv. & Val.). (G. i, 287. P.)
(? *Pristipoma auratum* C. & V.).

491. Anisotremus bilineatus (Cuv. & Val.). (G. i, 287. P.)
(? *Anisotremus trilineatus* Poey; *Pristipoma melanopterum* Cuv. & Val.)

492. Anisotremus surinamensis (Bloch). (G. i, 288.)

493. Anisotremus obtusus (Poey). (P.)
(*Hæmulon labridum* Poey.)

494. Anisotremus virginicus (Linnæus). (G. i, 288.)
(? *Anisotremus spleniatus* Poey.)

196. GENYATREMUS Gill.

495. Genyatremus cavifrons (Cuv. & Val.). (G. i, 286.)

197. HÆMULON * Cuvier.

§ *Hæmulon.*

496. Hæmulon gibbosum (Walbaum). (G. i, 311. P.)

497. Hæmulon bonariense Cuv. & Val. (G. i, 311. P.)
(*Hæmulon continuum* Poey.)

498. Hæmulon parra (Desmarest). (G. i, 310. P.)
(*Hæmulon acutum* Poey.)

499. Hæmulon fremebundum Goode & Bean.
(*Diabasis lateralis* Vaillant.)

500. Hæmulon macrostoma Günther. (G. i, 289).

501. Hæmulon carbonarium Poey. (P.)

502. Hæmulon melanurum (Linnæus). (P.)
(*Hæmulon dorsale* Poey.)

503. Hæmulon sciurus (Shaw). (G. i, 306. P.)
(? *Hæmulon hians* Haly.)

504. Hæmulon plumieri (Lacépède). (G. i, 305. P.)

505. Hæmulon flavolineatum (Desmarest). (G. i, 312. P.)

§ *Brachygenys* Scudder.

506. Hæmulon chrysargyreum Günther. (G. i, 314. P.)
(*Hæmulon taeniatum* Poey.)

§ *Bathystoma* Scudder.

507. Hæmulon rimator Jordan & Swain. (G. i, 313. P.)
(? *Perca striata* L.)

508. Hæmulon aurolineatum Cuv. & Val. (G. i, 318. P.)
(*Hæmulon jeniguano* Poey.)

509. Hæmulon quadrilineatum Cuv. & Val. (G. i, 316. P.)
(? *Grammistes tririttatus* Bloch & Schneider.)

198. CALAMUS† Swainson.

510. Calamus medius Poey. (P.)

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* For an account of the species of *Hæmulon* see Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 281.

† See Jordan & Gilbert, Proc. U. S. Nat. Mus. 1884, 14.

511. Calamus macrops Poey. (P.)

512. Calamus penna (Cuv. & Val.)
(*Calamus milneri* Goode & Bean; *? Calamus microps* Guichenot: *? Grammateus humilis* Poey.)

513. Calamus bajonado (Bloch & Schneider). (P.)
(*Calamus plumatula* Guichenot.)

514. Calamus calamus (Cuv. & Val.). (P.)
(*Calamus orbitarius* Poey.)

515. Calamus proridens Jordan & Gilbert. (P.)
(Jordan & Gilbert, Proc. U. S. Nat. Mus., 1884, 15, 150.)

516. Calamus pennatula Guichenot. (Guichenot, Revue des Pagels, 116.)

199. SPARUS Linnæus.

§ *Pagellus* Cuv. & Val.

517. Sparus mormyrus Linnæus. (G. i, 481.)
(*Pagellus pernambucensis* C. & V.)

200. DIPLODUS * Rafinesque.

(*Sargus* Cuvier).

518. Diplodus argenteus (Cuv. & Val.). (P.)
(*Sargus caudimacula* Poey.)

519. Diplodus sargus (Gmelin). (G. i, 440.)
(*Sargus rondeletii* C. & V.)

201. ARCHOSARGUS Gill.

520. Archosargus probatocephalus aries (Cuv. & Val.). (G. i, 449.)

521. Archosargus unimaculatus (Bloch). (G. i, 446. P.)
(*Sargus caribæus* Poey; *Sargus flavolineatus* Cuv. & Val.).

522. Archosargus tridens (Poey). (P.)

202. LAGODON Holbrook.

523. Lagodon rhomboides (Linnæus). (G. i, 447. P.)

203. BOOPS Cuvier.

(*Box* Cuv. & Val.)

524. Boops carabaicus (Günther). (G. i, 419.)

204. ERYTHRICHTHYS Temminck & Schlegel.

(*Iuermia* Poey.)

525. Erythrichthys vittatus (Poey). (P.)

Family LXXV.—KYPHOSIDÆ.

205. KYPHOSUS Lacépède.

(*Pimelepterus* Lacépède.)

526. Kyphosus sectatrix (Linnæus). (G. i, 497. P.)
(*Pimelepterus bosqui* Lacépède; *? Pimelepterus flavolineatus* Poey).

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* *Diplodus capensis* Smith has been recorded from the Bermudas by Dr. Günther. This needs verification.

Family LXXVI.—CHEILODIPTERIDÆ.

206. AMIA Gronow.

(*Apogon* Lacépède=*Monoprion* Poey.)

§ *Amia.*

527. Amia imberbis (Linnæus). (G. i, 230.)
528. Amia maculata Poey. (P.)
529. Amia binotata Poey. (P.)
530. Amia pigmentaria Poey. (P.)
531. Amia stellata Cope. (Cope, Trans. Am. Phil. Soc., 1866, 400.)

§ *Apogonichthys* Bleeker.

532 Amia puncticulata (Poey). (P.)

207. AMIICHTHYS* Poey, genus novum.

533. Amiichthys diapterus Poey. (P.)

208. CHEILODIPTERUS Lacépède.

534. Cheilodipterus affinis Poey. (P.)

209. SPHYRÆNOPS Gill.

535. Sphyræops bairdianus Poey. (P.)

210. SCOMBROPS Temminck & Schlegel.

(*Latebrus* Poey.)

536. Scombrops oculatus (Poey). (P.)

Family LXXVII.—MULLIDÆ.

211. UPENEUS Cuvier.

537. Upeneus martinicus Cuv. & Val. (G. i, 403.)
(*Upeneus balteatus* C. & V.=*Upeneus flavovittatus* Poey.)
538. Upeneus maculatus (Bloch). (G. i. 408. P.)
(*Upeneus punctatus* Cuv. & Val.)

212. UPENEOIDES Bleeker.

539. Upeneoides parvus Poey. (P.)

Family LXXVIII.—SCIÆNIDÆ.

213. EQUES Bloch.

§ *Eques.*

540. Eques lanceolatus (Gmelin). (G. ii, 279. P.)
541. Eques punctatus Bloch. (G. ii, 281. P.)

Amiichthys Poey, MSS., genus novum, for the fish described with the specific name of *diapterus* in the Synopsis Pisc. Cub., p. 305. It is regarded by Poey as belonging to the *Cheilodipteridæ*.

542. Eques pulcher Steindachner.
(Ichth. Notizen, vi, 43.)

§ *Pareques* Gill.

543. Eques acuminatus Bloch & Schneider. (G. ii, 280. P.)

214. ODONTOSCION Gill.

544. Odontoscion dentex (Cuv. & Val.). (G. ii, 269. P.)

215. LARIMUS Cuvier & Valenciennes.

(*Monosira* Poey; *Amblyscion* Gill.)

545. Larimus breviceps Cuv. & Val.. (G. ii, 268.)

546. Larimus stahli (Poey).
(*Monosira stahli* Poey, Anales de Hist. Nat. Esp., 1881, 326.)

547. Larimus batabanus (Poey). (P.)

216. SCIÆNA Linnæus.

§ *Diplolepis** Steindachner.

548. Sciæna surinamensis (Bleeker).
(Arch. Néerl. Sci. Exact. et Nat., viii, 458.)

549. Sciæna magdalenæ (Steindachner).
(Zur Fisch-Fauna des Magdalenen-Stromes, 1878, 6.)

550. Sciæna monacantha (Cope).
(*Corvina monacantha* Cope, Trans. Am. Phil. Soc., 1866, 402.)

§ *Bairdiella* Gill.

551. Sciæna ronchus (Cuv. & Val.). (G. i, 299.)

552. Sciæna armata (Gill).
(*Corvina acutirostris* Steindachner, Zur Fisch-Fauna des Magdalenen-Stromes, 1878, 9.)

553. Sciæna subæqualis (Poey). (P.)

§ *Stelliferus* Stark.†

554. Sciæna microps (Steindachner). (G. ii, 299.)
(Steindachner, Ich. Notiz., i, 6.)
(*Corvina stellifera* Günther.)

555. Sciæna stellifera (Bloch).
(*Corvina trispinosa* C. & V.; *Bodianus stellifer* Bloch.)
(Steindachner, Ich. Notiz., i, 6.)

217. PACHYPOPS Gill.

556. Pachypops trifilis (Müller & Troschel). (G. i, 273.)

557. Pachypops furcræus (Lacépède).
(Steindachner, Ichth. Beitr., viii, 12.)
(*Corvina biloba* Cuv. & Val.)

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* *Sciæna rubella* Schomburgk: *Corvina grunniens* Schomburgk (Fish. Guiana, ii, 133, 136), are doubtful species of the group from rivers of Guiana. Still another species, allied to *Sciæna*, has been described by Dr. Gill as "*Plagioscion*," without specific name.

† It is possible that *Diplolepis*, *Bairdiella* and *Stelliferus* are valid genera, but their characters, if any exist, have not been pointed out.

218. LEIOSTOMUS Lacépède.

558. Leiostomus xanthurus Lacépède. (G. i, 288.)

219. MICROPOGON Cuvier & Valenciennes.

559. Micropogon fournieri (Desmarest). (P.)
(Jordan, Proc. U. S. Nat. Mus., 1884, 36.)

220. UMBRINA Cuvier.

560. Umbrina broussonneti Cuv. & Val. (G. i, 279.)
(*Umbrina coroides* Cuv. & Val.)

221. MENTICIRRUS Gill.

561. Menticirrus arenatus (Cuv. & Val.). (G. i, 276.)

562. Menticirrus martinicensis (Cuv. & Val.). (G. i, 277.)
(*Umbrina gracilis* Cuv. & Val.)

222. NEBRIS Cuvier & Valenciennes.

563. Nebris microps Cuv. & Val. (G. ii, 316.)

223. LONCHURUS Bloch & Schneider.

564. Lonchurus lanceolatus (Bloch). (G. i, 317.)
(? *Lonchurus depressus* Bloch & Schneider.)

224. CYNOSCION Gill.

565. Cynoscion obliquatum (Sauvage). (Bull. Sci. Philom. iii, 209, 1879. Martinique.)

566. Cynoscion acoupa (Lacépède). (G. ii, 309.)
(*Lutjanus cayennensis* Lac.: *Otolithus toëroe* C. & V.: *Apseudobranchus toëroe* Gill.)

567. Cynoscion leiarchus (Cuv. & Val.). (G. ii, 308.)

568. Cynoscion virescens (Cuv. & Val.).
(*Otolithus virescens* Cuv. & Val., v, 72.)

569. Cynoscion microlepidotum (Cuv. & Val.). (G. ii, 311.)

225. ANCYLODON Cuv. & Val.

570. Ancylodon ancylodon (Bloch & Schneider). (G. ii, 311.)
(*Ancylodon jaculidens* C. & V.)

226. ISOPISTHUS Gill.

571. Isopisthus parvipinnis (Cuv. & Val.). (G. ii, 312.)

Family LXXIX.—POLYCENTRIDÆ.

227. POLYCENTRUS Müller & Troschel.

572. Polycentrus tricolor Gill. (G. iii, 371.)

Family LXXX.—GERRIDÆ.

228. GERRES * Cuvier.

§ *Gerres.*

573. **Gerres plumieri** Cuv. & Val. (G. iv, 253. P.)

574. **Gerres brasilianus** Cuv. & Val. (P.)
(*Gerres patao* Poey.)

§ *Moharra* Poey.

575. **Gerres olisthostoma** Goode & Bean.
(Goode & Bean, Proc. U. S. Nat. Mus., 1882, 423.)

576. **Gerres rhombeus** Cuv. & Val.
(Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1883, 123.)

§ *Diapterus* Ranzani.

577. **Gerres cinereus** (Walbaum). (G. iv, 254. P.)
(*Gerres aprion* Cuv. & Val.: *Gerres zebra* Müller & Troschel.)

578. **Gerres gula** Cuv. & Val. (G. iv, 255. P.)
(*Eucinostomus gulula* Poey.)

579. **Gerres gracilis** (Gill). (G. iv, 255.)
(Evermann & Meek, Proc. Ac. Nat. Sci. Phila., 1883, 118.)

580. **Gerres dowi** (Gill.)
(Evermann & Meek, l. c. 120.)

581. **Gerres pseudogula** (Poey). (P.)
(*Gerres jonesi* Günther.)

582. **Gerres lefroyi** (Goode). P.
(*Eucinostomus productus* Poey; *Diapterus lefroyi* Goode, Am. Journ. Sci. Arts, 1874, 123.)

Family LXXXI.—LABRIDÆ.

229. LACHNOLAIMUS Cuvier & Valenciennes.

583. **Lachnolaimus maximus** (Walbaum). (G. iv, 87. P.)
(*Lachnolæmus falcatus, suillus,* etc., of authors.)

230. BODIANUS Bloch.

(*Harpe* Lacépède; *Cossyphus* Cuvier.)

584. **Bodianus rufus** (Linnæus). (G. iv, 108. P.)

585. **Bodianus pulchellus** Poey. (G. iv, 108. P.)

231. DECODON Günther.

586. **Decodon puellaris** (Poey). (G. iv, 101. P.)

232. CLEPTICUS Cuvier.

587. **Clepticus genizara** Cuvier. (G. iv, 112. P.)

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* For the synonymy of the species of *Gerres*, see papers by Evermann & Meek in Proc. Ac. Nat. Sci. Phila. for 1883 and 1885.

233. PLATYGLOSSUS * Bleeker.

§ *Chærojulis* Gill.

588. Platyglossus radiatus (Linnæus). (G. iv, 161. P.)

589. Platyglossus dimidiatus (Agassiz). (G. iv, 164. P.)

590. Platyglossus garnoti (Cuv. & Val.). (G. iv, 162, 163. P.)

591. Platyglossus bivittatus (Bloch). (G. iv, 164. P.)

592. Platyglossus maculipinna (Müller & Troschel). (G. iv, 165. P.)

593. Platyglossus caudalis (Poey). (G. iv, 166. P.)

234. THALASSOMA Swainson.

594. Thalassoma bifasciatum (Bloch). (G. iv, 186. P.)
(*Julis gillianus* Poey; *Julis detersor* Cuv. & Val.)

595. Thalassoma nitidum (Günther). (G. iv, 190.)
(? *Julis nitidissima* Goode.)

235. XYRICHTHYS Cuvier.

596. Xyrichthys psittacus (Linnæus). (P.)
(*Coryphæna lineata* Gmelin; *Xyrichthys vermiculatus* Poey.)

597. Xyrichthys venustus Poey. (G. iv, 171.)
(*Xyrichthys lineatus* C. & V.)

598. Xyrichthys martinicensis (Cuv. & Val.). (G. iv, 171.)
(*Xyrichthys ritta* C. & V.)

599. Xyrichthys modestus Poey. (P.)

236. DORATONOTUS Günther.

600. Doratonotus megalepis Günther. (G. iv, 124.)
(? *Doratonotus thalassinus* Jordan & Gilbert.)

237. CRYPTOTOMUS Cope.†

(*Callyodon* Cuvier: not of Bloch & Schneider nor of Gronow.)

601. Cryptotomus dentiens (Poey). (P.)
(? *Calliodon retractus* Poey.)

602. Cryptotomus ustus (Cuv. & Val.). (G. iv, 214.)

603. Cryptotomus auropunctatus (Cuv. & Val.). (G. iv, 214.)

604. Cryptotomus roseus Cope.
(Cope Trans. Am. Phil. Soc., 1871, 462.)

605. Cryptotomus beryllinus Jordan & Swain.
(Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 101.)

238. CALLYODONTICHTHYS Bleeker.

606. Callyodontichthys bleekeri Steindachner.
(Steindachner. Ichthyol. Mittheil, v, 1862; *Callyodon flavescens* C. & V., not *Scarus flavescens* Bloch & Schneider.)

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* For a review of the species of this genus, see Jordan & Hughes, Proc. U. S. Nat. Mus., 1886.

† For an account of some of the Scaroid fishes, see Jordan & Swain, Proc. U. S. Nat. Mus., 1884, 81.

239. SPARISOMA* Swainson.

(*Scarus* Bleeker; not of Gronow, nor of Forskål.)

607. Sparisoma radians (Cuv. & Val.). (G. iv, 211.)

608. Sparisoma xystrodon Jordan & Swain.
(Jordan & Swain l. c. 99.)

609. Sparisoma hoplomystax (Cope.)
(*Scarus hoplomystax* Cope, Trans. Am. Philos. Soc., 1871, 462.)

610. Sparisoma lacrimosum (Poey). (P.)

611. Sparisoma atomarium (Poey). (P.)

612. Sparisoma abildgaardi (Bloch). (G. iv, 209. P.)
(*Scarus oxybrachius* Poey.)

613. Sparisoma aurofrenatum (Cuv. & Val.). (G. iv, 212. P.)
(*Scarus miniofrenatus* Poey.)

614. Sparisoma lorito Jordan & Swain.
(Jordan & Swain, l. c. 95.)

615. Sparisoma chrysopterus (Bloch & Schneider). (G. iv, 12. P.)
(*Scarus lateralis* Poey.)

616. Sparisoma distinctum (Poey). (G. iv, 210.)
(*Scarus frondosus* Günther, not C. & V.)

617. Sparisoma brachiale (Poey.)

618. Sparisoma circumnotatum (Poey). (P.)

619. Sparisoma emarginatum (Poey). (P.)

620. Sparisoma flavescens (Bloch & Schneider). (G. iv, 211, 212. P.)
(*Scarus squalidus* Poey; ? *Scarus truncatus* Poey; *Scarus rubripinnis* C. & V.; ? *Scarus virens* C. & V.; *Scarus frondosus* Cuv.)

621. Sparisoma aracanga (Günther). (G. iv, 209.)
(*Scarus aracanga* Günther.)

622. Sparisoma viride Bonnaterre. (G. iv, 210. P.)
(*Scarus viridis* Bonnaterre, 1788, not of Bloch 1790; *Scarus catesbæi* Lacépède.)

240. CALLIODON Gronow.

(*Scarus* Forskål, not of Gronow, which is *Labrus* L.)

(*Hemistoma* Swainson; *Pseudoscarus* Bleeker.)

623. Calliodon punctulatus (Cuv. & Val.). (G. iv, 226. P.)
(? *Scarus diadema* Cuv. & Val.)

624. Calliodon tæniopterus (Desmarest). (G. iv, 225. P.)
(*Pseudoscarus psittacus* Günther, not *psittacus* L., nor of Forskål; *Scarus virginalis* Jordan & Swain.)

625. Calliodon vetula (Bloch & Schneider). (G. iv, 218. P.)
(*Scarus superbus* Poey.)

626. Calliodon flavomarginatus (Cuv. & Val.). (C. & V., xiv, 202.)

627. Calliodon croicensis (Bloch). (G. iv, 226. P.)
(*Pseudoscarus sanctæ-crucis* and *Ps. lineolatus* Poey.)

628. Calliodon cœruleus (Bloch). (G. iv, 227. P.)
(*Scarus obtusus* and *nuchalis* Poey.)

Scarus spinidens Guichenot, Scaridés 15, is a species of *Sparisoma*, but the name is preoccupied by Quoy & Gaimard.

629. **Calliodon quadrispinosus** (Cuv. & Val.). (C. & V., xiv, 197.)
630. **Calliodon pleianus** (Poey).
(*Scarus guacamaia* C. & V., not of Cuvier.)
631. **Calliodon trispinosus** (Cuv. & Val.). (Cuv. & Val., xiv, 182.)
682. **Calliodon guacamaia** (Cuvier). (G. iv, 233. P.)
(*Scarus turchesius* Cuv. & Val.)
633. **Calliodon cœlestinus** (Cuv. & Val.). (P.)
(Cuv. & Val., xiv, 180.)
634. **Calliodon simplex** (Poey). (P.)
(? *Pseudoscarus aracanga* Günther.)
635. **Calliodon rostratus** (Poey). (P.)
636. **Calliodon acutus** (Poey). (P.)
(? *Scarus gnathodus* Poey.)

Family LXXXII.—CICHLIDÆ.

241. ASTRONOTUS* Swainson.

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637. **Astronotus pulcher** (Gill). (G. iv, 280.)
§ *Cichlasoma* Swainson.
638. **Astronotus bimaculatus** (Linnæus). (G. iv, 276.)
639. **Astronotus tetracanthus** (Cuv. & Val.) (G. iv, 282. P.)
(*Chromis fuscomaculatus* Guichenot.)
640. **Astronotus adspersus** (Günther). (G. iv, 282.)

242. CRENICICHLA Heckel.

641. **Crenicichla frenata** Gill. (G. iv, 308.)

Family LXXXIII.—POMACENTRIDÆ.

243. POMACENTRUS Lacépède.

642. **Pomacentrus fuscus** Cuv. & Val. (G. iv, 31.)
643. **Pomacentrus rectifrænum** Gill. (G. iv, 26.)
(Young of *P. fuscus*?)
644. **Pomacentrus leucostictus** Müller & Troschel. (G. iv, 31.)
645. **Pomacentrus obscuratus** Poey. (P.)
(Young of *P. atrocyaneus*?)
646. **Pomacentrus atrocyaneus** Poey. (P.)
(? *Pomacentrus analis* Poey.)
647. **Pomacentrus otophorus** Poey. (G. iv, 32. P.)
648. **Pomacentrus xanthurus** Poey. (G. iv, 32. P.)
649. **Pomacentrus caudalis** Poey. (P.)
650. **Pomacentrus dorsopunicans** Poey. (P.)
651. **Pomacentrus partitus** Poey. (P.)
652. **Pomacentrus niveatus** Poey. (P.)
653. **Pomacentrus planifrons** Cuv. & Val. (G. iv, 33.)

* *Astronotus* Swainson=*Hygrogonus* Günther=*Acara* (Heckel) Gill. According to Steindachner this group should be united with *Heros*, *Acara*, and *Uaru*, in a single genus.

244. GLYPHIDODON Lacépède.

654. Glyphidodon saxatilis (Linnæus). (G. iv, 35. P.)

655. Glyphidodon rudis Poey. (G. iv, 37. P.)

656. Glyphidodon taurus Müller & Troschel. (G. iv, 37.)

657. Glyphidodon declivifrons (Gill). (G. iv, 37, 38.)
(*Euschistodus concolor* Gill.)

245. MICROSPATHODON Günther.

658. Microspathodon chrysurus (Cuv. & Val.). (G. iv, 57. P.)
(*Pomacentrus denegatus* Poey.)

246. CHROMIS Cuvier.

659. Chromis insolatus (Cuv. & Val.). (G. iv, 61.)

660. Chromis punctus (Poey). (G. iv, 64. P.)

661. Chromis cyaneus (Poey). G. iv, 64. P.)
(*Heliases multilineata* Guichenot in part; name and coloration from *Kyphosus sectatrix*.)

Family LXXXIV.—EPHIPPIDÆ.

247. CHÆTODIPTERUS Lacépède.

662. Chætodipterus faber (Broussonet). (G. iv, 61. P.)

Family LXXXV.—CHÆTODONTIDÆ.

248. CHÆTODON Linnæus.

663. Chætodon ocellatus* Bloch. (G. ii, 9. P.)
(*Chætodon bimaculatus* Bloch; *Sarothrodus maculocinctus* Gill.)

664. Chætodon sedentarius Poey. (G. ii, 20. P.)
(*Chætodon gracilis* Günther.)

665. Chætodon striatus Linnæus. (G. ii, 8. P.)

666. Chætodon capistratus Linnæus. (G. ii, 12. P.)

667. Chætodon atæniatus Poey. (P.)

668. Chætodon aya Jordan.

249. PROGNATHODES Gill.

669. Prognathodes aculeatus (Poey). (G. iv, 38. P.)
(*Chelmo pelta* Günther.)

250. HOLACANTHUS Lacépède.

670. Holacanthus ciliaris (Linnæus). (G. ii, 46. P.)

671. Holacanthus tricolor (Bloch). (G. ii, 49. P.)

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* *Sarothrodus amplexicollis* Poey is the larval ("*Tholichthys*") form of some species of *Chætodon* (probably *Ch. ocellatus*).

251. POMACANTHUS Lacépède.

672. **Pomacanthus arcuatus** (Linnæus). (P.)
(? *Chætodon littoricola* Poey.)

673. **Pomacanthus aureus** (Bloch). (P.)
(Lütken, Spolia Atlantica, 571.)

Family LXXXVI.—ACANTHURIDÆ.

252. ACANTHURUS* Forskål.

(*Acronurus* Günther.)

74. **Acanthurus cœruleus** (Bloch). (G. iii, 336. P.)
(*Acanthurus brevis* Poey; *Acronurus cœruleatus* Poey.)

675. **Acanthurus tractus** Poey. (P.)
(*Acronurus nigriculus* Poey.)

676. **Acanthurus hepatus** (Linnæus). (G. iii, 329. P.)
(*Acanthurus chirurgus* and *phlebotomus* Cuv. & Val.; *Acronurus carneus* Poey.)

Family LXXXVII.—MALACANTHIDÆ.

253. MALACANTHUS Cuvier.

677. **Malacanthus plumieri** (Bloch). (G. iii, 359. P.)

254. CAULOLATILUS Gill.

678. **Caulolatilus chrysops** (Cuv. & Val.). (G. iii, 253.)

679. **Caulolatilus cyanops** (Poey). (P.)

Family LXXXVIII.—GOBIIDÆ.

255. GOBIOMORUS† Lacépède.

680. **Gobiomorus dormitor** (Lacépède). (G. iii, 119. P.)

681. **Gobiomorus longiceps** (Günther).
(Günther, Proc. Zool. Soc. Lond., 1864, 151, Nicaragua.)

256. DORMITATOR Gill.

682. **Dormitator maculatus** (Bloch). (G. iii, 112. P.)

257. GUAVINA Bleeker.

683. **Guavina guavina** (Cuv. & Val.). (G. iii, 124. P.)

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*See Meek and Hoffman, Proc. Ac. Nat. Sci. Phila., 1884, for the synonymy of the species of this genus.

†See Eigenmann and Fordice, Proc. Ac. Nat. Sci. Phila., 1885, for the synonymy of the *Eleotridinæ*.

258. ELEOTRIS Gronow.

(*Culius* Bleeker.)

684. Eleotris amblyopsis (Cope).

(*Culius amblyopsis* Cope, Proc. Am. Phil. Soc., 1870, 473.)

685. Eleotris pisonis (Gmelin). (G. iii, 122. P.)

(*Eleotris gyrinus* Cuv. & Val.; *Culius perniger* Cope.)

686. Eleotris belizana Sauvage.

(Sauvage, Bull. Sci. Philom. Paris, 1879, 16.)

259. EROTELIS Poey.

687. Erotelis smaragdus (Cuv. & Val.). (G. iii, 123. P.)

(*Erotelis valenciennesi* Poey.)

260. SICYDIUM Cuvier & Valenciennes.

688. Sicydium plumieri (Bloch). (G. iii, 92. P.)

(*Sicydium siragus* Poey; ? *Sicydium antillarum* Ogilvie-Grant.)

261. EVORTHODUS Gill.

689. Evorthodus breviceps Gill. (G. iii, 85.)

262. CHONEPHORUS Poey.

(? *Rhinogobius* Gill.)

690. Chonephorus taiasica (Lichtenstein). (G. iii, 159. P.)

(*Gobius banana* and *martinicus* C. & V.; *Gobius dolichocephalus* Cope; *Chonephorus bucculentus*, and *Ch. contractus* Poey.)

691. Chonephorus flavus (Cuv. & Val.).

263. LOPHOGOBIUS Gill.

692. Lophogobius cyprinoides (Pallas). (G. iii, 8. P.)

264. GOBIUS Linnæus.

§ *Gobius.*

693. Gobius soporator Cuv. & Val. (G. iii, 26. P.)

(*Gobius mapo* and *lacertus* Poey; *Gobius bishopi* Müller & Troschel.)

§ *Ctenogobius** Gill.

694. Gobius poeyi Steindachner.

(Ieth. Beitr., vi, 44.)

695. Gobius fasciatus Gill. (G. iii, 34.)

696. Gobius kraussi Steindachner.

(Ichth. Beitr., viii., 18.)

§ *Euctenogobius* Gill.

697. Gobius strigatus (O'Shaughnessy).

(*Euctenogobius strigatus* O'Shaugh. Am. Nat. Hist., xv, 146, 1875.

§ *Gobileptes* Swainson.

698. Gobius stigmaticus Poey. (P.)

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* *Gobius brunneus* and *Gobius lineatus* Poey are two species briefly described under names which are preoccupied.

699. Gobius lyricus Girard. (P.)
(*Smaragdus costalesi* Poey.)

700. Gobius smaragdus Cuv. & Val. (P.)
(*Smaragdus valenciennesi* Poey.)

701. Gobius oceanicus Pallas. (G. iii, 50. P.)
(*Gobius lanceolatus* Bloch.; *Gobius bacalaus* C. & V.; *Gobionellus hastatus* Girard.)

265. MICROGOBIUS Poey.

702. Microgobius signatus Poey. (P.)

266. GOBIOSOMA Girard.

703. Gobiosoma multifasciatum Steindachner.
(Ichth. Beitr., v, 183.)

267. GOBIOIDES Lacépède.

(*Amblyopus* Cuv. & Val.)

704. Gobioides broussoneti Lacépède. (G. iii, 136. P.)
(*Gobius brasiliensis* Cuv. & Val.; *Gobioides barreto* Poey.)

268. CAYENNIA Sauvage.

705. Cayennia guichenoti Sauvage.
(Bull. Sci. Philom., iv, 57, 1880.)

Family LXXXIX.—CALLIONYMIDÆ.

269. CALLIONYMUS Linnæus.

706. Callionymus pauciradiatus Gill. (P.)

Family XC.—SCORPÆNIDÆ.

270. SCORPÆNA Linnæus.

707. Scorpæna grandicornis Cuv. & Val. (G. ii, 114. P.)

708. Scorpæna plumieri Bloch & Schneider. (G. ii, 113. P.)
(*Scorpæna rascacio* Poey.)

709. Scorpæna brasiliensis Cuv. & Val. (G. ii, 112.)
(*Scorpæna stearnsi* Goode & Bean.)

710. Scorpæna inermis Cuv. & Val. (P.)
(? *Scorpæna occipitalis* Poey; ? *Scorpæna calcarata* Goode & Bean).

711. Scorpæna castor (Poey).
(? *Pontinus pollux* Poey.)

Family XCI.—TRIGLIDÆ.

271. PERISTEDION Lacépède

712. Peristedion imberbe Poey. (P.)
(*Peristethion micronemus* Poey.)

713. Peristedion brevirostre Günther. (G. ii, 217.)

714. Peristedion longispatha Goode & Bean.
(Goode & Bean, Bull. M. C. Z., xii, 166, 1886.)

715. Peristedion platycephalum Goode & Bean.
(Goode & Bean, l. c., 167.)

272. PRIONOTUS Lacépède.

716. Prionotus rubio Jordan. (P.)

717. Prionotus punctatus (Bloch). (G. ii, 193.)

273. CHELIDONICHTHYS* Kaup.

718. Chelidonichthys pictipinnis Kaup.
(Archiv f. Nat., 1873, 71; Barbadoes.)

274. CEPHALACANTHUS Lacépède.

719. Cephalacanthus volitans (Linnæus). (G. ii, 221. P.)

Family XCII.—PLATYCEPHALIDÆ.

275. PLATYCEPHALUS Bloch.

720. Platycephalus angustus † Steindachner.
(Ichth. Notizen., iii, 6.)

Family XCIII.—GOBIESOCIDÆ.

276. GOBIESOX Lacépède.

§ *Gobiesox.*

721. Gobiesox cephalus Lacépède. (G. iii, 499.)

722. Gobiesox nigripinnis Peters. (G. iii, 502.)

723. Gobiesox virgatulus Jordan & Gilbert. (G. iii, 502.)
(? *Gobiesox nudus* Günther, not *Cyclopterus nudus* L.)

724. Gobiesox cerasinus Cope.
(Trans. Am. Phil. Soc., Phila., 1871, 473.)

§ *Sicyases* Müller & Troschel.

725. Gobiesox fasciatus Peters. (G. iii, 497.)

726. Gobiesox rupestris (Poey). (P.)

727. Gobiesox rubiginosus (Poey). (P.)

728. Gobiesox punctulatus (Poey). (P.)

729. Gobiesox carneus (Poey). (P.)

Family XCIV.—BATRACHIDÆ.

277. BATRACHOIDES Lacépède.

730. Batrachoides surinamensis (Bloch & Schneider). (G. iii, 174.)

278. BATRACHUS Bloch & Schneider.

731. Batrachus tau (Linnæus). (G. iii, 167. P.)

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*A doubtful genus, the description of which I have not seen.
† Doubtfully American, "Angeblich aus Surinam."

279. **PORICHTHYS** Girard.

732. **Porichthys porosissimus** (Cuv. & Val.). (G. iii, 176.)
(*Porichthys plectrodon* Jordan & Gilbert.)

280. **THALASSOPHRYNE** Günther.

733. **Thalassophryne maculosa** Günther. (G. iii, 175.)

Family XCV.—LEPTOSCOPIDÆ.

281. **DACTYLOSCOPUS** Gill.

734. **Dactyloscopus poeyi** Gill. (P.)
735. **Dactyloscopus tridigitatus** Gill. (G. iii, 279.)

Family XCVI.—URANOSCOPIDÆ.

282. **URANOSCOPUS** Linnæus.

736. **Uranoscopus occidentalis** Agassiz. (G. iii, 227.)

283. **UPSILONPHORUS** Gill.

737. **Upsilonphorus y-græcum** (Cuv. & Val.). (G. iii, 229.)

Family XCVII.—OPISTHOGNATHIDÆ.

284. **OPISTHOGNATHUS** Cuv. & Val.

738. **Opisthognathus macrognatha** Poey. (G. ii, 255. P.)
(*Opisthognathus megastoma* Günther; *? O. scaphiura* Goode & Bean.)

285. **GNATHYPOPS** * Gill.

739. **Gnathypops maxillosus** (Poey.) (P.)
740. **Gnathypops macrops** (Poey.) (P.)

286. **LONCHOPISTHUS** Gill.

741. **Lonchopisthus micrognathus** (Poey.) (P.)

Family XCVIII.—BLENNIIDÆ.

287. **CHÆNOPSIS** Gill.

742. **Chænopsis ocellatus** Poey. (P.)

288. **OPHIOBLENNIUS** Gill.

(*Blennophis* Val.; preoccupied.)
743. **Ophioblennius webbi** (Valenciennes). (G. iii, 259.)

* It is perhaps possible that the species referred to *Gnathypops* are the females of *Opisthognathus*, as suggested by Poey (Enumeratio, 133.)

289. **BLENNIUS** Linnæus.

744. Blennius crinitus (Cuv. & Val.). (G. iii, 224.)

290. **SCARTELLA** Jordan.

745. Scartella microstoma (Poey). (P.)
746. Scartella marmorea (Poey). (P.)
747. Scartella vincta (Poey). (P.)
748. Scartella truncata (Poey). (P.)

291. **RUPISCARTES** Swainson.

(*Entomacrodus* Gill.)

749. Rupiscartes atlanticus (Cuv. & Val.). (G. iii, 242.)
750. Rupiscartes nigricans (Gill). (G. iii, 254.)
751. Rupiscartes margaritaceus (Poey). (P.)
752. Rupiscartes decoratus (Poey). (P.)

292. **SALARIICHTHYS** Guichenot.

753. Salariichthys textilis (Quoy & Gaimard). (G. iii, 248.)
(*Salarias vomerinus* Cuv. & Val.)

293. **MYXODES** Cuvier.

754. Myxodes macropus Poey. (P.)
755. Myxodes versicolor Poey. (P.)
756. Myxodes lugubris Poey. (P.)
757. Myxodes varius Poey. (P.)

294. **GOBIOCLINUS** Gill.

758. Gobioclinus gobio (Cuv. & Val.). (G. iii, 267.)

295. **LABRISOMUS** Swainson.

759. Labrisomus nuchipinnis (Quoy & Gaimard). (G. iii, 262, P.)
760. Labrisomus herminier (Cuv. & Val.). (G. iii, 264.).
761. Labrisomus microlepedotus Poey. (P.)
762. Labrisomus ocellatus (Steindachner.) (Ichth. Beitr., v, 182.)
763. Labrisomus buccifer Poey. (P.)
(*L. biguttatus* Cope, Trans. Am. Phil. Soc., 1871, 473.)
764. Labrisomus delalandi (Cuv. & Val.). (G. iii, 264.)
765. Labrisomus gilli (Steindachner). (Ichth. Notiz., **vi**, 46.)
(? *Clinus bimaculatus* Steind. Ichth. Beitr., v, 180.)

296. **CREMNOBATES** Günther.

766. Cremnobates marmoratus Steindachner. (Ichth. Beitr., v, 175)
767. Cremnobates affinis Steindachner. (Ichth. Beitr., v, 175.)
768. Cremnobates fasciatus Steindachner. (Ichth. Beitr. v. 176.)
769. Cremnobates nigripinnis (Steindachner.*)
(*Clinus nigripinnis* Ichth. Notiz., vi, 45, 1867.)

**Clinus nigripinnis* Steindachner, from Barbadoes, is a *Cremnobates* and certainly very close to *C. fasciatus*, but it seems to have rather larger scales (Lat. l. 33.).

Family XCIX.—FIERASFERIDÆ.

297. **FIERASFER** Cuvier.

770. **Fierasfer dubius** Putnam. (P.)
(Putnam, Proc. Bost. Soc. Nat. Hist.; *Carapus? affinis* Poey, 1874, 344.)

298. **LEFROYIA** Jones.

771. **Lefroyia bermudensis** Jones.
(Jones, Zoologist, 1874, 338: Bermuda.)

Family C.—OPHIDIIDÆ.

299. **OPHIDION** Linnæus.

772. **Ophidion graëllsi** Poey. (P.)
(*? Ophidium marginatum* De Kay.)
773. **Ophidion brevibarbe** (Cuvier). (G. iv, 379.)

300. **LEPTOPHIDIUM** Gill.

774. **Leptophidium profundorum** Gill. (Gill, Proc. Ac. Nat. Sci., Phila., 1863, 211.)

Family CI.—BROTULIDÆ.

301. **LUCIFUGA** Poey.

775. **Lucifuga subterranea** Poey. (P.)

302. **STYGICOLA** Gill.

776. **Stygicola dentata** (Poey). (P.)

303. **BROTULA** Cuvier.

777. **Brotula barbata** (Bloch & Schneider). (G. iv, 371. P.)

304. **BARATHRONUS** Goode & Bean.

778. **Barathronus bicolor** Goode & Bean. Goode & Bean, l. c., 1886, 164.

305. **NEOBYTHITES** Goode & Bean.

779. **Neobythites gilli** Goode & Bean. (Goode & Bean, Proc. U. S. Nat. Mus., 1885. 601.)
780. **Neobythites robustus** Goode & Bean. (Goode & Bean, Bull. M. C. Z., xii, 1886, 161.)
781. **Neobythites marginatus** Goode & Bean. (Goode & Bean, l. c., 1886, 162.)

306. **POROGADUS** Goode & Bean.

782. **Porogadus miles** Goode & Bean. (L. c., 1885, 602.)

307. **BATHYONUS** Goode & Bean.

(*Bathynectes* Günther, preoccupied.)
783. **Bathyonus catena** Goode & Bean. (L. c., 1885, 603.)
784. **Bathyonus pectoralis** Goode & Bean. (L. c., 1885, 604.)

308. **APHYONUS** Günther.

785. Aphyonus mollis Goode & Bean. (Goode & Bean, l. c., 1886, 163.)

Family CII.—GADIDÆ.

309. **PHYSICULUS** Kaup.

786. Physiculus kaupi Poey. (P.)

310 **BREGMACEROS** Thompson.

787. Bregmaceros atlanticus Goode & Bean. (Goode & Bean, l. c., 1886, 165.)

Family CIII.—MACRURIDÆ.

311. **BATHYGADUS** Günther.

788. Bathygadus cavernosus Goode & Bean. (L. c., 1885, 598.)
789. Bathygadus macrops Goode & Bean. (L. c., 1885, 598.)
790. Bathygadus longifilis Goode & Bean. (L. c., 1885, 599.)
791. Bathygadus arcuatus Goode & Bean. (Goode & Bean, Bull. M. C. Z., xii, 158, 1886.
792. Bathygadus favosus Goode & Bean. (Goode & Bean, Bull. M. C. Z., xii, 158, 1886.)

312. **MACRURUS** Bloch.

793. Macrurus caribbæus Goode & Bean. (L. c., 1885, 594.)
794. Macrurus occa Goode & Bean. (L. c., 1885, 595.)

313. **CORYPHÆNOIDES** Gunner.

795. Coryphænoides sulcatus Goode & Bean. (L. c., 1885, 596.)

314. **MALACOCEPHALUS** Günther.

796. Malacocephalus occidentalis Goode & Bean. (L. c., 1885, 597.)

Family CIV.—PLEURONECTIDÆ.

315. **PLATOPHRYS** Swainson.

(*Rhomboidichthys* Bleeker.)
797. Platophrys lunatus (Linnæus). (G. iv, 433. P.)
798. Platophrys ellipticus (Poey). (G. iv, 434. P.)
799. Platophrys maculifer (Poey). (P.)
800. Platophrys ocellatus (Agassiz.) (G. iv, 433. P.)
801. Platophrys spinosus (Poey). (P.)

316. ARAMACA Jordan & Goss.

802. Aramaca papillosa (Linnæus).
(*? Citharichthys ocellatus* Poey. *? Hemirhombus aramaca** Günther iv, 422.)
803. Aramaca soleæformis (Agassiz). (G. iv, 422.)

317. HEMIRHOMBUS Bleeker.

804. Hemirhombus æthalion (Jordan). (Proc. U. S. Nat. Mus., 1886.)
805. Hemirhombus fimbriatus Goode & Bean. (Proc. U. S. Nat. Mus., 1885, 591.)

318. CITHARICHTHYS Bleeker.

806. Citharichthys spilopterus Günther. (G. iv, 421. P.)
(*Hemirhombus fuscus* Poey.)
807. Citharichthys cayennensis Bleeker. (Comptes Rendus Ac. Sci. Amst., 1862.)
808. Citharichthys guatemalensis Bleeker. (Nederl. Tydskr. Dierk., 1864–'73.)
809. Citharichthys ventralis Goode & Bean. (Proc. U. S. Nat. Mus., 1885, 592.)
810. Citharichthys dinoceros Goode & Bean. (Goode & Bean, Bull. M. C. Z., xii, 157, 186.)

319. ETROPUS Jordan & Gilbert.

811. Etropus rimosus Goode & Bean. (Proc. U. S. Nat. Mus., 1885, 593.)

320. PARALICHTHYS Girard.

812. Paralichthys brasiliensis (Ranzani). (G. iv, 429.)
(*Pseudorhombus vorax* Günther.)

321. MONOLENE Goode.

813. Monolene atrimana Goode & Bean. (Bull. M. C. Z., 1866, xii, 155.)

322. ACHIRUS Lacépède.

§ *Baiostoma* Bean.
814. Achirus inscriptus (Gosse). (G. iv, 473. P.)
(*Monochir reticulatus* Poey.)
815. Achirus maculipinnis (Agassiz). (G. iv, 473.)
816. Achirus gronovii (Günther). (G. iv, 477.)
§ *Achirus.*
817. Achirus achirus (Linnæus). (G. iv, 477.)
(*Solea browni* Gthr.; *? Pleuronectes apoda* Mitchill; *? Pleuronectes lineatus* L.)

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*The *Aramaca* of Maregrave, which is the sole basis of *Pleuronectes aramaca* Walbaum, of *Pleuronectes macrolepidotus* Bloch, of *Rhombus aramaca* Cuvier and of *Pleuronectes papillosus* Linnæus, can be no known species other than the present. Marcgrave's species is of course an *Aramaca*, having the form of a sole. It is represented as having the eyes wide apart, the left pectoral produced, the mouth very large, the body oblong, and the coloration stone-like (sand-color) on the left side and white on the eyed side.

323. APIONICHTHYS Kaup.

818. Apionichthys unicolor (Günther). (G. iv, 489.)
(*Solcotalpa unicolor* Günther.)

819. Apionichthys nebulosus Peters. (Peters, Berl. Monalster., 1869, 709; Surinam.)

324. APHORISTIA Kaup.

820. Aphoristia plagiusa (Linnæus). (G. iv, 490. P.)

821. Aphoristia diomedeana Goode & Bean. (Goode & Bean, Proc. U. S. Nat. Mus., 1885, 589.)

822. Aphoristia pusilla Goode & Bean. (L. c., 1885, 592.)

823. Aphoristia pigra Goode & Bean. (Bull. M. C. Z., 1886, xii, 154.)

824. Aphoristia marginata Goode & Bean. (Bull. M. C. Z., 1886, xii, 153.)

Family CV.—ANTENNARIIDÆ.

325. PTEROPHRYNOIDES Gill.

825. Pterophrynoides histrio (Linnæus). (G. iii, 185. P.)
(*Antennarius marmoratus* Günther.)

326. ANTENNARIUS Lacépède.

826. Antennarius scaber Cuvier. (G. iii, 188.)
(*Antennarius histrio* Günther.)

827. Antennarius ocellatus (Bloch & Schneider). (G. iii, 196.)
(*Antennarius pleurophthalmus* Gill.)

828. Antennarius multiocellatus (Cuv. & Val.). (G. iii, 194.)
(? *Antennarius annulatus* Gill.)

829. Antennarius tigris Poey. (G. iii, 189. P.)

830. Antennarius inops Poey.
(Poey, Anales Hist. Nat. Exp. 1881, 340. Porto Rico.)

831. Antennarius corallinus Poey. (P.)

832. Antennarius tenebrosus Poey. (G. iii, 197. P.)

Family CVI.—MALTHIDÆ.

327. MALTHE Cuvier.

833. Malthe vespertilio (Linnæus). (G. iii, 200. P.)

328. HALIEUTICHTHYS Poey.

834. Halieutichthys aculeatus (Mitchill). (P.)
(*Halieutichthys reticulatus* Poey.)

Family CVII.—OSTRACIIDÆ.*

329. **OSTRACION** Linnæus.

835. **Ostracion tricorne** Linnæus. (G. viii, 258. P.)
(*Ostracion quadricornis* L.; *Acanthostracion polygonius* Poey.)
836. **Ostracion trigonum** Linnæus. (G. viii, 256. P.)
(*? Lactophrys undulatus* Poey; *Ostracium expansum* Cope.)
837. **Ostracion bicaudale** Linnæus. (G. viii, 257. P.)
838. **Ostracion triquetrum** Linnæus. (G. viii, 256. P.)

Family CVIII.—TRIACANTHIDÆ.

330. **HOLLARDIA** Poey.

839. **Hollardia hollardi** Poey. (G. viii, 209. P.)

Family CIX.—BALISTIDÆ.

331. **BALISTES** Linnæus.

§ *Balistes.*

840. **Balistes vetula** Linnæus. (G. viii, 215. P.)
841. **Balistes carolinensis** Gmelin. (G. viii, 217. P.)
(*Balistes capriscus* Gmelin; *Balistes tæniopterus* and *B. nebulosus* Poey.)
842. **Balistes moribundus** Cope. (Cope, Trans. Am. Philos. Soc., 1871, 478.)

332. **CANTHIDERMIS** Swainson.

843. **Canthidermis longus** (Gronow). (P. ? G. viii, 214.)
(*Balistes macrops* Poey; *? ? Balistes maculatus* Bloch.)
844. **Canthidermis sufflamen** (Mitchill). (P.)
(*? Balistes sobaco* Poey.)
845. **Canthidermis melanopterus** (Cope). (Cope, Trans. Am. Philos. Soc., 1871, 478.)
846. **Canthidermis asperrimus** (Cope). (Cope, l. c., 478.)

333. **XANTHICHTHYS** Kaup.

847. **Xanthichthys ringens** (Linnæus). (G. viii, 221. P.)
(*Xanthichthys cicatricosus* Poey.)

334. **MELICHTHYS** Swainson.

848. **Melichthys piceus** (Poey). (G. viii, 227. P.)
(*? Balistes buniva* Lacépède.)

335. **MONACANTHUS** Cuvier.

§ *Cantherines* Swainson.

849. **Monacanthus stratus** Poey. (P.)
850. **Monocanthus parraianus** Poey. (P.)

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* For synonomy, see Goode, Proc. U. S. Nat. Mus., 1879, 261.

851. Monacanthus pullus Ranzani. (G. viii, 230, pt. P.)

852. Monacanthus macrocerus Hollard. (Ann. Sci. Nat., 1854, ii, 237.)

853. Monacanthus irroratus Poey. (P.)

(*? Monacanthus punctatus* Poey.)

§ *Monacanthus.*

854. Monacanthus oppositus Poey. (P.)

855. Monacanthus ciliatus Mitchill. (G. viii, 237.)

(*Monacanthus occidentalis* Günther; *Monacanthus pira-aca* Kner.; *Monacanthus davidsoni* Cope.)

856. Monacanthus hispidus L. (G. viii, 239. P.)

(*Monacanthus setifer* Poey.)

857. Monacanthus spilonotus Cope. (Cope, Trans. Am. Phil. Soc., 1871, 476.)

858. Monacanthus amphioxys Cope. (Cope, l. c., 477.)

336. ALUTERA Cuvier.

859. Alutera scripta (Osbeck). (G. viii, 252. P.)

(*Alutera picturata* Poey.)

860. Alutera monoceros (Osbeck). (G. viii, 251. P.)

(*Alutera güntheriana* Poey.)

861. Alutera punctata Agassiz. (G. viii, 254.)

Family CX.—TETRAODONTIDÆ.

337. LAGOCEPHALUS Swainson.

862. Lagœphalus lævigatus (Linnæus). (G. viii, 274. P.)

(*? Tetrodon lineolatus* Poey.)

338. SPHÆROIDES Lacépède.

(*Cirrhisomus* Swainson; *Cheilichthys* Müller.)

863. Sphæroides pachygaster (Müller & Troschel). (G. viii, 287.)

864. Sphræroides testudineus (Linnæus). (G. viii, 282. P.)

(*Tetrodon punctatus* Poey.)

865. Sphæroides spengleri (Bloch). (G. viii, 284. P.)

(*Tetrodon nephelus* Goode & Bean; *Tetrodon turgidus* Poey, not of Mitchill.)

339. COLOMESUS Gill.

866. Colomesus psittacus (Bloch). (G. viii, 286.)

340. CANTHIGASTER Swamson.

867. Canthigaster rostratus (Bloch). (G. viii, 303.)

(*Letrodon ornatus* Poey. *Anchisomus caudacinctus* Richardson.)

Family CXI.—DIODONTIDÆ.

341. DIODON Linnæus.

868. Diodon hystrix Linnæus.

(*Diodon atinga* Bloch, not of L.; ? *Diodon holacanthus* Linnæus = *Diodon spinosissimus* Cuvier = *Diodon maculatus* Günther.)

869. Diodon maculifer Kaup. (G. viii, 309.)

342. CHILOMYCTERUS (Bibron) Kaup.

870. Chilomycterus schœpfi (Walbaum). (G. viii, 310.)

(*Chilomycterus geometricus* Authors, not *Diodon geometricus* Bloch & Schneider.)

871. Chilomycterus spinosus (Linnæus). (G. viii, 311, var. P.)

(*Cyclichthys cornutus* Kaup. *Chilomycterus orbitosus* Poey.)

872. Chilomycterus antennatus (Cuvier) (G. viii, 311. P.)

(*Chilomycterus puncticulatus* Poey.)

873. Chilomycterus reticulatus (Linnæus). (G. viii, 313.)

Family CXII.—ORTHAGORISCIDÆ.

343. RANZANIA Nardo.

874. Ranzania truncata (Retz). (G. viii, 319.)

344. MOLA Cuvier.

875. Mola mola (Linnæus). (G. viii, 317. P.)

SUPPLEMENTARY LIST.

To the foregoing list we may confidently add the following species, obtained from the Florida Keys and from the "Snapper" Banks off Pensacola and Tampa. All of them are essentially members of the West Indian Fauna, although, as yet, none of them have been noted from any locality south of the Tropic of Cancer:

CLUPEIDÆ.

Dussumieria stolifera Jordan & Gilbert.

MURÆNIDÆ.

Sidera nigromarginata (Girard).

OPHISURIDÆ.

Letharchus Goode & Bean.

Letharchus velifer Goode & Bean.

Callechelys Guichenot.

Callechelys muræna Jordan.
Callechelys scuticaris (Goode & Bean).
Callechelys teres (Goode & Bean).
Callechelys bascanium Jordan.

CONGRIDÆ.

Myrophis egmontis Jordan.
Conger caudicula Bean.

Neoconger Girard.

Neoconger mucronatus Girard.

MUGILIDÆ.

Querimana Jordan & Gilbert.

Querimana gyrans Jordan & Gilbert.

ATHERINIDÆ.

Atherina arœa Jordan & Gilbert.

BRAMIDÆ (?).

Steinegeria Jordan & Evermann.

Steinegeria rubescens Jordan & Evermann.

SERRANIDÆ.

Centropristis ocyurus Jordan & Evermann.
Hypoplectrus gemma Goode & Bean.

Pronotogrammus Gill.

Pronotogrammus vivanus (Jordan & Swain).

SPARIDÆ.

Calamus arctifrons Goode & Bean.

Stenotomus Gill.

Stenotomus caprinus Goode & Bean.
Sparus pagrus Linnæus.

CHEILODIPTERIDÆ.

Amia aluta (Jordan & Gilbert).

MULLIDÆ.

Mullus Linnæus.

Mullus surmuletus auratus Jordan & Gilbert.

LABRIDÆ.

Xyrichthys rosipes Jordan & Gilbert.
Doratonotus thalassinus Jordan & Gilbert.
Sparisoma cyanolene Jordan & Swain.
Calliodon bollmani Jordan & Evermann.
Calliodon evermanni Jordan.

POMACENTRIDÆ.

Chromis enchrysurus Jordan & Gilbert.

MALACANTHIDÆ.

Caulolatilus microps Good & Bean.

GOBIIDÆ.

Gobiosoma ceuthæcum Jordan & Gilbert.

Ioglossus Bean.

Ioglossus calliurus Bean.

TRIGLIDÆ.

Prionotus roseus Jordan & Evermann.
Prionotus stearnsi Jordan & Swain.
Prionotus ophryas Jordan & Swain.

URANOSCOPIDÆ.

Astroscopus Gill.

Astroscopus anoplos (C. & V.)

OPISTHOGNATHIDÆ.

Opisthognathus scaphiura Goode & Bean.
Opisthognathus lonchura Jordan & Gilbert.
Gnathypops mystacinus Jordan.

BLENNIIDÆ.

Blennius asterias Goode & Bean.
Blennius favosus Goode & Bean.
Blennius stearnsi Jordan & Gilbert.

Emblemaria Jordan & Gilbert.

Emblemaria nivipes Jordan & Gilbert.
Cremnobates nox Jordan & Gilbert.

Stathmonotus Bean.

Stathmonotus hemphilli Bean.

OPHIDIIDÆ.

Ophidion beani Jordan.

Otophidium Gill.

Otophidium omostigma (Jordan & Gilbert).

GADIDÆ.

Phycis Bloch & Schneider.

Phycis floridanus Bean.

PLEURONECTIDÆ.

Aramaca patula (Bean).
Platophrys nebularis Jordan & Gilbert.
Etropus crossotus Jordan & Gilbert.
Achirus comifer Jordan & Gilbert.
Achirus brachialis Bean.

INDIANA UNIVERSITY,
October 6, 1886.

A CATALOGUE OF THE BIRDS OF GRENADA, WEST INDIES, WITH OBSERVATIONS THEREON.

By JOHN GRANT WELLS, of Grenada.

[Edited by George N. Lawrence.]

For the past three years Mr. Wells has been sending me specimens of birds from Grenada, through the Smithsonian Institution, to have them identified. His object in so doing was that he might give as complete a catalogue as possible of the birds inhabiting and frequenting that island. He has enumerated ninety-two species, two of which require identification for want of specimens.

Mr. Wells enumerates thirty-eight species more than are given by Mr. Ober in his catalogue of the birds of Grenada. He procured all the species obtained or seen by Mr. Ober, and four he had not identified have been determined.

Of most of the species he has given very full and interesting notes of their habits.

Mr. Wells has proved himself to be a most diligent collector and careful investigator, the result being, besides the greatly increased number of birds added to the fauna of Grenada, the discovery of three species new to science and of eleven species not before noted from the Lesser Antilles.

Most of the species given in this catalogue have been liberally presented by Mr. Wells to the U. S. National Museum at Washington.

October, 1886.

Family TURDIDÆ.

1. **Turdus nigrirostris** Lawr. Mountain Grieve; Thrush.

♂ Length, 9⅛ inches; expanse, 15¼ inches; wing, 5 inches.

♀ Length, 9 inches; expanse, 15 inches; wing, 4⅞ inches.

This bird is exclusively confined to the deep woods, preferring the dark valleys along the mountain streams, and may always be found on the "figeur" trees, on the berries of which it feeds. It is rather a shy bird, and immediately makes off with a "cluck, cluck," on the approach of any one. Its note may be heard morning and evening, and has been compared to these words: "John Pierre oh—John Pierre oh—mi yes, mi yes, mi yes," with a stress on "Pierre," the last three words rather fast.

The nest is generally placed in the fork of a tree with dark foliage, and composed outwardly of dried roots and ferns, the shell of mud, and lined with finer roots. The eggs are three in number, of a pale green, speckled and blotched with reddish brown, the spots confluent at the large end. They measure 1.68 inches by .84 inch and 1.20 inches by .82 inch.

2. **Turdus gymnopthalmus** Cab. Yellow-eye Grieve; Thrush.

♂ Length, 9¼ inches; expanse, 15½ inches; wing, 5 inches.

Abundant everywhere from the coast to the borders of the mountains, frequenting the cocoa fields and mango trees; feeds on "figeur" and other wild berries; also frequently seen on the ground scratching amongst the dead leaves for insects and larvæ; hence it is often caught in springs set for the "Pedrix." It has several notes very melodious, and also an alarm note or "cluck."

Its nest is generally placed in the fork of the cocoa (*Theobroma*), rather a rude and bulky structure, composed of dry roots and mud, with no soft lining for the eggs, which are three in number, of a pale green, thickly spotted with brown. They measure 1.06 inches by .80 inch, 1.16 inches by .80 inch, and 1.12 inches by .82 inch.

[I described the Grenada bird (Ann. N. Y. Acad. of Sci., Vol. I, p. 160) under the name of *Turdus carribæus*. It is considered by Messrs. Sclater and Seebohm not to differ from *T. gymnopthalmus*. I have three specimens of *gymnopthalmus*, one of them presented to me by Mr. Seebohm. These are smaller in all their dimensions than the bird from Grenada, which has a perceptibly smaller bill; the feathers of the tail are broader and darker in color; the under wing-coverts are of a lighter pale salmon, and the inner margins of the quills are more cinereous, are less tinged with salmon color, and the upper plumage is slightly darker in color than in my specimens of *gymnopthalmus*.

I will endeavor to get more specimens from Grenada, to see if these differences are constant.—G. N. L.]

3. **Mimus gilvus** Vieill. Mocking Bird; Pied Carreau.

♂ Length, 10 inches; expanse, 13¾ inches; wing, 4½ inches; tail, 4 inches.

♀ Length, 9 inches; expanse, 12½ inches; wing, 4 inches.

Very numerous, though seldom seen in the mountains. It delights in the neglected pastures overgrown with "black sage," on the red berries of which it feeds, and several dozens may be seen at a time perched near to each other, alternately trilling forth most delightful music and devouring berries. On moonlight nights its note is heard at intervals of an hour; hence its being called by some a nightingale. It is found also on all the little rocky islands on the coast. The nest is a platform of dry sticks, with a round saucer-like depression in the middle, lined with fine roots and sometimes with horse-hair. The eggs vary exceedingly both in color and marking. They are sometimes of a pale blue and sometimes of a dull green, with spots, blotches, or rings of brown. It is seldom that two sets or clutches are found alike, and the three eggs in each set are usually different. For example, a set before me: One of them is rather long and with specks so faint that at a little distance it appears to be of a uniform pale blue; another is rather shorter, greenish, and thickly blotched with brown; and the third is thick at one end and

pointed at the other, pale bluish green, with a ring of brown spots round the blunt end. They measure 1.06 inches by .74 inch, 1.08 inches by .68 inch, and 1.12 inches by .78 inch.

Family TROGLODYTIDÆ.

4. **Thryothorus grenadensis** Lawr. Wren; God Bird.

♂ Length, 5 inches; expanse, 7⅛ inches; wing, 2¼ inches.

Active, fussy, noisy, yet pleasant withal, this little bird is found in the house, the sugar-works, or the woods, and though all other birds are shot, robbed, or stoned, the "Oiseau Bon-Dieu" is never molested, and seems to appreciate its immunity from the "ills that affect" its feathered brethren.

Its favorite spot for a nest is on the "plate" of a house, but it chooses many curious spots, such as a hole in a cliff, an old calabash, a hat hung up in a room, &c. In the chimney of the distillery at Mirebeau Estate there is now a wren's nest (February 3, 1882). In a crack in the masonry about 1 inch wide the bird enters to the nest, which is built on the projecting bricks inside. It kept going in and out, feeding its young, whilst there was a roaring fire in the distillery and smoke rushing up the chimney.

The nest is generally composed of fine dried roots and grapes, and lined with a thick coat of feathers. The eggs are four and sometimes five in number, of a dirty white, thickly sprinkled with bright reddish-brown specks. They measure .70 inch by .54 inch and .68 inch by .54 inch.

Family MNIOTILTIDÆ.

5. **Dendroica petechia** (Linn.). Yellow Bird.

♂ Length, 4¼ inches; expanse, 7½ inches; wing, 2⅜ inches.

Not numerous; very shy; frequents the mangrove trees near to the swamps on windward side of the island.

6. **Seiurus nævius** (Bodd.). Water Thrush.

♀ Length, 6 inches; expanse, 9 inches; wing, 3⅛ inches; tail, 1¾ inches.

Not numerous; rather shy; seldom more than two seen together; frequents the mangrove swamps and outlets of streams.

7. **Setophaga ruticilla** (Linn.). Redstart.

Family VIREONIDÆ.

8. **Vireosylvia calidris**, var. **dominicana**, Lawr. Bastard Grieve.

♀ Length, 6 inches; expanse, 10 inches; wing, 3½ inches.

♂ Length, 6 inches; expanse, 9½ inches; wing, 3¼ inches.

Pretty well distributed all over the island is this sprightly little bird. I have found it in the forests that surround the Grand Etang, 2,000 feet

above the sea, and among the manchioneel trees on the beach at Isle de Rhonde. It is very fond of a small green berry the fruit of a creeping parasite which spreads over the tops of high trees, and also feeds on small crickets and other insects.

The nest is pensile, something like a deep teacup in shape; the walls are compactly formed of flat grasses and fine tendrils. Eggs three in number, white, with a few scattered dark-brown spots, sometimes forming a ring round the larger end. They measure .86 inch. by .60 inch, .88 inch by .60 inch, and .92 inch by .60 inch.

Family HIRUNDINIDÆ.

9. **Progne dominicensis** (Gm.). Purple Swallow.

♂ Length, 7½ inches; expanse, 15 inches; wing, 5½ inches.

♀ Length, 8 inches; expanse, 15⅞ inches; wing, 6 inches.

Though preferring the vicinity of the sea-coast, these birds are often seen in large flocks skimming over the country districts. One morning after a shower of rain a large number were disporting around a large mango tree at my place (which is three miles from the coast), and I shot seven of them. They are fond of perching on the dry branches of the silk-cotton trees, clustered thickly together, during the middle of the day.

They make their nests in holes in the inaccessible cliffs of Soubise Island; also at the "Morne de Sauteurs" and like places along the coast. I have hitherto been unable to procure their eggs.

10. **Hirundo erythrogastra**, Bodd. Rufous-belly Swallow.

Migrant. Large flocks appear in August and remain until March. They frequent the open pastures near the sea-shore, and may be observed skimming along the ground and occasionally alighting on a dry tree or shrub.

Family CŒREBIDÆ.

11. **Certhiola atrata** Lawr. Black See-see.

♂ Length, 4¾ inches; expanse, 7¾ inches; wing, 2½ inches.

Found everywhere except in the "high woods;" rather abundant along the roadsides; very fond of the flowers of the "morengu" tree, amongst which it may be seen inserting its little bill with a quiet, business-like air, sometimes hanging head downwards to reach a choice blossom; have observed a waxy substance adhering to the ridge of the upper mandible, probably collected from the flowers, and sometimes the head is covered with pollen, giving the bird a strange appearance. It also feeds on fruit, particularly bananas.

The nest is a domed structure, with a round opening at the side, composed generally of fine grasses, but sometimes intermixed with cotton, placed on a small shrub about 18 inches from the ground, or

pendent among the liannes 20 feet high and swinging with the brezee, and also in the razor-grass tufts. They nest all the year round. The eggs are three, and are of a dull white, with spots of purplish brown, generally thicker at the blunt end.

12. **Certhiola saccharina** Lawr. Sucrier; Yellow See-see.

♀ Length, 4 inches; expanse, 7 inches; wing, $2\frac{1}{8}$ inches.

The most brilliant in plumage of our birds (excepting the humming birds), though, strange to say, it is not found in the island of Grenada itself, but in all the islands on the coast northwards. It is abundant at Isle de Rhonde and Carriacou. Habits very similar to that of the black species above described.

The nest and eggs are not to be distinguished from that of *C. atrata*. I once observed a nest on a bracket to the spouting of a house in the town of Hillsboro', Carriacou.

Family TANAGRIDÆ.

13. **Euphonia flavifrons** (Sparrm.). Yellow Bird.

Not numerous; rather shy; frequents the tops of high trees covered with a creeping vine, on the seeds of which it feeds; nesting habits not determined.

14. **Calliste versicolor** Lawr. Sour-sop Bird.

♂ Length, 6 inches; expanse, 9 inches; wing, 3 inches; tail, 2 inches.
♀ Length, 6 inches; expanse, $9\frac{1}{8}$ inches; wing, $3\frac{1}{8}$ inches; tail, 2 inches.

This is a strong, robust bird, rather plentifully distributed all over the island. As its name implies, it is very partial to the fruit of the sour-sop, but feeds also on all kinds of fruit. It is very pugnacious when put in a cage along with other birds. I have seen one peck a hole in the head of a ♂ *L. noctis* within five minutes after being put together in a cage. It frequents the fruit-trees near the houses, and often nests in them. It robs the nests of other birds most unmercifully of materials for building its own.

The nest is generally placed in a forked branch, about 6 to 8 feet from the ground. It is round, with a deep cup-like depression, composed outwardly of flat leaves and fronds and lined with fine hairy roots and tendrils. The eggs are two, of a dull bluish white, plentifully spotted and blotched with brown and drab spots. They measure .90 inch by .62 inch and .90 inch by .64 inch.

[Soon after my description of this species Mr. Sclater considered it not to differ from *Calliste cucullata*, Sw. His decision was accepted as correct, and it has been so noted by several writers.

In a revision of the Family Tanagridæ (Cat. of the Birds of the Brit. Museum, Vol. XI, p. 113) he restores it to specific rank, and remarks:

"At one time Mr. Salvin and I were inclined to believe that this

species was the same as *C. cucullata*, Sw. (cf. Ibis, 1879, p. 357), and that there might have been some error in the statement that Swainson's species came from Venezuela."—G. N. L.]

Family FRINGILLIDÆ.

15. Loxigilla noctis (Linn.). Red-throat See-see.

♂ Length, 5¾ inches; expanse, 8 inches; wing, 2½ inches; tail, 1⅞ inches.

♀ Length, 5 inches; expanse, 8 inches; wing, 12⅞ inches; tail, 1¾ inches.

Almost as familiar as the wren are this black fellow and his brown mate; plentifully distributed all over the island; feeds on fruit of all kinds; roosts in large numbers in the mango trees, also in churches and other large buildings. The Holy Innocents' Chapel is a favorite resort of these birds, where they nest in the ridge. A nest I procured from Saint Cyr House was built on the ledge above a window; very like a wren's in shape; no attempt at a dome. When they build in trees the nest is rather a large domed structure, with a round opening at the side, composed of fine dried leaves and stems, the bottom compactly formed and lined with soft grass. The eggs, three in number, are of a dirty white, speckled all over with reddish brown; sometimes the spots are confluent at the blunt ends. They measure .80 inch by .60 inch, one clutch; another measures .82 inch by .56 inch.

16. Spermophila gutturalis (Licht.). White-beak See-see.

♂ Length, 4½ inches; expanse, 7 inches; wing, 2 inches.

When the Guinea-grass fields are in seed numbers of these birds may be found feeding there morning and evening, flitting from one flower-stem to the other, which, bending down with their weight nearly to the ground, enables them to reach the bunch of seed at the end, which they soon pick clean. They are very shy, especially during the nesting period, and I have been baffled in identifying their nest. They build in the clumps of grass.

[This species is new to the West Indies. Examples from Panama and Bahia are rather larger, but there is no perceptible difference in plumage.—G. N. L.]

17. Euethia bicolor (Linn.). See-see Zerbe; Black-face Seed-eater.

♀ Length, 4½ inches; expanse, 6½ inches; wing, 2¼ inches.

♂ Length, 4¼ inches; expanse, 6⅝ inches; wing, 2⅛ inches.

This is an exceedingly common species; is found everywhere except in the mountains; feeds almost exclusively on the seeds of grasses. In the Guinea-grass field small flocks of six to ten may often be seen. They perch on the flower-stem, which bends down with their weight and enables them to pick off the seeds. When flying from one tuft of grass

to another they utter a note resembling "tsip, tsip." They build a domed nest, generally composed of fine roots and lined with soft dry grass (rather a bulky structure for such a small bird), placed in a small shrub or among the roots on a bank overhanging the road. The eggs are three and occasionally four in number, of a dull white, with several reddish-brown spots, confluent at the blunt end. They measure .59 inch by .48 inch.

18. **Volatinia jacarina** (Linn.). Blue-black Grass See-see.

♂ Length, 4½ inches; expanse, 6½ inches; wing, 2 inches.

Rather shy; frequents pastures and Guinea-grass fields, on the seeds of which it feeds, running along under the grass and picking up the fallen seeds. Is fond of perching on a small dry shrub and springing into the air several times, uttering a prolonged "chur-r," always alighting on the same spot again. Found a nest in April at Hope Estate, in a pasture near the sea. The nest was placed in a tuft of grass about 6 inches off the ground, in shape like the bottom of a teacup, composed entirely of very fine dried roots, with no lining, 3 inches in diameter at top and 1 inch deep. The eggs are two, of a dirty white, with thick brown spots at the large end and scattered spots of the same color over the rest of the egg. They measure .68 inch by .50 inch and .66 inch by .48 inch. The female is brown.

[This species is new to the Lesser Antilles, but is found in Tobago.—G. N. L.]

Family ICTERIDÆ.

19. **Quiscalus luminosus**, Lawr. Blackbird. Merle.

♂ Length, 10 inches; expanse, 14½ inches; wing, 4¾ inches.

♀ Length, 9¼ inches; expanse, 13 inches; wing 4¼ inches.

The *bête noir* of the Indian-corn grower and the friend of the stock-keeper, this bird is well known all over the island, gregarious, noisy, and quarrelsome, committing havoc among the young corn and exulting over the feast with its cry of "*green-corn-sweet;*" frequents cattle-pens and pastures, where they do excellent service in picking off the ticks and other vermin which infest the cattle; a common sight in the pastures are these birds walking about the backs of the cattle and clinging on to the tail in search of ticks; the animals seem to enjoy this, and will not even swish their tails for fear of disturbing their feathered friends; they feed also on earthworms and insects; have observed them eat fresh meat; fond of water; during the heat of the day they resort to the small streams for a bath, and then stretch their wings out to dry; they generally select a Mango tree for a roosting place, and the noise made by them when settling down for the night is almost deafening; they are heard occasionally during the night, and in the early morning the noise commences again, before they depart on their foraging expeditions.

They breed in colonies, several nests on the same tree, the Mango being a favorite for the purpose; sometimes they select the flower stems of the Palmiste, and on the little islands they build on the cactus clumps; the nest is rather a rude cup formed of dry roots and straws well plastered with cow-dung, in which they lay their eggs, measuring 1.02 inches by .76 inch, 1 inch by .72 inch, 1.10 inches by .74 inch; of a pale greenish-blue, with beautiful lines, blotches, and spots of purple, drab and dark brown.

20. **Dolichonyx oryzivorus** (Linn.). Bobolink; Reed Bird.

♂ Length, 7½ inches; expanse, 12 inches; wing, 3¾ inches.

This bird was shot on the eastern side of the island; it is quite new to me; it is one of five seen; they had evidently but just arrived and were feeding on grass-seeds; two of them were shot. No doubt it will prove to be a well-known species, but it is quite new to Grenada. [This species has not been observed before in the Lesser Antilles.—G. N. L.]

Family TYRANNIDÆ.

21. **Elainea martinica** (Linn.). Top-knot Pippiree.

♂ Length, 6¾ inches; expanse, 10½ inches; wing, 3¼ inches.

This active little bird is very familiar, frequenting the vicinity of houses and the hedges and borders of the woods; it is very quick in all its motions, darting from branch to branch or at some flying insect with astonishing rapidity; it is very pugnacious; with crest erect and eyes flashing, it will pounce like a fury on a bird twice its size and inflict several thrusts with its sharp little bill. On calm still evenings several of these birds may be observed in company with others of the same family, springing a few feet into the air and returning to their perches after capturing the winged ants or other insects on which they feed. The voice of this little bird is the first to be heard in the early morning from 4.30 to 7 a. m., and has been compared to these words: "*Ladies, ladies, ladies, you're lazy.*" During the rest of the day this note is seldom heard, but occasionally it utters a single prolonged note, and when joined by its mate it gives out a series of joyful twitterings which would be difficult to render in words. The nest of this bird is truly a beautiful structure, recalling the lines–

> "Mark it well within, without!
> No tool had he that wrought, no knife to cut,
> No nail to fix, no bodkin to insert,
> No glue to join; his little beak was all;
> And yet how neatly finished!"

It is generally placed in the fork of a small branch, and sometimes "saddled" on a large limb; the hog-plum tree (*spondias*) is often selected; in shape the nest is like a round shallow cup, measuring about 3 inches in diameter and 1 inch deep; it is composed outwardly of skel-

eton leaves and fine hairy substance, interwoven with cobwebs and cotton, or the soft down from the corkwood tree, and lined with very fine tendrils and feathers; the eggs are two in number and vary much in shape and markings; the general color is a very pale buff, with a scarcely perceptible pink tinge when fresh; round the blunt end is a circle of spots of brown, purple, and reddish-brown, with occasional scattered spots on the body of the egg; they measure .80 inch by .64 inch; in a few instances the spots may be found more or less confluent at the sharp end.

22. **Myiarchus oberi** (Lawr.). Pippiree gros-tête.

♀ Length, 9 inches; expanse, 12⅛ inches; wing, 4 inches; tail, 3½ inches.

This is rather a foolish bird, not abundant, found in the mountains and also in the vicinity of dwellings, estates, buildings, &c.; feeds on winged insects; is fond of remaining for several minutes perched on a dry shrub or twig and uttering at intervals its call-note. "*pleet, pleet.*" Mr. Ober says this bird is called the "Sunset-bird" in Dominica, as it utters at sunset a note resembling "soleil-coucher"; I have studied this bird particularly, and never heard a note from it that could be rendered thus.

The nest is generally placed in a hole in a tree or in the end of a bamboo fence; one which I procured on the 15th April, 1882 (from a bamboo-joint, part of a cattle pen at Balthazar estate), was composed of cocoanut fiber, human hair, the skin of a snake, horse hair, and bits of old rag; another from a hole in a Cashew tree was composed of stuffing from an old saddle, and lined with horse hair.

The eggs are three and sometimes four in number, of a light buff color, thickly scribbled and blotched with purplish-brown; they measure .96 inch by .70 inch, .88 inch by .72 inch, and .90 inch by .72 inch.

23. [**Blacicus flaviventris** Lawrence. "Flycatcher? Sp.?"

Upper plumage dark hair-brown, deeper in color on the crown; tail colored like the back; quills brownish-black; wing-coverts dark brown, edged with clear pale rufous; throat of a dull pale fulvous; breast and abdomen pale yellow, intermixed with dusky; upper mandible black, the under clear light yellow; feet black.

In size about the same as *B. brunneicapillus;* wing, 2.50 inches; tail, 2.50; tarsus, .50; bill, .50.

"Shot at Hampden, St. Andrews, Grenada, 16th March, 1880."

Type in National Museum, Washington.

Remarks: The only species necessary to compare it with is *B. brunneicapillus* from Dominica; it differs from that, in having the abdomen yellow instead of reddish fulvous and the tail not tipped with fulvous; the under mandible is entirely yellow, not whitish with the end dusky as in *brunneicapillus.*

The specimen is in poor condition and I think is a young bird, but probably the adult would not differ materially in plumage.

Mr. Wells has as yet secured only this specimen; he writes about it as follows:

"I send you a very mutilated skin of a small bird which was shot in a cocoa field at St. Andrews; the ants got at the skin and nearly destroyed it. I hope, however, that you will be able to identify it. I once saw one of these birds on a tree overhanging the Grand Etang road, and this is the second I have seen."—G. N. L.]

24. **Tyrannus rostratus** (Scl.). "Pippiree."

♂ Length, 9¾ inches; expanse, 15 inches; wing, 4¾ inches.

♀ Length, 9¾ inches; expanse, 14 inches; wing, 4¾ inches.

On the terminal apex of the palmiste tree, or on some dry or leafless branch of the hog-plum, this bold and dashing bird may often be seen, on the lookout for a passing insect, or some hapless hawk or gaulin, which latter it seems to delight in tormenting, inflicting quick and sharp strokes with its powerful beak, and uttering after each stroke its shrill cry "*pip-pi-ree*," as if in exultation and triumph, whilst its victim flounders about in its endeavors to escape, with loud cries of pain. The hawk, when attacked, shows an inclination first to battle with his foe, by endeavoring to get above it, but the pippiree is too "wide-awake" for this, and soon compels him to dash down towards the ground or into some tree with thick foliage. The food of this bird is exclusively flies and other winged insects, which it takes by darting at them in the air, turning and twisting about with marvellous ease, while the snapping of its strong bill is heard as it closes over its prey; it also frequents ponds and streams, and may be observed skimming over the surface in the capture of the insects which usually abound in such places. The courage of this bird in defense of its nest is proverbial; both male and female will dart at any one climbing the tree on which the nest is built, and peck him about the face and hands. I have seen a pair of these birds attack a dog which happened to pass under their nesting tree and make it howl with pain; pigs also seem to be obnoxious to them when they approach the vicinity of their nests

The hog-plum tree (*Spondias*) is a favorite resort of this bird for nesting: it builds also in the bread-fruit and in the fronds of the palmiste. The nest is rather loosely formed of dry tendrils, and occasionally the midribs of ferns and leaves; there is no soft lining for the eggs, though the shallow cup in the center is usually of finer materials than the foundation of the nest; the eggs are three, of a reddish-buff, handsomely marked with spots and blotches of red-brown and dark gray, the spots more or less confluent at the blunt end; the eggs measure 1.15 by .75 inch, 1.10 by .75 inch.

25. **Tyrannus melancholicus** Vieill.

Length, 8¾ inches; expanse, 12¼ inches; wing, 4½ inches.

I send you by book-post a bird which I shot a few days ago. I have

only once before seen one of the kind, and this one I saw in the same locality twice before I had the opportunity to secure him, which I succeeded in doing by borrowing a gun which had a charge of shot big enough to kill a goat. The bird may prove to be Tyrannus melancholicus.

26. Milvulus tyrannus (Linn.). "Fork-tail Flycatcher."

♂ Length, 14¼ inches; expanse, 13 inches; wing, 4½ inches; tail, 9½ inches.

♀ Length, 9 inches; expanse, 13⅜ inches; wing, 4¼ inches; tail, 2½ inches.

This bird is a migrant, and arrives with us about the end of August, and wings its way to Central America and thereabouts about the middle of February. It frequents the open pastures near the sea-shore, and preys on the winged insects which swarm about the swamps and rain-pools. It may often be seen perched on a dry shrub or twig, from which it darts among the flocks of plovers or sandpipers which may happen to pass within its sight, causing them to utter loud notes of pain from the attacks of its strong and sharp bill. When darting on its prey or inflicting punishment on some unoffending bird, the long tail feathers are opened and shut like a pair of shears. Like most of the Flycatcher family there is on the head of this bird a beautiful crest of bright crimson and yellow feathers, which is concealed, except when the bird is excited or in chase of its prey. This bird does not nest on the island.

[This has not been recorded before from the Lesser Antilles, which is surprising, as it is so conspicuous a bird and seems not to be rare in Grenada.—G. N. L.]

Family TROCHILIDÆ.

27. Glaucis hirsutus (Gm.). Brown Humming Bird; Doctor Bird.

♀ Length, 5¼ inches; expanse, 6½ inches; wing, 2¾ inches.

Numerous in the mountains and in the cocoa fields; feeds chiefly on insects, which it takes on the wing as well as from blossoms. Nest usually found hanging to a strip from the under side of a ballisier leaf. It is loosely formed of fine crisp tendrils, twined round the strip of leaf, forming a cup at top, with a long pendant of pieces of bark, &c. The eggs are two, pure white, and measure .60 by .34 inch.

28. Eulampis holosericeus (Linn.). Green Humming Bird.

♂ Length, 4⅞ inches; expanse, 5¾ inches; wing, 2⅜ inches.

♀ Length, 4¾ inches; expanse, 6⅛ inches; wing, 2⅝ inches.

Not abundant; rather shy. Frequents the vicinity of dwellings, fruit trees, &c. Nest usually saddled on a large limb, beautifully formed of fine substances, coated with moss and spiders' webs. Eggs two, white.

29. **Orthorhynchus cristatus** (Linn.). Crested Humming Bird; Coulibri.

Found everywhere; common. Frequents also the little islets; very pugnacious; beats the chicken hawk. Nests on low branches; very fond of the drooping branches of the nutmeg tree. Nest usually formed of the soft fur from the cork-wood tree and other fine substances. Lays two diminutive white eggs. Found a nest once on a sea-side grape at Soubise Island.

Family CYPSELIDÆ.

30. **Chætura cinereiventris** Sel. Mountain Swallow.

♂ length, 4⅜ inches: expanse, 10 inches; wing, 4⅜ inches.

♀ length, 4½ inches; expanse, 10¼ inches; wing, 4¼ inches.

Though more numerous in the mountains, this Swift is found everywhere, especially after a shower of rain. On the Grand Etang road they are plentiful; skimming along close to the ground, they will just rise and pass over the head of a traveler or dash on one side and return to the road again to feast on the insects disturbed by the tramp of the horse. They breed among the inaccessible cliffs in the mountains.

[This Swift has not been noted before from the Lesser Antilles, though it was observed by Mr. Ober in Grenada, but not identified. —G. N. L.]

31. **Hemiprocne zonaris** (Shaw). Collared Swift.

On the 13th July, 1882, I was traveling through Tuilleries estate, and observed a large flock of birds hovering over a rocky hill; I got close up to them, and found them to be large Swifts, with a white collar round the neck. I went back about a mile and borrowed a gun, but just as I got to the hill again a hawk swooped down on the flock and dispersed them. I am told that they frequent that particular hill every year. I saw several of them on the 9th August about Grenville one afternoon after a heavy shower of rain. I have no doubt that they are identical with the "Ringed gowrie" described in Gosse's Birds of Jamaica.

Family ALCEDINIDÆ.

32. **Ceryle alcyon** (Linn.). Belted Kingfisher.

♂ Length, 13 inches; expanse, 20¼ inches; wing, 6½ inches.

Migrant; arrives September; a few stragglers remain all the year; exceedingly shy; frequents the mouths of rivers; sometimes follows the streams for three or four miles inland; does not nest on the island.

Family CUCULIDÆ.

33. **Coccyzus minor** (Gm.). Cuckoo manioc.

♂ Length, 13⅛ inches; expanse, 16¼ inches; wing, 5¾ inches.

Not numerous; seldom more than one seen at a time; frequents hills and valleys; feeds on crickets and other insects; breeds in May; nest very difficult to find; eggs pale sea-green.

34. **Crotophaga ani** Linn. Corbeau.

♂ Length, 15 inches; expanse, 16¾ inches; wing, 6 inches.

Abundant everywhere; gregarious; feeds on crickets and other insects; cleans the ticks off cattle; and is very destructive to the fields of Indian corn. The nesting habits of this bird are peculiar. The number of eggs laid by each bird cannot be ascertained, as several of them lay in the same nest. The eggs when first laid are of a uniform sea-green, but after a day or two they become coated with a white chalky substance, and this, in turn, becomes scratched by the feet of the birds, giving the eggs a strange appearance. The nest is first rather flat, in which six or seven eggs are laid; then another nest is built over them, and about the same number of eggs deposited; this is also built over, and more eggs laid. I once found a nest in an orange tree which had four layers of eggs. How the hatching is effected I have not ascertained. I have seen three of the birds sitting together on the nest while several others were perched close to it. They often cover the eggs with dry leaves. I believe that after the top layer of eggs is hatched and the young reared the nest is scratched away down to the second layer, which is then hatched, as I have often found fragments of the nest and egg-shells under a tree which I had been watching for some time, and noticed the nest reduced in size. The eggs measure 1.28 inches by 1.04 inches and 1.32 inches by 1.02 inches.

Family STRIGIDÆ.

35. **Strix flammea**, var. **nigrescens**, Lawr. Owl. Chawan.

♂ Length, 11¾ inches; expanse, 32 inches; wing, 9¾ inches.

Owing to its nocturnal habits, this bird is more often heard than seen, though it is well distributed about the island. It frequents ruined buildings, decayed "groo-groo" and other trees, and the dark valleys in the mountains. The R. C. church in Grenville was a favorite haunt of this owl. During a midnight service there I have observed several of them flying in and out, engaged in feeding their young, which were on the walls, and making a loud hissing noise all the while. The owl has been regarded with superstitious awe in many countries, and here it is not exempt from the same, as there are many who still believe that the screech of this bird heard near to a dwelling bodes evil or death to one of the inmates; certainly its cry heard "at dead of night" has rather a weird and "uncanny" sound, but it is quite as natural and harmless as the familiar warble of the house-wren. The food of the owl consists of small lizards, mice, and bats; also, some kinds of fruit, particularly that of the almond tree. It is a great robber of the pigeon cot, taking the young from the nest.

The eggs of the owl are two, nearly spherical in form, and of a dull white color.

Family FALCONIDÆ.

36. Falco columbarius Linn. Pigeon Hawk.

♂ Length, 12 inches; expanse, 24¼ inches; wing, 8 inches.

Migrant; a few arrive with the *Limicolæ* in August and September, and frequent the pastures near the sea-coast. They prey on the small sandpipers, &c.

[This hawk has not been observed before in the Lesser Antilles.—G. N. L.]

37. Tinnunculus sparverius caribbæarum (Gm.). Sparrow Hawk.

Resident; rare and rather shy; occasionally seen darting across a pasture or into a flock of birds; have not been able to procure the nest.

38. Pandion haliætus carolinensis (Gm.). Osprey. Fish Hawk.

♀ Length, 23 inches; expanse, 67½ inches; wing, 20 inches; tail, 9 inches.

This large and powerful bird is a non-resident, though a straggler or two may be observed all the year round. It generally arrives about the month of August, and frequents the bays along the eastern coast of the island. It sometimes follows the streams for three or four miles inland. The specimen from which the above measurements were taken was shot on the Great River, near to the Balthazar Bridge. It had a most unpleasant odor, and was infested with vermin of three kinds. A remarkable coincidence was, that, whilst I was dissecting this bird, a second (probably its mate) flew past, within twenty feet of the window at which I sat. The talons of this bird are remarkably well adapted for holding its slippery prey. I once observed a fish-hawk swoop down into the *boucherie* at Telescope and rise again slowly with a fish in its talons. I ran, endeavoring to get a shot at it, when it took fright, and, dropping its prey on the sands, was soon out of range. The fish I picked up, and found it to be a "*Grand-ecaille*," which weighed nearly four pounds. This bird does not nest on the island.

39. Buteo latissimus (Wils.). Chicken Hawk. Gree-gree.

♂ Length, 16 inches; expanse, 34½ inches; wing, 11 inches.

♀ Length, 15 inches; expanse, 34½ inches; wing, 10¼ inches.

Numerous; feeds on lizards, rats, snakes, young birds, &c., and occasionally makes a raid on the poultry yard; breeds on the fronds of the palmiste, and on large trees like the silk-cotton (*Ceiba*); nest a large bulky structure of dry sticks; eggs two, buff color, spotted and blotched with reddish-brown.

40. Regerhinus uncinatus (Temm.). Merlion. Mountain Hawk.

No. A.—Blue Hawk. ♂. Sp. ?. Morne Rouge, 26 March, 1885. 16 16 inches by 31½ by 10 inches.

No. B.—Hawk. ♀. Sp. ?. Morne Rouge, 26 March 1885. 16½ inches by 34 inches by 10½ inches.

I was pleased to learn that the Hawk had come to hand, and that it was new to the Antilles. It is a resident, though not numerous, and seems to prefer the vicinity of the sea-coast. I saw a nest about half a mile from the sea; it was built in an inaccessible tree, so that I could not procure the eggs, but the birds I identified clearly. This was about the middle of March.

[This hawk is an interesting addition to the fauna of the Lesser Antilles; the two specimens sent by Mr. Wells differ in plumage from any others I have met with. It seems to be a species of most variable plumage. I have two specimens of it; one is from Brazil, the upper plumage of which is of very dark-brown color; the under plumage is white, connecting with which is a band of white on the hind neck; the tail is marked with alternate bars of black and plumbeous-gray, and terminates with white. The other from Gautemala is entirely of a deep slate-black, with a broad white band across the middle of the tail.

In the American Museum of Natural History are six specimens of it, differing very much in plumage from each other.

The Grenada birds are entirely unlike my specimens, or any single specimen in the American Museum. The male has its upper plumage of a dark plumbeous-slate color, there is a band of bright light rufous around the hind-neck, bordered below with deep rich brown; the upper tail coverts have light plumbeous margins; the tail feathers are black, crossed with two bands of plumbeous-gray, and are white at their bases; the quills are brownish-ash barred with black; the under plumage is dull white, closely crossed with bars of bright brownish-rufous; under tail coverts pale rufous, marked with narrow bars of darker rufous; the upper mandible is black, the under plumbeous, with the end whitish; tarsi and toes yellow, claws black.

The female differs in having the upper plumage dark brown, the feathers of which are conspicuously margined with deep bright rufous; the wings are deep rufous barred with black; the under plumage is very similar to that of the male, but the rufous bars are lighter and brighter in color.

Of the American Museum specimens only one is crossed underneath with rufous bars like the Grenada examples, but its upper plumage is quite different. Taking the under plumage of this specimen and the upper plumage of another, a similar stage of plumage to that of the male Grenada bird is made out; this last one, with the plumbeous upper plumage, is underneath of a light bluish-ash, barred with white, and has no nuchal collar, and no rufous color whatever in its plumage

In the specimens I have had under examination, there are at least six very distinct stages of plumage.—G. N. L.]

Family COLUMBIDÆ.

41. Columba corensis Gm. Ramier.

♂ Length, 16 inches; expanse, 26½ inches; wing, 8¾ inches.

This beautiful pigeon is our finest game bird. Its flesh is considered a great delicacy, and it is almost the only bird that is shot and brought into the market for sale. It is strictly arboreal, and frequents the highest mountain ridges. About the month of April it resorts to the vicinity of the sea-coast, and then to the islets, on which it nests. The nest is often placed in a tuft of grass, and also on the outspreading branches of the mangrove and sea-side grape; it is usually composed of a few dry sticks, hollowed in the middle by the weight of the bird; the eggs are two, pure white, and of the size of those of the domestic pigeon, though somewhat more spherical in shape.

42. Zenaida martinicana Bp. Tourterello. Seaside Dove.

♂ Length, 11¾ inches; expanse, 18 inches; wing, 6¼ inches.

Very numerous all round the island, though seldom found higher than two miles from the sea; frequents the mangrove trees, open pastures, the cliffs overhanging the sea, and the little islets; feed on fallen berries and seeds, pigeon peas, &c.; makes its nest generally in a tuft of grass, sometimes on the bare ground, and on ledges along the cliffs; the eggs are two, pure white in color.

43. Zenaida rubripes Lawr. Trinidad Ground Dove.

It is with great pleasure that I now forward to you by book-post (registered) a skin of the Dove known locally as the "Trinidad Ground Dove." This bird was shot on the eastern side of the island and sent to me by a brother of mine who knew I was anxious to procure a specimen of it. It is not a common bird. I have shot three or four of them on a small island off the south coast called "Glover's Island," where I believe they resort to during the nesting period, and I have also shot one in Carriacou, but have never until this instance seen one taken on the island proper. The present specimen is a ♀, and I would have been very glad to get a ♂ also, as (writing from memory) I believe the ♂ to have a gray head. However, I shall use every endeavor to procure one. I trust the skin will reach you safely and that you may be able to identify it. The bird was much injured by shot and decomposed when it reached me, hence the skin is not a very good one.

[For the description of this species, see The Auk, vol. II, page 357.—G. N. L.]

44. Engyptila wellsi Lawr. (Auk, vol. I, p. 180). Pea Dove.

Dove sp ?

A beautiful dove, new to me, about the size of *Z. martinicana;* frequents a place called Fontenoy, on the western side of the island.

Since I last wrote you I have been able to procure four live specimens of the Dove called "Pea Dove" on my list. One of these died a day or two ago, and I send you the skin per book-post, which I trust will reach you and serve to identify the bird. The skin is a poor one, as the bird had injured itself considerably by fluttering in the cage, and the person who caught it had clipt off the ends of the wing feathers to prevent its flying away. However, I thought that it might still serve the purpose of identification, so I send it per post.

[This species is described in The Auk, vol. I, p. 180.—G. N. L.]

[Since my description of this species, the type of which is a female, Mr. Wells has obtained and sent me a fine adult specimen of the male, "shot at Glover's Island, a mile from the south end, May 25, 1886."

Mr. Wells was correct when he wrote: "I believe the male to have a gray head."

It differs from the female in the front being vinous, in having the crown of a bluish-gray color, which color extends on the hind neck, but there it is of a duller shade. The lower part of the back, rump, and upper tail coverts are of a rather darker and duller bluish gray than the crown. The color of the breast, abdomen, and under tail coverts, in this specimen, are of a much paler cinnamon, and the quills are darker than those of the female, being blackish brown. In all other respects they are alike.

The feet are dark carmine, much brighter than in the female as shown at present, the color in that having faded.—G. N. L.]

45. Columbigallina passerina (Linn). Ground Dove; Ortolan.

♂ Length, 6½ inches, expanse, 10½ inches; wing, 3½ inches.

Common. Found along the roadside, in the pastures, and along the sea-shore; nests on the bare ground, or on a short stump or tuft of grass; a rude nest formed of dried stalks and grass, in which it lays two pure white eggs measuring .85 inch by .60 inch.

46. Geotrygon montana (Linn). Perdrix; Mountain Dove.

♂ Length, 9¾ inches; expanse, 17¾ inches; wing, 6 inches; tail, 3 inches.

♀ Length, 9½ inches; expanse, 17 inches; wing, 6 inches; tail, 2¾ inches.

Traveling along our mountain roads in the early morning, the plaintive moan of this beautiful dove is often heard; and among the cocoa fields and nutmeg groves one or two brace may be flushed morning and evening. It is essentially a ground pigeon, and seeks its food by scratching amongst the fallen leaves for small seeds, gravel, &c. It is very partial to seeds of the "Christmas bush" tree, or wild pimento. The beautiful bright chestnut of the male makes it conspicuous in contrast with the sober olive-brown of the female; hence the former more often falls a victim to the gun. They are easily caught alive in springs

set amongst their haunts, but are difficult to keep in captivity except when taken young from the nest. I have kept several which were taken full grown, and after being in the cage for more than a year they would continue to flutter and batter their heads on the approach of any one. The nest (which is generally placed on a stump or fallen tree, about 3 to 4 feet from the ground, and sometimes in a tuft of "razor-grass") is merely a platform of dry leaves and a few sticks on which a slight depression is made by the bird sitting on it (both male and female take part alternately in the process of incubation) In this it lays two buff-colored eggs, immaculate, and it is remarkable that one of the eggs in each nest is invariably much darker than the other. They measure 1.04 inches by .84 inch and 1.06 inches by .80 inch.

Family ARDEIDÆ.

47. Ardea herodias Linn. Large Crabier.

♂ Length, 61½ inches; expanse, 71 inches; wing, 19½ inches.

Migrant; not numerous; frequents swamps, mouths of rivers, and occasionally follows the streams up to the mountains.

48. Ardea candidissima Gm. White Gaulin.

Though a specimen of this bird was obtained here by Mr. Ober, I have not been able to discover one. White gaulins are seen everywhere, but they are the young of *F. cœrulea*. There is no record of a *White Gaulin's nest* ever having been found.

49. Ardea cœrulea Linn. Blue Gaulin.

♀ Length, 21 inches; expanse, 36 inches; wing, 10 inches.

♂ Length, 21¼ inches; expanse, 35¼ inches; wing, 10 inches.

A very common bird; may be found wherever there is water. They breed on the small islands, several nests on the same tree. The nest is but a flat platform of dry sticks. The eggs can be seen through the nest. They lay two eggs, and often three or four, of a beautiful bluish green, measuring 1.66 by 1.32, 1.68 by 1.30. The young are pure white, and grow to their full size before the change of feathers takes place. Then they may be observed in all stages, from a few specks of blue to a few specks of white, until the pure blue of the adult is reached.

50. Ardea virescens Linn. Kyallie.

A very common bird on our streams and along the sea-shore; feed on small crabs and fish; breed among the mangroves and trees overhanging the water. Found a nest in an orange tree at Balthazar, near to the dwelling-house which is not far from the great river. The nest is but a few dry sticks laid across each other. The eggs are two and occasionally three, of a uniform bluish green. They measure 1.42 inches by 1.10 inches and 1.32 inches by 1.02 inches.

51. Nyctiorax violaceus (Linn.). Crabier. Night Heron.

♀ Length, 22½ inches; expanse, 37½ inches; wing, 12 inches.

Found in the mangrove swamps and about the mouths of rivers. Is rather shy, seeking its food after dusk along the sea-shore, where it preys on the sand-crabs and small fry. Travelers along the road from Pearls to Conference beach at night are often startled by the loud "*quok*" of these birds as they rise from the ground. They sometimes build in the mangroves, but generally resort to the rocky islets during the nesting period, in April and May. Hope Island and Labaye Rock are favorite breeding places. There they build in the prickly-pear bushes a large platform of dry sticks, on which is laid three eggs (sometimes two) of a uniform bluish green, measuring 2.10 inches by 1.48 inches; 2.12 inches by 1.50 inches, and 2.16 inches by 1.48 inches.

Family PLATALEIDÆ.

52. Ajaja rosea (Linn.). Roseate Spoonbill.

[Mr. Wells remarks of this species: "Never seen or heard of by me." Mr. Ober gives it in his catalogue of the Birds of Grenada; he did not observe it, but says: "A very rare migrant, said to have been seen here."

I have thought best to include it, as it is the only species enumerated by Mr. Ober, not obtained by Mr. Wells.—G. N. L.]

Family CHARADRIIDÆ.

53. Charadrius dominicus Müll. American Golden Plover.

♀ Length, 10 inches; expanse, 23 inches; wing, 7½ inches.

Migrant; arrive in large flocks early in September; frequent the open pastures; afford fine sport until November.

54. Charadrius squatarola (Linn.). Grey Plover.

♀ Length, 11½ inches; expanse, 23½ inches; wing, 7¼ inches.

Migrant; arrives in September and October; not numerous; rather shy.

55. Ægialitis semipalmata Bonap. Ring-neck Plover.

♀ Length, 7½ inches; expanse, 14¾ inches; wing, 5 inches.

Migrant; arrives in August and September; frequents the sand-beach; abundant.

56. Oxyechus vociferus (Linn.). Killdeer.

♂ Rare migrant; 9¾ inches by 20 inches by 6⅜ inches.

Family STREPSILIDÆ.

57. Strepsilas interpres (Linn.). Turnstone.

♀ Length, 9 inches; expanse, 18¾ inches; wing, 6 inches.

Several arrive along with the plovers; frequents the sea-shore and mouths of streams; often found among the drift-wood and débris cast up by the sea.

Family SCOLOPACIDÆ.

58. Gallinago delicata (Ord). Wilson's Snipe.

♂ Length, 11 inches; expanse, 17½ inches; wing, 5¼ inches; tail, 2 inches; bill, 2⅝ inches.

Migrant; a few arrive in September; frequents the swampy flats near the sea.

59. Micropalama himantopus (Bonap.). Stilt Sandpiper.

♂ Length, 9 inches; expanse, 16 inches; wing, 5¼ inches.

Not abundant; frequents the edges of pools and streams; migrant.

60. Actodromas maculata (Vieill.). Grass bird. Pectoral Sandpiper.

♀ Length, 9½ inches; expanse, 18 inches; wing, 5¾ inches.

Large flocks arrive in September and October; frequent the open pasture; become very fat; good shooting.

61. Ereunetes pusillus (Linn.). Small Sandpiper.

♂ Length, 6 inches; expanse, 11½ inches; wing, 3¾ inches.

Arrive in great numbers in August and September; frequent the sea-shore and swamp edges.

62. Limosa fedoa (Linn.). Marbled Godwit.

♂ Length, 17 inches; expanse, 29¼ inches; wing, 9 inches.

A few arrive with the first flight of yellow-legs, &c.

63. Symphemia semipalmata (Gmel.). Willet.

64. Actitis macularia (Linn.). Spotted Sandpiper.

♀ Length, 7¼ inches; expanse, 12¾ inches; wing, 3⅞ inches.

Large numbers arrive in August and September. Several stragglers remain all the year round, frequent the sea-shore, and follow the streams for four or five miles inland.

65. Bartramia longicauda (Bechst.). Cotton-tree Plover.

♂ Length, 11¾ inches; expanse, 22½ inches; wing, 6⅞ inches.

♀ Length, 11⅝ inches; expanse, 19⅞ inches; wing, 6¾ inches.

Not numerous. Arrives in September; frequents the hilly pastures, with tufts of grass, &c.; very wary; affords excellent shooting.

[This is an addition to the fauna of the Lesser Antilles.—G. N. L.]

66. Totanus flavipes (Gmel.). Small Yellow-legs.

♀ Length, 10¼ inches; expanse, 19¼ inches; wing, 6 inches.

Large numbers begin to arrive early in August; frequent the edges of swamps and rain-pools.

67. Totanus melanoleucus (Gmel.). Large Yellow-legs. Piker.

♀ Length, 13½ inches; expanse, 22 inches; wing, 7¾ inches.

Arrive a little later than the preceding; frequent marshy lowlands; fine shooting.

68. Numenius hudsonicus (Lath.). Large Curlew.

A rare migrant.

69. Numenius borealis (Forst.). Curlew.

Several along with the plovers.

[Not before noted from the Lesser Antilles.—G. N. L.]

Family RALLIDÆ.

70. Porzana carolina (Linn.). Sora Rail.

♀ Length, $8\frac{5}{8}$ inches; expanse, $12\frac{7}{8}$ inches; wing, $4\frac{1}{4}$ inches.

A familiar object about the swamps is this lively little bird, where it may be observed running along on the leaves of the water lilies and flicking up its short tail all the while. Found it numerous at Isle de Rhonde in January. On the 25th February, 1883, one was caught alive at Mount Parnassus, in a trap set for ground doves and baited with Indian corn. I have not yet procured its eggs or observed its nest.

71. Ionornis martinica (Linn.). Kascamiol; Purple Gallinule.

This bird is rather abundant on the little islands between this and Carriacou, where it is often taken alive in "fish pots" baited with corn. On one island (Mabouya) the people who cultivate it destroy numbers of the eggs of this bird every year, as they state that the bird destroys their growing crops of Indian corn. I have kept a pair of live ones for more than two years. A pair has just been taken away to England by a gentleman who intends to present them to the Zoological Society there.

72. Gallinula galeata (Licht.). Red-head Water Fowl.

♀ Length, $14\frac{1}{2}$ inches; expanse, 23 inches; wing, $6\frac{3}{4}$ inches.

Abundant; frequents all the swamps; occasionally found on the streams inland; numerous at Lake Antoine and at Isle de Rhonde, though I have not observed it at the Grand Etang; builds a large flat nest among the rushes, the bottom of the nest generally resting on the water; found nest with four eggs at Telescope Swamp.

73. Fulica americana, Gm. Coot. Poule d'Eau.

♀ Length, $16\frac{1}{2}$ inches; expanse, 26 inches; wing, $7\frac{3}{4}$ inches.

Found on the Grand Etang or mountain lake, Lake Antoine, and all the large swamps; also numerous at the fresh-water pond at Isle de Rhonde; they afford fine shooting, though difficult to retrieve if wounded, as they dive and swim under water very fast. They may often be seen swimming with a large brood of young, which all dive on the least alarm and rise again at a considerable distance; they will continue to dive and rise until the rushes at the side are gained, when they secrete themselves. Occasionally the adult birds will fly along the surface of the water, the end of the wings touching the water and leaving a clear "wake" behind them. They nest on the borders of the swamps, &c.

Family ANATIDÆ.

74. Anas discors Linn. Blue-wing Teal.

Large numbers arrive in our ponds and swamps early in October. On January 3, 1883, found numbers of them at Isle de Rhonde found nesting; got several eggs; they were incubated; large embryo in them.

75. Anas boschas Linn. Mallard.

This duck visits us in October and affords fine shooting.

[Not before noted from the Lesser Antilles.—G. N. L.]

76. Black Duck, sp.?

A small duck, quite black, occasionally found in the sea. I shot one a couple of years ago.

[No example of this duck has been sent, therefore it remains unidentified for the present.—G. N. L.]

77. Erismatura rubida (Wils.). Ruddy Duck.

[This species has not been observed before in the Lesser Antilles.—G. N. L.]

Family FREGATIDÆ.

78. Fregata aquila (Linn.). Man-o-war Bird. Fregâte.

♂ Length, 39½ inches; expanse, 82 inches; wing, 25¼ inches.

Numerous; breed on the rocky islets; found nests with young in May at "Kick-em-Jenny," a peaked rock off the north end of the island. They beat the Boobies and Gulls making them disgorge their prey, which the Man-o-war bird catches in the air and devours.

Family PELECANIDÆ.

79. Pelecanus fuscus (Linn.). Pelican; Grand-gorgé.

♂ Length, 48 inches; expanse, 73½ inches; wing, 20 inches.

Very numerous all round the island and among the grenadiers. In September and October large numbers come into the bays to feed on "sprat" and "fry." Their breeding place has not been clearly determined; they are supposed to breed on some of the isolated rocks and on the mainland of America.

80. Sula sula (Linn.). Booby: Fou.

Numerous; breeds on islets; nests in trees; several nests on same tree.

81. Sula piscator (Linn.). Red-foot Booby.

Abundant at "Kick-em-jenny." Found nests there in May, some with young and some just building. The nest is a large flat structure of dry sticks, placed on the outspread branch of a large leafless tree.

82. Sula cyanops Sundev. White Booby: Blue-faced Gannet.

Not abundant; observed several building in trees at Kick-em-jenny in May.

I went on a collecting trip to our little islands about the middle of May, which proved a disastrous one. I procured several specimens, amongst which were four "Boobies," but got swamped in a boat, owing to the heavy sea, and lost them all. Two of the Boobies were new to me, viz, a *white* one with red feet (*Sula piscator?*) and one which was all brown except the tail, which was white; feet also lake-red (*S. parva?*). They were building nests in trees; several nests on same tree. I could not procure any eggs, as the trees overhung the rocks, and were inaccessible. The other Boobies observed were brown; one with white breast, feet dull pale yellow (*S. fiber* or *S. fusca?*).

Family PHAETHONIDÆ.

83. Phaëthon æthereus Linn. Boatswain; Tropic Bird; Paille-en-queque.

♀ Length, 38 inches; expanse, 41 inches; wing, 13 inches; tail feather, 19½ inches.

These birds are abundant amongst the small islands between this and Carriacou, notably the La Tantes, where they breed in holes in the rock; they are easily taken alive whilst sitting on their nests; they are very graceful on the wing, the long tail feathers having a tremulous motion; they utter a shrill grating cry at intervals whilst flying, from which the name Boatswain has been given them by sailors. In Pere Labat's book, published in 1722, there is an illustration of one of these birds, called by him *Paille-en-cul*, a name by which it is known to the inhabitants of Isle de Rhonde at the present day. The male bird has two of the long tail feathers; the female only one. The specimen from which the above measurements were taken was shot on the wing at La Tantes Islands on 20th January, 1881. A live one was taken from a nest at the same place in April last and brought to me; it lived for two days.

Family LARIDÆ.

84. Larus atricilla Linn. Mauve; Laughing Gull.

♂ Length, 16½ inches; expanse, 39 inches; wing, 12 inches.

Numerous all round the island; several of them attend on the flocks of pelicans, and when those birds dive for fish the gulls swoop down with them and pluck the fish or a part of it from the mouths of the pelicans, uttering at the same time their peculiar laughing cry, which the fishermen interpret as "half," "half." On the 15th May, 1882, I observed a number of these birds at Isle de Rhonde, hovering over a large Figeur tree. On going up to the tree I found that they were plucking and eating the berries; they never alighted on the branches, but kept hovering around and plucking at the fruit, keeping up an in-

cessant laughing all the while. They nest on the ledges of the cliffs overhanging the sea.

85. Sterna maxima Bodd. Royal Tern.

♂ Length, 19 inches; expanse, 44¾ inches; wing, 14½ inches.

Not abundant; frequents the bays on the eastern side of the island; two or three are often seen in Grenville Harbor, where they roost at night on the buoys laid down for warping vessels; nest on the islets in April and May.

86 Sterna dougalli Mont. Roseate Tern; Careete.

♂ Length, 12 inches; expanse, 29¾ inches; wing, 13½ inches.

Numerous: frequent all the bays around the coast; breed on the island; found nests with two eggs each at Lee Rocks in May.

87. Sterna fuliginosa Gm. "Twa-oo."

This tern is abundant at Isle de Rhonde, Kickem-jenny, and all the small kays to the northward of the island. Large numbers breed on the "Lee Rocks." A friend of mine has one of these birds, which he reared from a nestling. It is kept in the house yard and serves the purpose of a watch-dog, as it gives notice of the approach of a stranger with a shrill grating cry. It is fed on bits of fish, and seems quite contented, though he is in company with Ramiers, Tourterelles, Perdrix, Ring Doves, and Pea Doves, all occupying a large aviary. Both the Bridled tern and this species are known locally by the name "twa-oo."

88. Sterna anæthetus Scop. Twa-oo; Bridled Tern.

♀ Length, 15 inches; expanse, 31¼ inches; wing, 11 inches.

Abundant among the islets; found nests at Lee Rocks in May; eggs two; general color light buff, with dark brown spots and blotches; they vary considerably in shape and markings.

89. Anous stolidus Linn. Mwen; Noddy Tern.

♂ Length, 16½ inches; expanse, 32 inches; wing, 10¾ inches.

Very abundant; large flocks may be seen feeding on "sprats" between the islands; found numerous nests at Lee Rocks early in May, some in tufts of short grass, others on the bare rock; the nests are placed very close to each other; the eggs are two in number and vary considerably both in color and markings.

Family PROCELLARIIDÆ.

90. Oceanites oceanicus (Kuhl). Wilson's Petrel.

♀ Length, 8¾ inches; expanse, 18¼ inches; wing, 6½ inches; tail, 3 inches. Wings when closed project 1½ inches beyond the tail.

Abundant; follow in the wake of boats and vessels; procured one from a fisherman, who struck it with an oar whilst following his boat

about a mile from shore; it was alive and pecked viciously at my hand, making a peculiar hissing sound at the same time; nesting place and habits not known.

[This species has not been noted before from the Lesser Antilles.—G. N. L.]

Family PODICIPITIDÆ.

91. Podilymbus podiceps (Linn.). Diver,

♂ Length, 14 inches; expanse, 23¾ inches; wing, 5 inches.

Numerous at Lake Antoine and the mangrove swamps on the east coast, also at the fresh-water pond at Isle de Rhonde.

92. Podiceps holbœllii? Red-back Diver.

Abundant at Isle de Rhonde pond. A few only observed at Lake Antoine.

[Mr. Wells has this bird in his list as *Podiceps holbölli?*, and calls it "The Red-back Diver."

No specimens have been sent, and I doubt that it is the species he supposes it to be, viz, the Amer Red-necked Grebe, of which he gives the scientific name, although he calls it the "Red-back Diver;" possibly a slip of the pen.

The Amer Red-necked Grebe is strictly a northern species. Its appearance in winter along the New England coast, and as far South as New Jersey, is irregular, and it is viewed in the light of a straggler.

It has never been noted from any of the most northerly of the West India Islands, and now that it is given as abundant in the most southerly island of the Lesser Antilles, seems to preclude the possibility of its being this species.

I hope before long to get specimens for its identification.—G. N. L.]

ON A COLLECTION OF BIRDS MADE BY MR. M. NAMIYE, IN THE LIU KIU ISLANDS, JAPAN, WITH DESCRIPTIONS OF NEW SPECIES.

By LEONHARD STEJNEGER.

A short time ago the National Museum received a fine collection of birds from the Educational Museum of Tokio, Japan, the director of which is Mr. S. Tegima. Besides numerous interesting and well-prepared specimens, especially from the provinces southwest of Tokio, there were several skins from Liu Kiu. At the same time, Mr. M. Namiye, in charge of the ornithological department of the Educational Museum, forwarded to me for inspection another lot from the same islands.

The Liu Kiu, or Riu Kiu, Islands (often spelt Lew Chew, or Loo Choo), in connection with the Linschoten Archipelago, form a continuous chain of islands between Kiu-Siu, the southern of the Great Japanese Islands proper, and the northern end of Formosa. Notwithstanding this intermediate position between two so peculiar and remarkable zoogeographical provinces, only little has been done in order to explore their fauna. That of the Linschoten group is wholly unknown, and what little we know of the birds of the Liu Kiu Islands is due to the American Pacific Exploring Expeditions under Perry and Rodgers.

The Liu Kiu Archipelago consists of three groups, a southern, the Miyaco Islands, or Nambu Sioto, south of 25° north latitude; a middle group, Tsubu Sioto, or Liu Kiu proper, between 26° and 27° north latitude, and a northern group, Hokubu Sioto, between 27° and 29° north latitude.

The first and the last named of these groups have apparently never been visited by naturalists, for the ornithological collections, at least, have only come from the main island of the middle group, Okinawa Shima, or Great Liu Kiu. The present collection was also made on this island during a short visit of Messrs. Tegima and Namiye during the month of March of the present year. Official business of more pressing nature prevented Mr. Namiye from devoting so much time to collecting as he wanted. This is much to be regretted, for when we look at the excellent results of his short stay, there can be no doubt but that he would have added more species to the Avifauna of the Japanese Empire. It is also desirable that the southern group should be explored, since situated, as they are, even more southerly than the northern point of Formosa, pretty well isolated, and not far from the Tropic of Cancer, many interesting novelties and additions to the fauna may be expected to occur on these islands, which, moreover, seem to be very mountainous, the mountains reaching a height of at least 600 meters.

Okinawa Shima, or Great Liu Kiu, is a long and narrow island, its greatest length in a southwest-northeast direction being nearly 60 miles. It is well cultivated in the southern part, about the chief city called Napa or Nafa, but further north it becomes rugged and mountainous and covered with forests.

Turnix blakistoni SWINH.

The discovery of this little quail-like bird on Japanese territory adds not only a species and genus to the list of Japanese birds, but a whole superfamily, *Turnicoideæ*, or *Turnicomorphæ* as the group is called by some ornithologists who consider it worthy of rank as an order.

I am somewhat doubtful in regard to the specific name, for Swinhoe's decription, if it can be called a description, is very short and unsatisfactory, and I have no Chinese specimens for comparison. Here is what he says (P. Z. S., 1871, p. 401):

"A male specimen of the *T. ocellata* group was procured by Captain Blakiston at Canton, and kindly given to me. This differs too much from the last [*T. rostrata*] for me to consider it of the same species. Its nearest ally is the *T. pugnax*, Temm., of Malacca, but it is smaller, shorter-toed, and possesses a remarkably small bill. Instead of spots it has numerous bands across the breast, and its upper parts are very rufous. I propose to separate it under the name of its discoverer."

I have before me a pair of "*T. pugnax* from Malacca" (U. S. Nat. Mus., Nos. 15176 and 15177), or *T. plumbipes* HORSF., as it ought to stand according to the opinion of the Marquis of Tweeddale, who considered it distinct from the typical *T. pugnax* from Java, from the male of which the bird from Liu Kiu differs in the following points:

(1) It is considerably smaller, with somewhat smaller bill and feet.

(2) Its forehead differs distinctly from the crown in being buffish white with black streaks, the crown being dark rufous with blackish centers, and a light median stripe.

(3) On the upper parts the ground color is much more rufous and the light marks more buffy.

(4) It is less heavily banded on the flanks.

So far as the description goes, the Liu Kiu bird, therefore, agrees tolerably well with the characters ascribed by Swinhoe to his *T. blakistoni*. I should remark, however, that the Indian form, which Mr. Hume calls *T. taigoor* SYKES, also seems to differ from *plumbipes* chiefly by the rufous tint of the upper parts (cf. Hume, Stray Feath., VI, 1878, p. 451).

The occurrence of a Hemipode on Japanese territory is not very surprising, since a species of this family has been found on the opposite mainland as far north as Ussuri (latitude of northern Yesso).

The following description of the Liu Kiu specimen may not be out of place:

♂ ad. *Napa, Okinawa Shima, March* 29, 1886. *Coll. M. Namiye.*—Forehead whitish, slightly tinged with buff, each feather marked longitud-

inally with black; supereiliary streak, lores, cheeks, malar region, ear-coverts, and upper lateral portion of neck similarly colored, the brownish black markings, however, occupying the tip of the feathers, forming semi-lunar, scale-like marks on the side of the neck; a distinct light hazel-colored spot behind the ear-coverts; chin and throat white, slightly suffused with buff, unspotted; feathers of the crown and nape black with broad hazel-colored tips, those nearest to the supercilium with a light mark in the outer web, and those nearest to the middle with a similar, but larger buffy white spot, forming a conspicuous light median line from the forehead to the neck; lower lateral portion of neck of a dull hazel inclining to cinnamon, and but faintly mottled with dusky; ground color of scapulars, and entire back, including rump and upper tail-coverts, of a raw umber somewhat irregularly overlaid with hazel inclining to rusty, and more or less conspicuously mottled and waved with blackish, the shoulder feathers and longest rump feathers in the outer web marked with a distinct buffy spot which is set well off from the rest of the feather by a black line or spot; ground color of under parts creamy buff, becoming tawny buff on the flanks, crissum and under tail-coverts, the feathers of the fore-neck, upper breast, and sides of the breast each with a subterminal transverse spot of black, forming a series of interrupted cross-bars, and most of the feathers also with a very narrow blackish edge to the tips; primaries dusky, fading into brownish gray toward the tip, the outer webs with light edges, which are particularly well defined, and nearly white on the outermost pair; secondaries similarly colored, but the edges more tinged with buff and the tips inclining to cinnamon, the inner ones in the outer webs showing trace of buff cross-bars as an indication of the markings on the tertiaries, which are hazel mottled with dusky and adorned with several transverse marginal spots of a light buff irregularly bordered by brownish black; primary coverts like the primaries; great secondary coverts similar to the tertiaries, but the hazel inclines to cinnamon, the buff occupies nearly the whole outer web, and the dark markings assume more the character of regular cross-bars; the smaller upper coverts similarly colored on both webs, the smallest ones with only terminal buff spot and a subterminal black one, nearly obsolete in those nearest to the edge of the wing; largest feather of the alula dusky with a broad and well-defined buffy white edge to the outer web; under wing-coverts and axillaries ashy gray, those nearest to the edge and the tips of the axillaries strongly washed with cinnamon; tail-feathers like the elongated rump-feathers and difficult to distinguish from the latter. Bill and legs appear to have been of a bluish horn-color, the gonys light yellowish.

Dimensions.—Total length 140^{mm}, according to the measurement of the fresh bird by the collector. Wing, 73^{mm}; tail-feathers, 26^{mm}; exposed culmen, 12^{mm}; tarsus, 24^{mm}; middle toe with claw, 20^{mm}.

It may be well to remark that the individual variation as to color is very great in the Hemipodes, and that the females of the present group are larger than the males, and have the chin, throat, and fore-neck uniform blackish.

Treron permagna, sp. n.

DIAGN.—Rectrices underneath uniform slate black, the tips bordered with ashy; tail slightly graduated; third primary sinuated in the inner web; under tail-coverts dark-olive green broadly bordered with pale creamy yellow; secondaries and their great coverts narrowly edged with the same; primary coverts uniform blackish; lower abdomen of a creamy primrose-yellow; rest of plumage dull olive-green above, clearer on the rump, clear yellowish oil-green on forehead and under parts. Size very large: wing over 200^{mm}.

TYPE.—No. 17, Coll. Namiye; Napa, Okinawa Shima, Liu Kiu Islands, March 9, 1886.

HABITAT.—Okinawa Shima, middle group, Liu Kiu Islands, Japan.

The identification of the present species has caused me considerable difficulty. It is much larger than *Treron formosæ* SWINHOE* from Formosa, being, so far as I can see, the largest species in the whole genus *Treron* in its widest sense, though otherwise evidently closely resembling the female of that species. But the specimen before me, which Mr. Namiye collected at Napa, March 9, 1886, is marked on the label as being a male. Should the determination of the sex be correct, the present species would be unique amongst its nearest allies in having the small upper wing-coverts olive-green in the male and not chestnut.

But even if the specimen be a female, it differs sufficiently from Swinhoe's description of the types of his *T. formosæ* to warrant the separation.

First, as to dimensions: His female has the wing 7.2 inches long and the "tail" 4 inches, while Namiye's bird measures, wing 8.3 and tail 6 inches! It is consequently much larger even than the male *T. formosæ*, which, according to Swinhoe, has the wing 7.8 and the tail 5 inches, with a graduation of 0.5 inch, while in *permagna* the latter measurement is nearly 1 inch. It should also be remarked that my mode of measuring gives the smallest possible dimensions, for the wing is not flattened, and the tail is measured by thrusting the point of the dividers between the central tail-feathers down to the base.

In general coloration my bird agrees tolerably well with Swinhoe's description (when we remember that "*yellow* on the head and rump" is a misprint for "*yellower*"), except that it has the throat uniform with the rest of the under parts, and not "grey, each feather margined with yellowish green." In the details, however, there seem to be some differences, which will be apparent from the subjoined full description of

* Ibis, 1863, p. 396, and 1866, p. 312; nec *Sphenocercus formosæ* SWINHOE, Ibis, 1866 p. 122, quæ *T. sororia* SWINH.

T. permagna. In regard to the coloration of the wing the discrepancies are very considerable, as will be seen from the following comparison:

T. formosæ ♀.	*T. formosæ* ♂.	*T. permagna.*
"Primary coverts and secondaries black, margined with clear yellow. "Tertiaries and other coverts green, some of them being likewise margined."—Swinh., Ibis, 1863, p. 397.	"The primary coverts with more or less greyish black, margined with yellow." "Outer tertials greyish black, narrowly edged with green and light yellow; the rest of the tertials the color of the black."—Swinh., Ibis, 1866, p. 312.	Primary coverts uniform black, without light edgings. Secondaries edged with yellowish. Tertiaries uniform olive green, without light edges. Six outer great secondary coverts edged with yellowish. No other coverts light edged.

I have a strong suspicion, however, that Swinhoe has not named correctly the parts he described. I believe that by "*primary coverts*" he really meant the "*great secondary coverts*," and that, in the description of the male, by "outer tertials" he meant "outer secondaries." The fact remains, however, that in the females he describes two sets of coverts as having yellow edges, while in the bird before me only the outer great coverts are colored in such a manner.

The following is a careful description of the type of *T. permagna.*

♂ (?) *Napa, Okinawa Shima, March* 9, 1886. *Coll. Namiye.*—Upper parts dark olive-green, clearer on the rump and hoary on occiput, cheeks, sides of neck, cervix, and interscapilium; forehead, anterior part of crown, and lores, like the under parts, clear oil-green, gradually deepening backwards to the abdomen into olive green; middle of lower abdomen and crissum of a delicate creamy crimson yellow; feathers covering tibia and sides of abdomen olive green, edged with a similar yellow; under tail-coverts, the longest of which reach beyond the tips of the lateral rectrices, dark olive green, broadly (about 5mm) margined with pale creamy yellow; sides of breast, axillaries, as well as the whole under side of the wing, dark slate, with a somewhat glaucous gloss to the under side of remiges; upper side of the remiges brownish black, the outer webs towards the edge washed with olive green; second, third, and fourth primaries distinctly, but very narrowly, edged with pale yellowish in the middle portion of the outer web; the outer webs of the six outer secondaries similarly edged, though somewhat broader and in the apical half only; the corresponding greater coverts colored exactly similarly; tertiaries and all the other upper coverts uniform olive green, with a scarcely perceptible purplish wash on the smaller ones, except the primary coverts, which are uniform blackish brown, without light edges; tail above olive green, the central pair of tail-feathers uniformly so, the rest with the inner edge slaty black (about 7mm wide); under side of tail slate black, each feather tipped with ashy on the portion not covered by the succeeding one. In the dried skin the bill is light horn-blue in its terminal half, whitish along the edges, the basal portion being horny bluish black; feet a dull burnt carmine.

Dimensions: Total length, according to Mr. Namiye's measurement of the fresh bird, 405mm; stretch of wings, 645mm. Wing, 211mm; tail-

feathers, 153mm; graduation of tail, 24mm; exposed culmen, 21mm; tarsus, 28mm; middle toe with claw, 37mm.

Treron permagna is the second species of the Green Pigeons known to occur in Japan, the other species being the well-known *T. sieboldii*.* The two species may be easily distinguished thus:

a^1 Lower breast and entire abdomen yellowish-white; the outer tail-feathers above with a subterminal black band ..... *T. sieboldii.*

a^2 The yellowish white of the body confined to the middle portion of the lower abdomen and the crissum; the tail-feathers without any subterminal cross-band ..... *T. permagna.*

A close ally of *T. sieboldii* is found in Formosa, viz, Swinhoe's *T. sororius*†, if, indeed, it really be separable. It would be interesting to know how the corresponding bird from the intermediate islands is colored.

Megascops elegans (CASSIN).

This species is not new to the Japanese fauna, for the type was taken on board a vessel while in Japanese waters, west of the northern islands of the Linschoten group, consequently not far from the locality where it has now been rediscovered by Mr. Namiye, who obtained a female specimen at Oroku, Okinawa Shima, March 28, 1886.

In order to determine this specimen I went to Philadelphia, where, by the courtesy of the authorities of the Academy of Natural Sciences, I was permitted to institute a direct comparison with Cassin's type of "*Ephialtes elegans.*" I found, as I had anticipated, that the bird collected by Mr. Namiye is identical with the type, agreeing as it does very closely both in size and coloration. It is slightly more rufous all over, but otherwise it matches it so closely, and especially in the amount of feathering on the tarsi, that two specimens more similar are scarcely found in any of the species of this variable group. The type specimen has hardly any indication of occipital or cervical bands and certainly less than several specimens of *M. japonicus* now before me. The Liu Kiu specimen shows more of a cervical light band, though it is by no means very pronounced. It seems not justifiable to refer the present species to *M. lettia* and *M. japonicus* to *M. scops* as subspecies because of the absence or presence of these bands, which apparently are quite an unstable character.

The present species is certainly very closely allied to *M. japonicus*, from which it is easily separated, however, by its superior size and by the greater extent of the naked portion of the tarsus. The coloration is very much the same, the individual variation being almost endless, but it seems as if *M. elegans* has the blackish markings on the top of the head larger and darker, thus making the crown conspicuously darker than the rest of the upper parts; a feature which I do not find in any specimen of my series of *M. japonicus*. The ear-tufts seem to be larger

Columba sieboldii TEMMINCK, Pl. Color., IV, liv, 93, pl. 549. (1835.)

†Ibis, 1866, p. 311=*Treron sonorius* GRAY, Hand-l. B., II, p. 224 (1870.)=*Sphenocercus formosæ* SWINHOE, Ibis, 1866, p. 122, nec *Treron formosæ* SWINHOE, 1863!

than in the latter species, the largest feathers in both specimens of *M. elegans* being 27mm long, besides being rather stiff and narrow, while in the specimen of *M. japonicus*, in which they are best developed (U. S. Nat. Mus., No. 96395), they are only 17mm long, and at the same time less markedly differentiated from the other feathers. The coloration of these tufts, too, is more pronounced in *M. elegans*, their inner webs being more rusty and less mottled with dusky, while the outer webs are more heavily marked with blackish.

The original label attached to the type specimen of *M. elegans* reads as follows: "En Mer. Côtes du Japon. Lat. 29° 17′ 00″ N. Long. 126° 13′ 30″ E. Mardi 2 Avril 1850. Yeux jaune serin," and on the under side of the stand is written: "Eph. affinis. Verr. Mss. Japan, J. B. W.," and with lead-pencil, in Mr. Cassin's handwriting: "E. elegans Cassin."

Whether this bird is the same as *E. glabripes* of Swinhoe, as supposed by Mr. Sharpe (Cat. B. Brit. Mus., II, p. 87), I cannot say with absolute certainty without a specimen of the latter, the more so since his description does not specially mention the amount of feathering on the tarsus, which in *M. elegans* is very much less than in *M. lettia*, of which Mr. Sharpe makes it a subspecies. If *glabripes* has the character assigned to "*lettia* and allies" on p. 46, viz, "tarsi plumed to the base of the toes, the feathering running some way down the middle and outer toes, so that the junction with the tarsus is always hidden," then *elegans* is a bird *toto cœlo* different from that described by Swinhoe, for the distance between the feathering of the tarsus and the junction of the toes with the tarsus is more than 5mm in both specimens of *M. elegans*. Sharpe also describes the nuchal and cervical bands of the Chinese specimens as much more distinct than found in my birds. On the whole I feel greatly inclined to doubt the identity of *elegans* and *glabripes*.

The individual variation in coloration of these owls being so enormous, the following description does not enter into any considerable detail, only such points, being taken in as are deemed essential.

♀ ad. (*Oroku, Okinawa Shima; March* 28, 1886. *Coll. M. Namiye*).—Ground color of upper surface russet fading into Isabella-color on the wings, and strongly tinged with ferruginous on crown and cervix, and with hazel on the rump, all over minutely mottled with dusky, especially dense along the shafts, the feathers on the middle of the crown being nearly black with irregular ferruginous spots, while on some of the feathers of the hind-neck the dusky mottlings are crowded into irregular bars towards the tip, leaving the basal and central portion nearly spotless, thereby forming a faintly indicated tawny band across the cervix; most of the outer scapulars have the outer webs white, slightly marked with tawny and with one or more large blackish spots at the tip, thus forming a narrow longitudinal whitish bar on the shoulders; two or three of the middle wing-coverts have also a large whitish spot, more or less tinged with tawny, in the outer web; ear-tufts long, each feather more or less solid blackish in the outer web and ferruginous

tawny in the inner, only the tips of the latter being mottled with dusky; face whitish mottled with dusky and slightly tinged with tawny, all the dusky mark being bordered with tawny; a blackish semilune limits the auricular region posteriorly; ground color of the entire under surface, except the legs, white with minute and delicate transversal dusky bars, each of which are very narrowly edged with tawny; near the middle line of the body from the breast backwards the feathers are nearly immaculate in the inner webs, forming a whitish median line; the dusky mottlings join at the shafts of the feathers, covering throat and sides so as to form more or less conspicuous shaft streaks; basal portion of all the feathers strongly tinged with tawny, which is quite conspicuous on throat, foreneck, and sides; feathers of tibæ and tarsi pale tawny, each feather with a subterminal dusky bar; axillaries nearly uniform whitish with a very pale tawny wash, under-wing coverts being colored more like the legs; remiges and great wing-coverts dusky with more or less distinct cross-bars of a dull cinnamon buff, which on the basal half of the outer web of the second, third, and fourth primaries becomes nearly whitish; in the inner webs the brownish bands are more or less mottled with dusky, while in the outer webs the dusky interspaces are similarly mottled with the same color as the light bands; tail-feathers colored similar to the wing-feathers, but the light cross-bars are proportionally narrower and less well defined, especially towards the tip, their number on the middle pair being about ten. Bill and feet, in the dried state, dark horn blue, the former with the extreme tip whitish.

Lower part of tarsus naked for a distance of 6mm. First primary slightly shorter than sixth; second intermediate between fourth and fifth; third and fourth equal and longest. Inner webs of first, second, and third primaries abruptly sinuated; outer webs of second, third, and fourth gently sinuated.

The dimensions are included in the following:

Comparative table of measurements.

1. MEGASCOPS ELEGANS.

Museum and No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail feathers.	Bill from nostrils.	Tarsus.	Middle toe without claw.	Total length.	Remarks.
Philada. Acad..	.....	ad.	29° 47′ N. lat.; 126° 13′ 30″ E. long.	Apr. 2, 1850	172	78	12	30	20	...	Type.
Educ. M., Tokio	Namiye.....	♀ ad.	Oroku, Okinawa Shima.	Mar. 28, 1886	166	75	12	30	22	210	Stretch of wing, 585.

2. MEGASCOPS JAPONICUS.

U.S. Nat.	96398.	Ringer, 182....	♂ ad.	Nagasaki, Kiusiu.	June 10, 1881	148	63	10	23	18	...
Do.	96397.	Blakist., 2295 .	♂ ad.	Hakodadi, Yesso.	Sept. 16, 1877	139	64	9	25	19	...
Do.	96395.	Blakist., 2076 .	♂ ad.	.....do	Sept. 19, 1876	147	67	9	24	18	168
Do.	96396.	Blakist., 2077 .	♀ ad.	.....do	Sept. 19, 1876	145	70	10	25	18	175
Do.	96394.	Blakist., 1514 .	♀ ad.	.....do	Sept. 20, 1874	145	65	9	...	....	...

Motacilla melanope PALL.

A male of this species collected at Napa, March 9, 1886, differs in no way from other Japanese specimens except in having a rather strong wash of green on the interscapilium. The throat is mixed white and black, the feathers of the latter color still partly in their sheaths. The tail-feathers are also moulting.

Total length, 190^{mm}; stretch of wings, 260^{mm} (according to the label). Wing, 83^{mm}; exposed culmen, 12^{mm}; tarsus, 21^{mm}; middle toe, with claw, 18^{mm}.

Hypsipetes pryeri, sp. n.

DIAGN.—Similar to *H. amaurotis* TEMM., but somewhat smaller, with a broad (about 12^{mm}.) collar of burnt umber brown across the throat, uniting the ear-patches, and with the gray of the under parts replaced by raw umber; top of head darker, and rest of upper surface more olivaceous.

TYPE.— ♀ collected by M. Namiye at Napa, Okinawa Shima, March 8, 1886.

HABITAT.—Okinawa Shima, Liu Kiu Islands, Japan.

This new species, which I take a pleasure in dedicating to Mr. Pryer in recognition of his meritorious work in Japanese ornithology, is quite distinct from the common Brown-eared Bulbul of Japan, and may at once be distinguished from this species by the characters given in the above diagnosis.

In some respects it comes nearer to the Bonin Shima bird, *H. squamiceps* KITTL., which sometimes, though, as shown by Dr. A. B. Meyer (Zeitsch. Ges. Ornith., I, 1884, p. 211), quite erroneously, has been considered identical with the common Japanese bird. Dr. Meyer is not correct, however, when asserting that the latter is materially inferior in general size, for, as shown by the table of dimensions given below, the average size of *H. amaurotis* is considerably larger than the measurements given by him. Unfortunately the only specimen of the Bonin bird at my command is in a very poor condition, but then there are two good plates by Kittlitz, and the comparative description by Dr. Meyer, quoted above, which will assist us in pointing out the features by which it differs from *H. amaurotis* proper and from *H. pryeri*.

It is then evident, both from Dr. Meyer's measurements and my own, that *H. squamiceps* has a comparatively longer tarsus than either of the two other species; it furthermore possesses a broad dusky pectoral band, very well represented in the original figure (Mém. Sav. Etr., I, pl. xvi), and by Dr. Meyer described as a "broad blackish pectoral band not quite continuous in the middle." In having the throat, fore neck, and other under parts brown, and not gray, *H. squamiceps* agrees with *H. pryeri*, but judging from my specimen of the former, this brownish color is of a different tint, less yellowish than in the latter species.

In addition, I should remark that it may later on be expedient to recognize the individuals breeding in Yesso as a distinct race, charac-

terized by the paleness of the flanks and the general lighter tone of the under parts, but at present, with only two specimens from that island, I refrain from naming it. I may also mention that a specimen from Tate-Yama, collected by Jouy, October 28, agrees with the Yesso birds. This would not invalidate the status of the latter as a distinct race, since it may be presumed that in winter or during the migrations it may occur in Hondo, especially on the western side. Additional specimens from Yesso are therefore very desirable, in order to have the question settled.

A specimen from Chusan, China (U. S. Nat. Mus., No. 85685), acquired by Mr. Jouy at the Shanghai Museum, differs in no essential from the typical Japanese *H. amaurotis*.

Comparative table of measurements.

1. HYPSIPETES PRYERI.

Museum and No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.	Total length.
.....	Namiye.....	♀ ad.	Napa, Okinawa	Mar. 8, 1886	115	109	21	23	20	270

2. HYPSIPETES SQUAMICEPS.*

U. S. Nat. 21163..	Stimpson	.....	Bonin Islands	Oct. —, 1854	125	118	..	26	26	...

*In regard to the measurements of this specimen, I may state that those of wing and tail feathers are probably too low, owing to the poor condition of the feathers.

3. HYPSIPETES AMAUROTIS.

Museum and No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.
U. S. Nat. 96279	Ringer, 21.....	♂ ad.	Nagasaki, Kiusiu	Jan. 1, 1877	128	115	24	22	23
Do. 109346	Namiye	♂ ad.	Sagami, Hondo	Nov. 15, 1884	133	120	24	22	....
Do. 88664	Jouy, 502	♂ ad.	Fuji, Hondo	July 13, 1882	130	119	26	21	23
Do. 96280	Blakist., 2154..	♂ ad.	Hakodadi, Yesso.....	Feb. 12, 1877	136	120	....	22	23
Do. 109347	Namiye.....	♀ ad.	Sagami, Hondo	Nov. 15, 1884	123	112	....	22	22
Do. 91325	Jouy, 729	♀ ad.	Tate-Yama, Hondo ...	Oct. 28, 1882	127	111	22	23	24
Do. 96281	Blakist., 2873..	♀ ad.	Mororan, Yesso.....	May 16, 1882	127	112	23	21	22
Do. 85685	Jouy, 115	♂	Chusan, China.....	Feb. 23, 1875	130	121	25	22	23

ICOTURUS, gen. nov.

(εἰκός, εἰκότος = reasonable.)

Of the family *Timaliidæ*, as defined by Mr. R. B. Sharpe (Cat. B. Brit. Mus.).

Bill rather long and slender, slightly hooked and notched at tip; culmen straight to near the tip; gonys slightly convex, equal in length to the distance from nostrils to tip; nostrils at the anterior end of the

nasal groove overhung by the membrane, oval and slightly oblique, and removed from the feathering a considerable distance; bristles at base of upper mandible tolerably well developed.

Wings short, rounded, and very concave; distance of secondaries from tip of longest primary less than the length of the exposed culmen.

Tail much shorter than wing, slightly rounded.

Feet long; tarsus nearly twice as long as exposed culmen, rounded behind, booted; toes long and slender, outer toe longer than inner; hind toe long, with a strong curved claw.

TYPE.—*Icoturus namiyei* STEJNEGER.

The other species belonging to this genus is *Icoturus komadori* (=Temmenick's *Sylvia komadori*, =*Erithacus komadori* of Seebohm in Cat. B. Mus. V.). So far as I can see, these birds have nothing to do with the *Turdinæ*, *Luscinilinæ*, or whatever that group may be called, which includes the English Robin. The very concave wing apparently at once removes them from that neighborhood and suggests "Timaliine" relationship. Another character by which *Icoturus* differs from the true robins is the remoteness of the nostrils from the frontal feathering, thereby also indicating relationship with "Timaliine" forms. True, the tarus is booted, but, I think, in a somewhat different way from that of the *Turdidæ*, and resembling that of the *Enicuridæ* (Stejneger, in Stand. Nat. Hist., IV, p. 489, 1885), in being rounded behind and not sharply edged. In fact, I cannot see that it differs from the "aberrant Timaliine group" *Enicuri* (or *Henicuri*, Sharpe, Cat. B. Brit. Mus., VII, pp. 312–323), except by the shape of the tail being slightly rounded instead of furcate. The shape of the bill is identical; the wing rather *more* "Timaliine"; and the tarsus and toes indistinguishable from the corresponding parts in the *Enicuri*. As to the tail it should be remarked, that in the latter group its shape varies greatly from the deeply forked and very long tail of *Enicurus* proper to the nearly square and short tail of *Microcichla*, from which there is only a very short step to the slightly rounded tail of *Icoturus*. Even in style of coloration the difference is not very great*, as considerable similarity will be found between *Icoturus* and *Hydrocichla ruficapilla* (TEMM.), especially in the coloration of the anterior part of the body. Unfortunately the first plumage of the *Icoturi* is not known, as that might go a long way in settling the question of their true relationship.

Icoturus namiyei, sp. nov.

DIAGN.—Similar to *I. komadori* TEMM., but with the flanks and axillaries uniform ashy, and the under wing-coverts ashy and rufous; second primary equals the ninth, much shorter than the eighth; third shorter than fourth, fifth, and sixth, which are longest.

* In coloration, however, the *Icoturi* very forcibly remind one of certain Formicariidæ. Should color count for more than structure, then *Icoturus* would come very close to *Myrmeciza longipes*, from Panama, to which it has a most astonishing superficial resemblance.

TYPE.—U. S. Nat. Mus., No. 109474.

HABITAT.—Liu Kiu Islands.

The type of the present species, which I take the pleasure to name after its discoverer, was collected by Mr. Namiye, at "Nagogatake, Liu Kiu," apparently the same as Nago Take of Hassenstein's map, a mountain in the northern part of Okinawa Shima.

Icoturus namiyei is evidently closely related to *I. komadori*, but the differences are so strongly marked that I feel no hesitation in describing it as a distinct species, although having no specimen of the latter at hand for direct comparison. The specimen before me is undoubtedly a male in full adult plumage, so the differences cannot be due to age or season, the more so as the proportions also seem quite different. I take Seebohm's description of the type specimen of *I. komadori* (Cat. B. Brit. Mus., v, p. 298) to be correct, and shall now give in tabular form the characters by which *I. namiyei* differs from that description:

I. namiyei ♂ ad.	*I. komadori* ♂ ad.
Flanks uniform ashy gray.	"Flanks black; the feathers of the * * * upper flanks margined with white. * * *."
Under wing-coverts ashy gray, the outer webs and the tips margined with rufous orange, similar to the color of the back.	"Under wing-coverts black, margined with white."
Axillaries uniform ashy gray.	"Axillaries white, with dark centers."
Bastard primary, 26.5mm.	"Bastard primary, 0.8 inch" (=20.3mm).
Length of wing, 72mm.	"Length of wing, male, 2.9" (=73.7mm).
Longest tail-feathers, 52mm.	"Tail, male, 1.9" (=48.3mm).
Tarsus, 29mm.	"Tarsus, 1.02" (26mm).
Wing with the fourth, fifth, and sixth primaries nearly equal and longest; second primary about equal to the ninth.	"Wing with the third, fourth, and fifth primaries nearly equal and longest; second primary about equal to the sixth."

It will be seen that *I. namiyei* has the wing much more rounded, with a longer first primary, and that while the other dimensions are nearly the same, the tarsus is proportionately longer. I have not introduced the length of the culmen in the above comparison, as I do not know how Mr. Seebohm measures it. The culmen is given by him as 0.68 inch (=17.3mm); the "exposed culmen" of my bird is 14mm, but from the extreme cranial base the culmen measures 19mm, both measurements differing considerably from Mr. Seebohm's. I may also remark that Mr. Seebohm describes the "rest of the under parts" (except chin, throat, breast, and flanks) as "white," while in my bird the tibiæ are ashy strongly suffused with rufous, and the under tail-coverts pale rusty.

DESCRIPTION.—♂ ad. (*U. S. Nat. Mus. No.* 109474; *Nagogatake, Liu Kiu, March* 21, 1886. *Coll. M. Namiyie*).—Entire upper side, including wing-coverts, tail-coverts, and rectrices beautiful orange rufous, deepest on top of head, lightest on the ear-coverts; in the middle of the forehead the rufous goes clear to the bill, but the sides of the forehead are jet black like the lores, the anterior part of the supercilium, cheeks, chin, throat, fore neck, and upper breast, the posterior outline of the black on the sides of the upper breast being as abrupt and well defined as in the middle; sides of body (the whole region covered by the folded

wings) and the axillaries uniform ash gray, the latter slightly lighter; lower breast, abdomen, and crissum white, towards the sides washed with ashy; tibial feathers ashy suffused with rufous; under tail-coverts pale rusty; exposed portion of the remiges of a color similar to that of the back, but inclining to burnt umber; inner webs dusky with pale rusty edges. Bill jet black; legs horny, brownish gray. Total length, according to Mr. Namiye, 152^{mm}, and stretch of wing 241^{mm}. Wing, 72^{mm}; tail-feathers, 52^{mm}; exposed culmen, 14^{mm}; tarsus, 29^{mm}; middle toe with claw, 23^{mm}; graduation of tail, 5^{mm}.

Turdus naumanni TEMM.

An adult male, differing in no way from typical specimens of the Red-tailed Thrush, was collected in Oroku, Okinawa Shima, March 28, 1886. The total length is given as 240^{mm}; stretch of wing, 400^{mm}. Wing, 130^{mm}; tail-feathers, 89^{mm}; exposed culmen, 17^{mm}; tarsus, 32^{mm}; middle toe with claw, 27^{mm}.

Monticola solitaria (MÜLL.).

An adult female from Napa, Liu Kiu, March 5, 1886 (U. S. Nat. Mus. No. 109473), in the gray plumage. This species was also collected at Napa by the Rodgers Expedition, during the winter 1854–1855. A male in chestnut plumage is in the collection of the U. S. National Museum (No. 21146).—*Cf. Petrocossypus manillensis*, Cassin, Proc. Acad. Phila. 1862, p. 314.

Ianthia cyanura (PALL.).

A male in the olive plumage was collected at Nagogatake, Liu Kiu, March 16, 1886 (U. S. Nat. Mus. No. 109475).

Chelidon namiyei, sp. n.

DIAGN.—Similar to *Chelidon javanica* (SPARRM.), but considerably larger, with the gloss of the upper surface more greenish, and the gray of the under side purer; under tail-coverts margined with pure white.

TYPE.—Coll. Namiye, Urassoimagiri, Okinawa Shima, Liu Kiu Islands, March 11, 1886.

HABITAT. Liu Kiu Islands, Japan.

Tested by Mr. Sharpe's "Key" to the species of this genus (Cat. B. Brit. Mus., x, p. 124), the present species would have to be sought for in the section embracing "*rustica* and allies," viz, *savignii*, *gutturalis*, *erythrogastra*, and *tytleri*, as far as length of wing is concerned, it being about 4.60 inches in *Ch. namiyei*. It must be compared, however, with the species following, which have the "wing extending beyond the tips of tail," and "no band on the fore neck," especially those with white spots on the tail-feathers and with the under tail-coverts "smoky brown."

Chelidon namiyei is at once distinguished from *Ch. neoxena* by the much shallower furcation of the tail, it being about 20^{mm} deeper in the Australian species, which, in fact, has the tail nearly as furcate and the outer tail-feathers quite as attenuated as *Ch. gutturalis*.

Our new species is much nearer related to *Ch. javanica*, from which, however, it differs not only in size, being, as it is, considerably larger, but also in coloration. The gloss of the upper surface is more greenish; the brown of the throat is more chestnut; the gray of the under parts deeper and less tinged with rusty; the under tail-coverts darker and tipped with pure white margin not tinged with rusty, as in the Javan bird. It should be remarked, however, that in the unsexed specimen in the Philadelphia Academy, these tips are nearly white. The tail of the present species is somewhat more furcate, but in spite of this, the outer rectrices are less attenuated at the tip.

The following description of the type specimen is appended for the sake of completeness.

♂ *ad.* (*Urassoimagiri, Okinawa Shima, Liu Kiu, March* 11, 1886. *Coll. M. Namiye*). Above, except forehead and anterior portion of crown, black with a strong gloss of steel-blue, somewhat inclining to greenish; forehead and anterior half of the crown deep chestnut, the feathers of the latter being bluish black in the center; lores deep velvety black; cheeks and lower ear-coverts, chin, throat, and fore neck bright tawny hazel inclining slightly to cinnamon, and becoming somewhat lighter towards the breast; upper half of the ear-coverts, sides of neck bluish black, like the back, this color descending on the side of the breast, forming a distinct semilune on each side, which partly separates the hazel of the neck from the rest of the under surface, which is of a nearly pure drab, each feather near the middle line of the body broadly though not very distinctly margined with whitish, the under tail-coverts gradually becoming blackish towards the tip, which is broadly and distinctly margined with white; under wing-coverts and axillaries of a drab color similar to that of the breast, but darker; wings and tail above black with a faint gloss of steel green; the tail-feathers, except the middle pair, with an oblique oval white spot in the inner web towards the tips, those on the outer pair being the smallest.

Total length, according to Namiye, 145^{mm}; stretch of wings, 325^{mm}. Wing, 118^{mm}; longest tail-feathers, 58^{mm}; furcation of tail, 14^{mm}; exposed culmen, 8.5^{mm}; tarsus, 10^{mm}; middle toe with claw, 15^{mm}.

In order to better show the differences in size and proportions between the present species and its two nearest allies I append the following

Table of comparative measurements.

1. CHELIDON NAMIYEI.

Museum and No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.	Furcation of tail.
Tokio Educat. Mus...	Namiye.....	♂ ad.	Urassoimagiri, Okinawa.	Mar. 11, 1886.	118	58	8.5	10	15	14

Table of comparative measurements—Continued.

2. CHELIDON JAVANICA.

Museum and No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe with claw.	Furcation of tail.
Philad'a. Acad., $\frac{3}{4}\frac{5}{9}$	Verreaux	♂ ad.	Java		102	48	...	..	....	10
Do	....do	.....	"Coupang", Java		99	46	...	..	....	7

3. CHELIDON NEOXENA.

Philad'a. Acad	Gould, 1047	♂ ad.	Rottnest Isl., Austr.		117	78	7	..	....	34
Do	Gould, 1048	♂ ad.	W. Austr.		117	78	...	..	....	34
Do	Gould, 1049	♂ ad.	V. Diem. Land		111	76	...	..	....	36
Do	Gould, 1050	♀ ad.	....do		108	71	...	..	....	28

Ampelis japonicus (SIEB.).

A male, collected in Liu Kiu, March 26, 1886 (U. S. Nat. Mus., No. 109477), is identical with specimens from Japan proper. Its total length, as given on the label, is 187^{mm}; stretch of wing, 330^{mm}.

Pericrocotus tegimæ, sp. nov.

DIAGN.—Similar to *P. cinereus*, but with a very broad and distinct pectoral band of a dark ashy, and without light edges or margins to the remiges and their upper coverts: tertiaries uniform blackish in both webs.

TYPE.—U. S. Nat. Mus., No. 109476.

HABITAT.—Liu Kiu, Japan.

The discovery of this very distinct species of *Pericrocotus* is most interesting, and it affords me great pleasure to dedicate it to the distinguished director of the Educational Museum at Tokio, Mr. S. Tegima, to whose zeal we are indebted for many of our most important accessions.

Two specimens, both males, collected March 11 and 12, 1886, by Mr. Namiye, on Okinawa Shima, agree in every particular and prove beyond doubt the great distinctness of the form.

Two adult males of the so-called *P. cinereus*, from the Main Island of Japan, are also in the collection, affording good material for comparison with a male collected by Mr. Jankovski in Ussuri. A specimen of the nearly allied *P. cantonensis* is also at hand.

The first result of a careful comparison is, that the male Japanese birds differ from the Ussuri specimen in the following points:

1. The black on head and upper neck also occupies the upper interscapilium, not contrasting so abruptly with the ashy of the back, which, besides, is darker and more blueish.

2. The bill and feet are proportionately larger.

I shall designate the Japanese bird as *Pericrocotus japonicus* (Type U. S. Nat. Mus., No. 109349), taking the mainland bird to be the true *P. cinereus*. This name, however, was based on a female from the Philippine Islands, consequently on a bird with gray head, and it is, therefore, impossible to determine from his description whether the name belongs to the Japanese or the Continental form, the more so since he gives no other measurements than those of total length and tail. A direct comparison with the type will be necessary to settle the question beyond doubt. In the meantime I feel justified in retaining *P. cinereus* for the form which has been so designated by most writers, and especially by Mr. R. B. Sharpe in his valuable Catalogue of Birds in the British Museum (vol. IV, pp. 83, 84).

Pericrocotus tegimæ, as the following comparison with *P. cinereus* and *P. japonicus* will show, is, perhaps, the most distinct and best-defined species of the group containing the gray *Pericrocoti*. It will be observed that only such characters have been included in the above diagnosis, which probably apply to the females as well as to the males.

The males of *P. tegimæ* differ from the males of *P. cinereus* and *P. japonicus*:

(1) By having the whole crown bluish black, only leaving a narrow white band on the forehead and a short superciliary stripe white, while in the two last-named forms the white covers the whole forehead and anterior half of the crown.

(2) By the bluish black of the upper head and neck not ending abruptly, but gradually becoming lighter backwards over all the upper parts which are much darker than in any of the allied species.

(3) By having the entire upper surface of the wing uniform blackish, with the exception of a small but well defined white speculum at the base of the outer secondaries, while the other forms have the bases of the primaries and secondaries as well as the outer webs of the tertiaries ashy, and the latter margined with more or less white, while all the coverts, except primary coverts, are bordered with gray.

(4) By possessing no trace of the white speculum on the outer web of the sixth primary.

(5) By having the lower fore neck and upper breast dark ashy, in strong contrast with the white of the throat, upper fore neck, and middle lower breast and abdomen, while in the allied forms the whole under surface is pure white.

(6) By having the under side of the shafts of the four central tail-feathers black, these being white in *P. cinereus* and *P. japonicus*.

(7) By having comparatively much shorter wings than either of the two other forms.

In view of this comparison, extending over nearly all the essential parts, a detailed description of *P. tegimæ* is deemed unnecessary in the present connection. I may remark that both specimens are precisely alike, except that in the specimen now in the U. S. National Museum

(the type) the white on the forehead is somewhat broader, it being only a very narrow line in the one sent for examination.

Comparative table of measurements.

P. TEGIMÆ.

Museum and No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Bill from nostril.	Tarsus.	Middle toe, with claw.	Total length.	Culmen to extreme base.
U.S. Nat. 109476	Namiye.....	♂ ad.	Liu Kiu	Mar. 11, 1886	87	96	12	10	16	16	...	18
.....	....do	♂ ad.	Chatanmagiri, Okinawa.	Mar. 12, 1886	83	96	13	10	15	17	200	18

P. JAPONICUS.

U.S. Nat. 109349	Namiye.....	♂ ad.	Amagi, Idzu....	May 1, 1885	99	95	12.2	9.5	16	18	...	18.5
U.S. Nat. 109348	...do	♂ ad.	....do	May 6, 1885	100	101	12.5	10	16	19	...	18.5
U.S. Nat. 88656	Jouy, 387	♀ ad.	Fuji	July 2, 1882	96	95	12	9.75	16	17	...	18
U.S. Nat. 91382	Jouy, 628	♂jun.	Chusenji Lake..	Aug. 27, 1882	96	96	12	9	15	17	...	18

P. CINEREUS.

U.S. Nat. 108892	Jankovski, 1765	♂ ad.	Sidenij, Ussuri..	May 13, 1884	95	91	11	8	14	16	...	16

Parus castaneoventris GOULD.

A female apparently belonging to this form, originally described from Formosa, and hitherto only known from that island, was collected at Nagogatake March 16, 1886. It is smaller than typical *P. varius*; it has only a few rufous feathers adjoining the black of the hind neck instead of a large triangular spot; and the creamy spot just behind the black of the fore neck is only faintly indicated. The flanks are also considerably paler than in the Hondo bird. Unfortunately I have no Formosa skin to compare it with, but in the points referred to it agrees with the descriptions of Gould and Swinhoe. The dimensions, however, are slightly in excess of those given by these authors, being, in fact, intermediate between typical birds of both species.

Comparative table of measurements.

PARUS VARIUS.

Museum and No.	Collector and No.	Sex and age.	Locality.	Date.	Wing.	Tail-feathers.	Exposed culmen.	Tarsus.	Middle toe, with claw.	Total length.
U.S. Nat. 91344..	Jouy, 831	♂ ad.	Tate Yama, Hondo	Dec. 3, 1882	76	54	12	20	20	...
U.S. Nat. 91343..	Jouy, 827	♀ ad.	.....do	Dec. 1, 1882	79	54	11	20	20	...
U.S. Nat. 109353..	.....	♀ ad.	Amagi, Idzu	May 2, 1885	72	48	11	19	18	...

PARUS CASTANEOVENTRIS.

U.S. Nat. 109478..	Namiye.....	♀ ad.	Nagogatake, Liu Kiu.....	Mar. 16, 1886	67	48	12	19	17.5	127

Spinus spinus (LIN.).

A pair collected at Napa, March 5 (U. S. Nat. Mus., Nos. 109479, 109480), concludes the list of species which were sent from these interesting islands.

Of this species I have only two more Japanese male birds for comparison with eight European males. In the former the black cap seems to reach further down on the hind neck than in the western birds. Additional Japanese specimens are, therefore, desirable, as with the present series I do not feel justified in separating the eastern bird.

WATER-BIRDS OF JAPAN.

By T. W. BLAKISTON.

If for no other reason, the publication in Bulletin No. 29 of the United States National Museum (Washington, 1885), of Mr. Stejneger's careful study of the birds of Kamtschatka and the adjacent Commander Islands, demands a further revision of the Japan list,* especially among the water-birds, so many of which are common to the two countries. Without any desire to anticipate Mr. Stejneger in those valuable contributions to the ornithology of Japan that he is now engaged upon, and which are appearing in successive papers in the Proceedings of the United States National Museum, entitled "Review of Japanese Birds,"† it is, on the contrary, with his full concurrence and assistance that the present list and notes are given, with a view perhaps as much to exhibit the deficiencies in our information, and thereby draw the attention of working ornithologists in Japan to questions which can only be solved through their exertions, as to bring up to date our positive knowledge on the subject.

Of the two tables here given, the first includes all the water-birds of Japan, embracing the Kurils, Bonins, and other outlying islands, so far as at present known. The total, inclusive of some doubtful records, is 94, of which about one-third are fresh-water species. The table has been arranged in four columns, in order to exhibit at a glance the geographical regions to which the birds belong, or rather their range; those under circumpolar being common to both the Atlantic and Pacific Oceans, or the Eurasian and American continents; palæarctic, being found on both sides, or extending across the Old World; Eastern Asiatic, confined to the eastern part of that continent; and Pacific, such as occur on both the eastern and western shores of that ocean, but not elsewhere.

While Japan exhibits a fair share in the water-birds which range around the arctic and north-temperate region, as shown in the first column, those belonging to the Eurasian continent and its waters, which the second and third columns taken together embrace, outnumber by one-half such as reach the American continent enumerated in the fourth column. This, from the position of the Japan Islands, is what might have been expected when fresh-water and marine species are taken together; but when a separation is made it will be found that this preponderance is due entirely to the great proportion of fluviatile or fresh-

* See (1) Catalogue of the Birds of Japan, Ibis, 1878; (2) Catalogue of the Birds of Japan, Trans. As. Soc. Japan, viii, 1880; (3) Catalogue of the Birds of Japan, Trans. As. Soc., Japan, x, 1882; (4) Amended List of the Birds of Japan, London, January, 1884.

† Sec. 1, The Woodpeckers, Proc. U. S. Nat. Mus., 1886, p. 99, *et seq.*

water palæarctic species, while Pacific forms largely predominate among the sea-birds proper. Indeed, there are but four or five of the American species which can be considered fluviatile, even by stretching that term, and one of them, *Anser albifrons gambeli*, is a sub-species at best. On the other hand, of birds of the Atlantic, and not circumpolar, but three gulls reach Japan, and one of these may possibly prove to be an Eastern representative of the true European species. The rest are peculiar to the Pacific Ocean, two-thirds of them being found on its American side. We thus see that so far as the water-birds are concerned Japan is, in its fresh-water inhabitants, Eurasian, and in its marine, Asio-Pacific. We learn nothing from this result, however, but that Japan is in its right place, or rather that, considering its position, its water-ornis is as it should be.

The second table, prepared so far as materials at hand will permit, exhibits the distribution of sea-birds peculiar to the North Pacific. The middle column, which enumerates those whose range extends across that ocean, is really no more than column four of the other table—the fresh-water species being omitted—with one bird in addition inhabiting the peninsula of Kamtschatka, which is not as yet known in Japan. It is instructive in that it shows that the most northern species are nearly all found on both sides, as might have been expected, owing to the near approach of the two continents in the north and their wide divergence southwards, while of the southern there are, when distinct, usually allied species representing the absent ones, and forming a corresponding marine avifauna. This, although not strictly true, is sufficiently so for general comparison; therefore it has been considered as well to make the following notes of reference, not only to draw attention to the exceptions, but to give the authorities for some of the determinations of species and sub-species which now stand under names differing from these hitherto used in published lists of Japan birds.

It will be observed that the number of birds peculiar to the American coast is more than double those of the Asiatic side. This is, perhaps, in great part due to the ornithology of the former having been much more fully worked up than that of the western side; for when we consider the extensive range in latitude of the Japanese Islands, from Cape Lopatka, at the extremity of Kamtschatka, to the Liu-Kius and Bonins, on the verge of the tropics, it cannot be doubted that there is a great field for zoological research, well worthy of more particular investigation than has yet been bestowed upon it.

So far Japan has been spoken of as a whole, and, while it has not been considered necessary to analyze very particularly the outside range of its water-birds, as those of Kamtschatka, which so nearly agree, have been fully gone into by Mr. Stejneger in his "Conclusions," forming Part III of his "Ornithological Explorations,"* it may be as well

*Bull. No. 29, U. S. Nat. Mus., 1885, pp. 332–359.

to remind readers of this paper that the chain of islands forming that country politically, can by no means be considered so homogeneous zoologically; nor would it be in reason to do so, even did we not know that while the resident fauna of the main or middle island is, to a considerable extent peculiar, that of Yezo is mostly Siberian, while the Bonins and Liu-Kius produce some local forms, in the latter mingled with Formosan or Chinese. Moreover, we find an indication of some degree of peculiarity attaching to the southwestern portion of the main island and Kiúshiu, which adjoins it, with a trace—in birds, at least—of Chinese. Besides this, it is noticeable that *some* migratory birds—non-oceanic—have been found on the Kurils and Yezo, but not on the main or southern islands; and as these are species which summer in Kamtschatka and winter in China, their non-occurrence south of the Strait of Tsugaru might indicate a line of migration across the Sea of Japan from Yezo to the mainland of the continent, possibly an ancient migration route. This seems, however, far from probable, for we know of other birds which do migrate along the Kurils (from Kamtschatka?) which pass through the whole of Japan. Mr. Stejneger has enlarged upon the absence of certain Japan birds in Kamtschatka, and the occurrence there of continental species unknown in Japan (speaking, of course, of migratory birds), and he is no doubt right in believing that the bare volcanic Kurils would not be a favorite route for many kinds. In addition, it must be borne in mind that such a line is not a direct route northwards from Japan, for the Kurils stretch off northeastward, while a due north line runs from Yezo, through Sakhalin, to the mouth of the Amur, and is over wooded land. This would be the most natural one, even supposing the Kuril Islands to have existed from a remote geological period, which is contrary to the opinions held by geologists. Moreover, Mr. Stejneger has shown it to be probable that certain birds reach Kamtschatka from the region south of Lake Baikal, while some others which pass along the western shore of the Okhotsk Sea do not penetrate Kamtschatka, but continue their journey north and east of it, *because it is a peninsula* with its point to the southward. It is probable, therefore, that few birds take the line of the Kurils as a migration route, although this is, from the scanty material at hand, little more than speculation, and should not perhaps have been entered into, save to draw the attention of collectors to the necessity of securing specimens from all localities and submitting them for careful identification, in order that those finely-drawn characters which sometimes distinguish races of the same species may be discovered, and lead to precise conclusions on the interesting subjects of migration and distribution.

(1) DISTRIBUTION OF THE WATER-BIRDS OF JAPAN.*

	Circumpolar.		Palæarctic.		East Asiatic.		Pacific.
14	Colymbus auritus LINN.	15	Colymbus cristatus LINN.	7	Synthliboramphus wumizusume (TEMM.).	2	Lunda cirrhata PALL.
	=*cornutus* GMEL.	16	minutus (LATH.).			3	Fratercula corniculata NAUM.
18	Urinator arcticus (LINN.).	17	nigricollis (BREHM).	10	Cepphus carbo PALL.	4	Simorhynchus cristatellus (PALL.).
18½	adamsii (GRAY).		=*auritus* (BRISSON).	22½?	Anser segetum middendorffi (SEV.).	5	pygmæus (GMEL.).
19	lumme (GUNN.).	20	Olor cygnus (LINN.).	26	Anser cygnoides (LINN.).	6	pusillus (PALL.).
	=*septentrionalis* (LINN.).		=*C. musicus* BECHST.	31	Anas zonorhyncha SWINH.	5½	Cyclorrhynchus psittaculus (PALL.).
27	Chen hyperborea (PALL.).	21	bewicki (YARR.).	32	Aix galericulata (LINN.).	13	Cerorhinca monocerata (PALL.).
30	Anas boschas LINN.	22	Anser segetum (GMEL.).	44	Aythya affinis mariloides (VIGORS).	8	Synthliboramphus antiquus (GMEL.).
36	Dafila acuta (LINN.).	23?	brachyrhynchus BAILL.	57½	Phalacrocorax capillatus TEMM.	9?	Brachyramphus kittlitzii BRANDT.
41	Spatula clypeata (LINN.).	25	erythropus (LINN.).	75½	Fregata minor (GMEL.).		? *perdix* PALL.
42	Chaulelasmus streperus (LINN.).	33	Tadorna casarca (LINN.).	62	Sterna sinensis GMEL.	10½	Cepphus columba PALL.
48	Histrionicus histrionicus (LINN.).		=*rutila*, PALL.	63	kamtschatica PALL.	11?	Uria troile californica (BRYANT).
50	Clangula hyemalis (LINN.).	34	cornuta (GMEL.).		=*longipennis* NORDM.	12	Tomvia arra (PALL.).
	=*glacialis* (LINN.).	35	Mareca penelope (LINN.).	65	Larus crassirostris VIEILL.	15½	Colymbus holbœllii (REINH.).
51	Eniconetta stelleri (PALL.).	37	Querquedula crecca (LINN.).		=*melanurus* (TEMM. & SCHL.).		=*P. rubricollis major* TEMM. & SCHLEG.
	=*S. dispar* (SPARRM.).	38	querquedula (LINN.).	72	kamtschatchensis (BONAP.)	24?	Anser albifrons gambeli (HARTL.).
56	Merganser serrator (LINN.).		=*circia* (LINN.).		=*nireus* PALL.	28	Branta canadensis hutchinsii (SW. & RICH.).
57	Phalacrocorax carbo (LINN.).	39	falcata (GEORGI).	76	Diomedea derogata SWINH.	29	Branta nigricans (LAWR.).
60?	Sula sula (LINN.).	40	formosa (GEORGI).	82	Puffinus leucomelas (TEMM. & SCHL.).	53	Oidemia americana (SW. & RICH.).
	leucogaster (BODD.).	43	Aythya marila (LINN.).	82½	Puffinus carneipes GOULD.	58	Phalacrocorax urile (GMEL.).
61	Sterna fuliginosa GMEL.	45	fuligula (LINN.).				=*bicristatus* PALL.
61½?	Anous stolidus (LINN.).		=*cristata* (LEACH).			59	pelagicus PALL.
66	Larus glaucus BRÜNN.	46	ferina (LINN.).				=*bicristatus* (TEMM. & SCHLEG.).
71	leucopterus FABER.	47	Nyroca ferruginea (GMEL.).			67	Larus glaucescens NAUM.
74½	Stercorarius longicaudus VIEILL.	49	Glaucionetta clangula (LINN.).			68	cachinnans PALL.
	=*buffonii* (BOIE).		=*glaucion* (LINN.).			70	schistisagus STEJN.
75	parasiticus (LINN.).	52	Oidemia fusca (LINN.).			74	Rissa tridactyla pollicaris RIDGW.
	=*crepidatus* (BANKS).	54	Merganser albellus (LINN.).			77	Diomedea albatrus PALL.
75½	pomarinus (TEMM.).	55	merganser (LINN.).			78	nigripes AUD.
80	Oceanodroma leucorhoa (VEILL.).		=*castor* (LINN.).			79	Fulmarus glacialis glupischa STEJN.
		68½	Larus affinis REINH.				=*P. pacifica* AUD.
		69	canus LINN.			81½	Puffinus griseus (GMEL.).
		73	rudibundus LINN.			83	tenuirostris (TEMM.).
						81	Oceanodroma furcata (GMEL.).

* Numbers refer to Blakiston and Pryer's Catalogue, Transactions of the Asiatic Society of Japan, 1882. The interrogation mark (?) against the number signifies uncertain determination. The nomenclature is that adopted in the Check List of the American Ornithologists' Union, 1886.

	Only on the Asiatic side.		Common to both sides.	Only on the American side.
		2	Lunda cirrhata PALL. (*a*)	
		3	Fratercula corniculata NAUM. (*b*)	
		4	Simorhynchus cristatellus (PALL.). (*c*)	
		5	pygmæus (GMEL.).	
		6	pusillus (PALL.).	
		5½	Cyclorrhynchus psittaculus (PALL.). (*d*)	
		13	Cerorhinca monocerata (PALL.). (*e*)	Ptychoramphus aleuticus (PALL.). (*h*)
				Brachyramphus hypoleucos XANTUS.
7	Synthliboramphus wumizusume (TEMM.). (*f*)	8	Synthliboramphus antiquus (GMEL.).	marmoratus (GMEL.).
		9?	Brachyramphus kittlitzi BRANDT. (*g*)	craveri (SALVAD.).
			?*perdix* PALL.	
10	Cephus carbo PALL. (*i*)	10½	Cephus columba PALL.	
		11	Uria troile californica (BRYANT). (*j*)	Urinator pacificus (LAWR.).
		12	lomvia arra (PALL.). (*k*)	
57½	Phalacrocorax capillatus TEMM. (*l*)	58	Phalacrocorax urile (GMEL.). (*m*)	Phalacrocorax dilophus cincinatus (BRANDT).
		59	pelagicus PALL. (*n*)	albociliatus RIDGW.
75½	Fregata minor (GMEL.). (*o*)			penicillatus (BRANDT).
				pelagicus robustus RIDGW.
				resplendens (AUD.)
62	Sterna sinensis GMEL.			Sterna elegans GAMB.
63	camtschatica PALL.			aleutica BAIRD.
65	Larus crassirostris VIEILL.	67	Larus glaucescens NAUM.	Larus nelsoni HENSH.
72	kamtschatchensis BONAP. (*p*)	70	schistisagus STEJN. (*q*)	occidentalis AUD.
		68	cachinnans PALL.	californicus LAWR.
		74	Rissa tridactyla pollicaris RIDGW. (*r*)	heermanni CASS.
			brevirostris BRUCH.	
	Diomedea derogata SWINH. (*s*)	77	Diomedea albatrus PALL.	
76		78	nigripes AUD.	
		79	Fulmarus glacialis glupischa STEJN. (*t*)	Fulmarus glacialis rodgersii (CASS.).
	Puffinus leucomelas (TEMM. & SCHL.). (*u*)	81½	Puffinus griseus (GMEL.). (*w*)	Puffinus creatopus COUES. (*y*)
82	carneipes GOULD. (*v*)	83	tenuirostris (TEMM.). (*x*)	gavia (FORST.).
82½				cinereus (GMEL.).
				Æstrelata fisheri RIDGW.
	Swinhoe included in his "Revised Catalogue of the Birds of China," *Sterna melanauchen* TEMM., *Sterna pelecanoides* KING, *Larus saundersi* SWINH., *Larus brunneicephalus* JERDON, *Thalassidroma monorhis* SWINH.			Halocyptena microsoma COUES.
		81	Oceanodroma furcata (GMEL.).	Oceanodroma melania (BONAP.).
				homochroa (COUES).

REFERENCES FROM TABLE OF SEA-BIRDS PECULIAR TO THE NORTH PACIFIC.

(*a*) In Japan, only on Yezo and the Kurils.

(*b*) In Japan, only on the Kurils.

(*c*) In Japan, only on Yezo and the Kurils.

(*d*) In Japan, only on the Kurils.

(*e*) Has not been found north of Yezo in Japan, and was not obtained by Mr. Stejneger in Kamtschatka, though he has included it in his "Synopsis of the Birds reported to inhabit Kamtschatka" (Bull. U. S. National Museum, No. 29, 1885), on the authority of Dr. Dybowski. On the American coast it breeds as far south as California, ranging to Lower California in winter.—A. O. U. Check List, p. 78.

(*f*) This, like the preceding species, is only found in Japan, in Yezo and the south, and is not included in the Kamtschatkan list. It was given in the "American Ornithologists Union Check List" as "from Washington Territory northward," but this it appears was an error which has been pointed out by Mr. Stejneger (vide antea, p. 524). The nearly allied species *S. antiquus* is a more northern bird.

(*g*) Japan collections contain no examples from the Kurils, and Mr. Stejneger missed this species at the Commander Islands. He has lately, however, received a bird from Kamtschatka which he considers *B. perdix* PALL., which hitherto has been used as a synonym of *B. marmoratus*, and he believes Japan specimens will be referable to that species.

(*h*) Mr. Stejneger considers the record of this species too uncertain to include it as an inhabitant of Kamtschatka. *B. craveri* and *B. hypoleucus* are both southern species, and not likely to occur on the Asiatic side.

(*i*) *Cepphus carbo* seems, as Mr. Stejneger remarks, "to be restricted to a very limited area." Its occurrence on the eastern shore of Kamtschatka is uncertain, while in Japan it is only determined with certainty on Yezo, all Kuril specimens being *C. columba*.

(*j*) (*k*) These are both of somewhat uncertain determination in Yezo and the Kurils, some specimens having been referred to Brünnich's Guillimot of the Atlantic, and lately Mr. Seebohm ("Ibis," 1885, p. 364) mentions "an almost complete series" of intermediate forms. Mr. Stejneger's conclusions on his Bering Island examples, however, leave no doubt as to the two Pacific sub-species being there.

(*l*) Of this cormorant Mr. Seebohm says ("Ibis," 1885, p. 271): "I have skins of five adults, besides those of several immature birds. The dated adults are Amoy, February; Amoy, April; Hakodadi, February * * *. Like the Common Cormorant, it has fourteen tail-feathers, but it is a slightly larger bird; the gorget is profusely streaked with greenish black, and the scapulars and wing-coverts are bronzy green, narrowly margined with black, as in the Shag."

(*m*) (*n*) Both these species were obtained by Mr. Stejneger on the Commander Islands, and are included in the Japan list. *P. perspicillatus* PALL. has been omitted, as Mr. Stejneger considers it exterminated from those islands.

(*o*) This species should possibly not figure in a list of peculiar *North* Pacific birds, depending, as it does, only on a single specimen obtained on Yezo. It is represented on the American Pacific coast by *Fregata aquila* (LINN.), which also inhabits the Atlantic.

(*p*) This has appeared in Japan lists until now as *L. delawarensis* ORD and *L. ridibundus* PALL., but Mr. Stejneger, after a critical examination and comparison of his specimens collected in Kamtschatka, arives at this name as the correct one, saying: "This Asiatic form is in some respects intermediate between *delawarensis* and *californicus*."

(*q*) Mr. Stejneger believes the Japan bird No. 70 to be the Pacific representative of *L. marinus* of the Atlantic, described by him from Kamtschatka in The Auk, 1884, p. 231, as *L. schistisagus*, which occurs also in Alaska.

(*r*) The Pacific Kittiwake, pointed out by Mr. Stejneger as a sub-species from Kamtschatka, includes that of the Pacific American coast, and doubtless that of Japan.

The Red-legged Kittiwake, *R. brevirostris*, was also obtained by him on Bering Island, but has not been collected in Japan.

(*s*) This name is retained on the Japan list pending an absolute decision as to whether it is the young of *D. albatrus*.

(*t*) Japan specimens only from the Kurils, consequently Mr. Stejneger's sub-specific name for his Commander Islands birds has been adopted.

(*u*) (*v*) In Japan not farther north than Yezo.

(*w*) In Japan specimens from the Kurils only.

(*x*) This is the only Shearwater recorded from Kamtschatka. In Japan it has been found only on the Middle Island.

(*y*) The three Shearwaters here given as confined to the American coast, are all southern species.

It may be as well, perhaps, also to append hereto some few notes referring to species not appearing in the second table, rendered necessary by the progress of ornithological research.

In the first place the Razor-bill (*Alca torda* LINN.) of the Atlantic has hitherto headed the Japan lists as "No. 1," but as it rests solely on the authority of the "Fauna Japonica," and is otherwise unrecorded from the Pacific, it is now omitted.

No. 10. The Sooty Guillemot, while confined to the Asiatic side of the Pacific, is unrepresented by a corresponding species on the American coast, unless we consider *Cepphus mandtii* (LICHT.) of the Arctic regions, found in Alaska, as taking its place, which is doubtfully included among the birds of Kamtschatka. (See Stejneger's "Results," Bull. U. S. National Museum, No. 29, 1885.)

No. 14. The Grebes are poorly represented in Kamtschatka by *C. auritus* and *C. holbœllii*, which Mr. Stejneger considers only as occasional stragglers at the Commander Islands. In Japan no specimens have been obtained on the Kurils or other outlying islands.

No. 21. An authentic specimen of *Olor bewicki* has been collected in Japan by Mr. Jouy. Mr. Stejneger obtained a young Swan on Bering Island which he has placed as the North American *O. columbianus* (ORD) = *americanus* Sharpless.

No. 22. Mr. Stejneger remarks (Bull. U. S. National Museum, No. 29, 1885): "The state of things in regard to the species of geese of Eastern Asia is in a deplorable condition." So far as Japan is considered this cannot be gainsaid. In the first place *A. segetum* was identified by Swinhoe ("Ibis," 1875, p. 456), but it was always believed that there was a larger form also in Japan, as well as in China, where Swinhoe included it in his "Revised Catalogue" (P. Z. S., 1871) as var. *serrirostris*. Mr. Stejneger seems convinced that the two forms do exist, and attributes specimens now in the United States National Museum collected by him at Bering Island to the larger, which he decides to be *A. segitum middendorffi* Severz. (= *A. grandis* Midd.), although he hesitates to include Swinhoe's *serrirostris*. In the present list, therefore, a number has been intrepolated as 22½? to represent the larger form in Japan.

No. 23 ?. The Pink-footed Goose as an inhabitant of Japan rests only on an identification made by Swinhoe ("Ibis," 1875, p. 456), of a speci-

men which is missing ("Amended List of the Birds of Japan," London, January, 1884).

No. 24. In the present list this name has been changed, and appears in the fourth column, as Mr. Stejneger has identified his specimen from Bering Islands so; and he remarks: "Schlegel has already pointed out that the Japanese white-fronted geese belong to the large American form" *gambeli*, which, however, he says can be considered "only a race or sub-species of *albifrons*, while the latter may be regarded as specifically distinct from *erythropus*." The examination of a large number of specimens will be necessary before a point like this can be decided, as both forms may occur in Japan.

No. 26. It may be that this species will have to be split up into two races according to size, as with the White-fronted and Bean Goose.

No. 35. There is little to remark on the true fresh-water ducks, but it may be mentioned that Nos. 31, 32, 33, and 34 are not known from Kamtschatka, and 40 and 42 are somewhat doubtful, while but a single species, *Mareca americana* (GMEL.), outside the Japan list, has occurred, which Mr. Stejneger considered a storm-blown bird that he found dead on Bering Island.

No. 44. This duck is considered the representative in Eastern Asia of the Lesser Scaup of North America, while No. 43 is the true Large Scaup of the Palæarctic Region, represented in America by *A. marila nearctica*, given a sub-specific distinction by Mr. Stejneger. In this division of the ducks, Nos. 44, 46, and 47 of the Japan list are wanting in Kamtschatka. On the other hand, the Buffle-headed Duck, *C. albeola* (LINN.), of the American continent, the Pacific Eider *S. v-nigra* (GRAY), and the King Eider, *S. spectabilis* (LINN.), which are found on the peninsula or the adjacent Commander Islands, are unknown in Japan. It should be noted likewise that, although Nos. 50 and 51 are on the Japan list, they are confined to the north, the former not having been found south of Yezo, while the only examples of the latter are from the Kuril Islands.

No. 52. Regarding the Scoters inhabiting the eastern coasts of Asia, the black-winged sub-genus may be disposed of by saying that the American species, *O. americana* (SW. & RICH.), is that found in Japan and Kamtschatka, *O. nigra* (LINN.) of Europe not having occurred. The Surf Scoter, *Oidemia* (*Pelionetta*) *perspicil'ata* (LINN.), may also be got out of the way by mentioning that it has not been found on the western shores of the Pacific. There remain, therefore, the two white-winged species, placed in the sub-genus *Melanitta*, but known as *Oidemia fusca* (LINN.) and *deglandi* BONAP. (=*velvetina* CASSIN), the specific distinction between which is limited (?) to a slight difference in the bill. While the first is European, with accidental (?) occurrence on the American continent, the other is North American, unknown in Europe. The question is what are the East Asiatic birds, and do they embrace both species? Mr. Stejneger has, without hesitation, referred his Bering Isl-

and specimens to *O. deglandi*, and has also done the same with an example in the U. S. National Museum from Shanghai. In China, Swinhoe considered *O. fusca* as the common species there, while he notes a single specimen of the American form as an exception ("Ibis," 1875, p. 457). At the same time he determined Japan examples as *O. fusca*, and Mr. Whitely's specimens were likewise so placed ("Ibis," 1867, p. 208). Other authorities for *O. fusca* in East Asia are quoted by Mr. Stejneger in his "Results of Ornithological Explorations," p. 176, and he remarks:

> The probability then being that the latter (*O. fusca*) occurs more to the northward and along the western shore of the Okotsk Sea to China, while *O. deglandi* reaches from Alaska across the Aleutian chain to Kamtschatka, the Kurils, and Japan, where it winters and meets *O. fusca* proper, sometimes even traveling as far as China, while, on the other hand, a stray individual of *O. fusca* occasionally finds its way to Alaska.

Careful comparison of further examples from Japan is necessary to clear up this question.

No. 54. Respecting the Mergansers it is only necessary to note that all those known in Japan are inhabitants of Kamtschatka; but only one reaches the American shore.

No. 62. This is the representative in Eastern Asia of *S. minuta* LINN. of Europe. The North Pacific is rather scantily supplied with Terns, but Mr. Stejneger obtained the Arctic Tern, *S. paradisæa* BRÜNN. (= *macrura* NAUM.), in Kamtschatka, which consequently ought to occur in Japan.

No. 65. This gull, which is so abundant in Japan, has not occurred in Kamtschatka, nor does it frequent any part of the American coast, so that it is probably confined to the temperate and semi-tropical parts of Eastern Asia, being, according to Swinhoe, "a common winter gull on the South China coast."

No. 73. In addition to the lettered references to the second table as to the gulls, it will be only necessary to say that Japan and Kamtschatkan specimens of *L. ridibundus* have been compared and found to agree by Mr. Stejneger, who seems inclined to share the opinions of Cassin and Middendorff, that the Eastern bird is larger than the European.

No. 75. The three Skuas found in Japan, which are circumpolar birds, are recorded by Stejneger and Dybowski, from Bering and Copper Islands, off the coast of Kamtschatka.

No. 80. The two Stormy Petrels in the Japan list were the only species found by Mr. Stejneger at Bering and Copper Islands.

LONDON, OHIO, *November* 5, 1886.

ALPHABETICAL INDEX.

[Pages in heavy type contain important references.]

Chirocentrodon 562.

D.

N.

Q.

O

EXPLANATION OF PLATE I.

(For text see pp. 83–91.)

FIG. 1. Fulgurite with wing-like projections.
FIG. 2. Fulgurite from South Carolina, with bulb-like enlargements.
FIG. 3. Cross-section of fulgurite with wing-like projections.
FIG. 4. Holes made by lightning in a hollow copper globe.

Fig. 1.

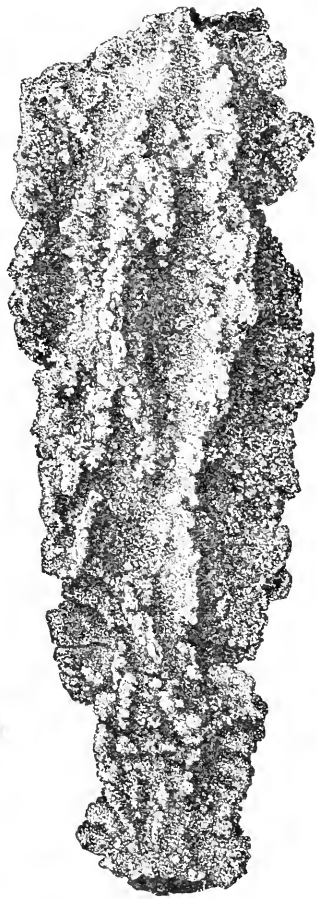
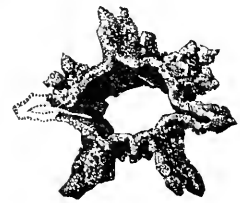


Fig. 2.

Fig. 4.

Fig. 3.



FULGURITES.

EXPLANATION OF PLATE II.

Dryobates namiyei Stejn. A new species of Japanese bird.

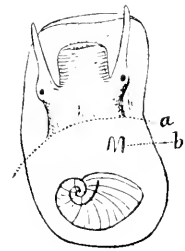
For description see page 116.

DRYOBATES NAMIYEI STEJN.

EXPLANATION OF PLATE III.

FIG. 1. Aquilonaria turneri Dall, dentition.
FIG. 2. Aquilonaria turneri Dall, animal, 6-1, page 204.
a, line of margin of shell (removed), page 204.
b, anal papilla, page 204.
FIG. 3. Aquilonaria turneri Dall, shell 4-1.
FIG. 4. Bela solida Dall, page 301.
FIG. 5. Alvania castanella Dall, page 307.
FIG. 6. Mangilia aleutica Dall, page 299.
FIG. 7. Bela lævigata Dall, page 300.
FIG. 8. Onoba saxatilis Möller, page 306.
FIG. 9. Cingula var. martyni Dall, page 306.
FIG. 10. Velutina conica Dall, page 305.
FIG. 11. Onoba aleutica Dall, page 307.

1



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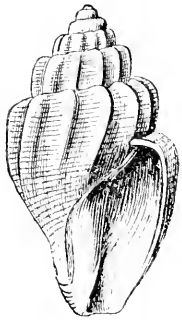

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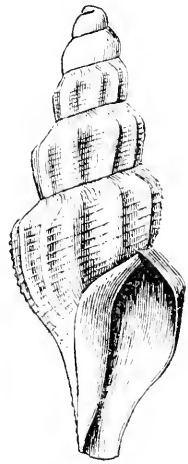

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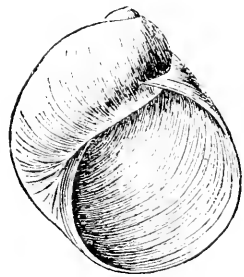
8

9



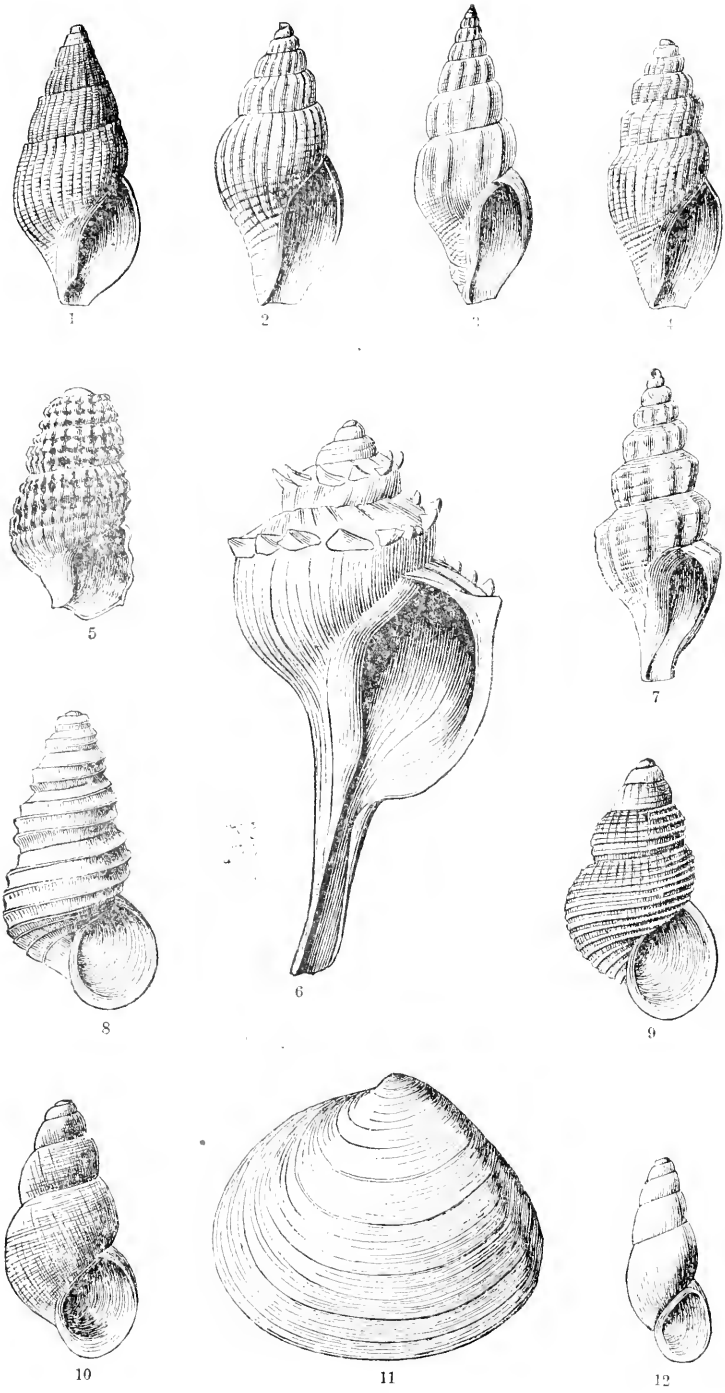
10

11

EXPLANATION OF PLATE IV.

FIG. 1. Bela albrechti Krause, page 300.
FIG. 2. Bela harpa Dall, page 300.
FIG. 3. Bela alaskensis Dall, page 299.
FIG. 4. Bela krausei Dall, page 301.
FIG. 5. Cerithiopsis var. truncatum Dall page 304.
FIG. 6. Trophon muriciformis Dall, page 302.
FIG. 7. Bela sculpturata Dall, page 299.
FIG. 8. Alvania aurivillii, Dall, page 308.
FIG. 9. Alvania castanea, Möller, var. alaskana Dall, page 307.
FIG. 10. Cingula var. scipio Dall, page 306.
FIG. 11. Macoma middendorffii, Dall, page 308.
FIG. 12. Onoba cerinella Dall, page 307.

PLATE IV.



EXPLANATION OF PLATE V.

Pandarus Cranchii Leach (page 317).

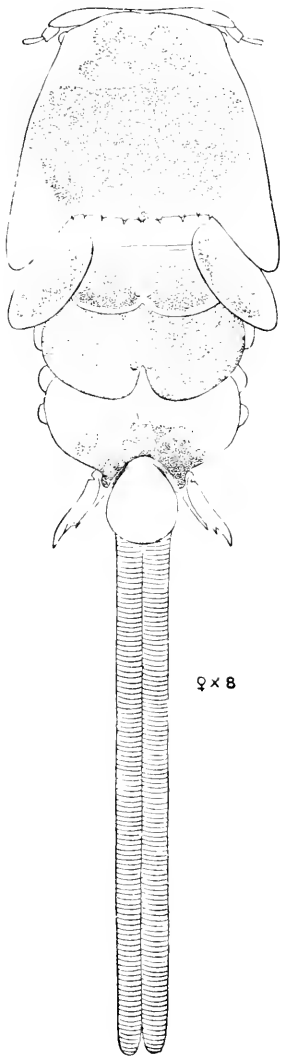
Fig. 1. Female, dorsal view, enlarged 8 diameters. The shaded portions indicate dark color markings.

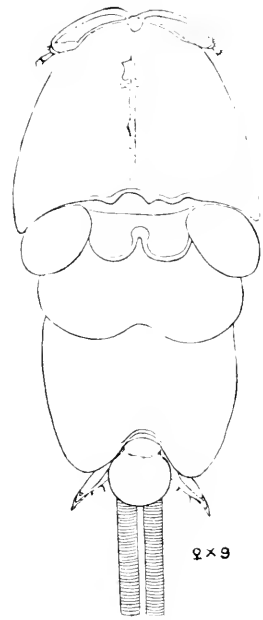
Pandarus sinuatus Say (page 310).

Fig. 2. Female, dorsal view, enlarged about 9 diameters. Only the basal portions of the egg-sacks are shown.

Pandarus Smithii, sp. n. (page 315).

Fig. 3. Female, dorsal view, enlarged about 9 diameters.


1
♀ × 8


2
♀ × 9


3
♀ × 9

EXPLANATION OF PLATE VI.

Pandarus sinuatus Say ♀ (page 310).

(Unless otherwise stated, all figures on this plate are from sand-shark specimens.)

Fig. 1. Posterior margin of first segment, and dorsal appendages of second, third, and fourth segments, enlarged 14 diameters; from *Mustelus canis*.

Fig. 2. Posterior sinus of fifth segment, dorsal caudal plate, and caudal stylet of one side, enlarged 31 diameters; from *Mustelus canis*.

Fig. 3. Ventral view of ventral caudal plate, and caudal stylets; the posterior margin of the dorsal caudal plate is also indicated; enlarged 22 diameters.

Fig. 4. Anterior antenna, with the adjacent sucking disk, enlarged 52 diameters.

Fig. 5. Posterior antenna, with the adjacent sucking disk, enlarged 52 diameters.

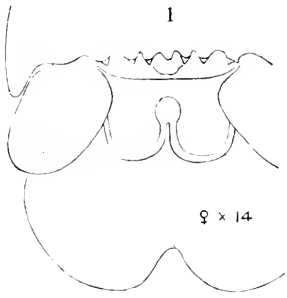
Fig. 6. Rostrum and palpi, enlarged 52 diameters.

Fig. 7. First pair of foot jaws, enlarged 52 diameters.

Fig. 8. Second pair of foot jaws, enlarged 22 diameters.

PLATE VI.

1



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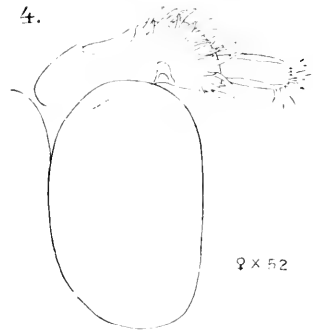

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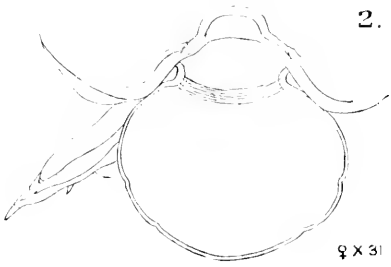

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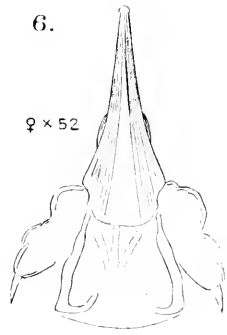
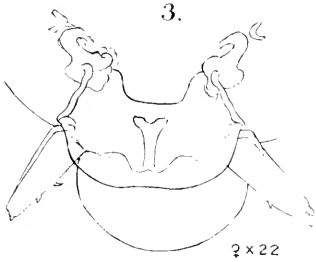
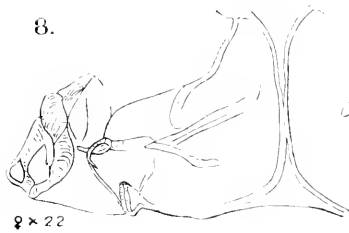
6.



3.



8.



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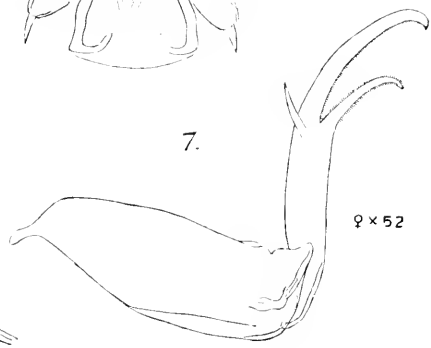


EXPLANATION OF PLATE VII.

Pandarus sinuatus Say ♀ (page 310).

(Unless otherwise stated, all appendages of this species figured on this plate are from sand-shark specimens.)

Fig. 1. Swimming foot of first pair, enlarged 52 diameters; from *Carcharodon Atwoodi.*

Fig. 2. Swimming foot of first pair, enlarged 29 diameters.

Fig. 3. Swimming foot of second pair, enlarged 22 diameters.

Fig. 4. Swimming foot of third pair, enlarged 22 diameters.

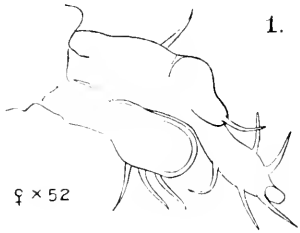
Figs. 5, 6. Swimming feet of fourth pair of two specimens, enlarged 22 diameters.

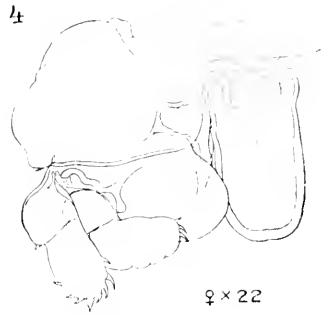
Fig. 7. Swimming foot of fourth pair, from *Carcharodon Atwoodi*, enlarged 22 diameters.

Fig. 8. Swimming foot of fourth pair, from *Mustelus canis*, enlarged 22 diameters.

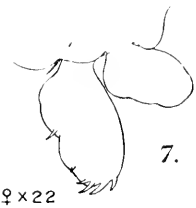
Pandarus Smithii, sp. n. ♀ (page 315).

Fig. 9. Swimming foot of fourth pair, enlarged 22 diameters.

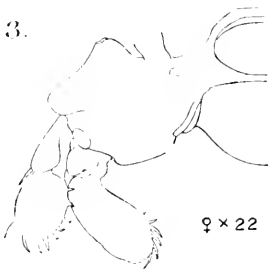

1.
♀ × 52

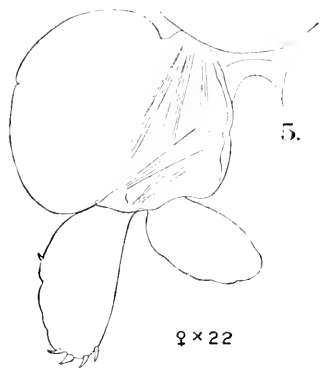

4
♀ × 22


2
♀ × 29

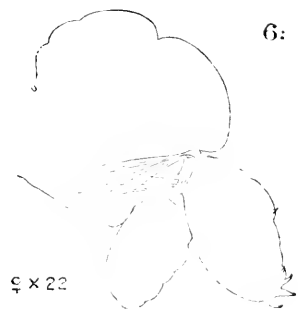

7.
♀ × 22


8.
♀ × 22


3.
♀ × 22


5.
♀ × 22


9.
♀ × 22


6.
♀ × 22

EXPLANATION OF PLATE VIII.

Chondracanthus galeritus, sp. n. (page 317).

Fig. 1. Female, dorsal view, and upper half of egg-sacks, enlarged 11 diameters.

Fig. 2. Same specimen, lateral view, with egg-sacks shown in full, enlarged 11 diameters.

Fig. 3. Female, partly contracted specimen, viewed laterally and ventrally, enlarged 9 diameters.

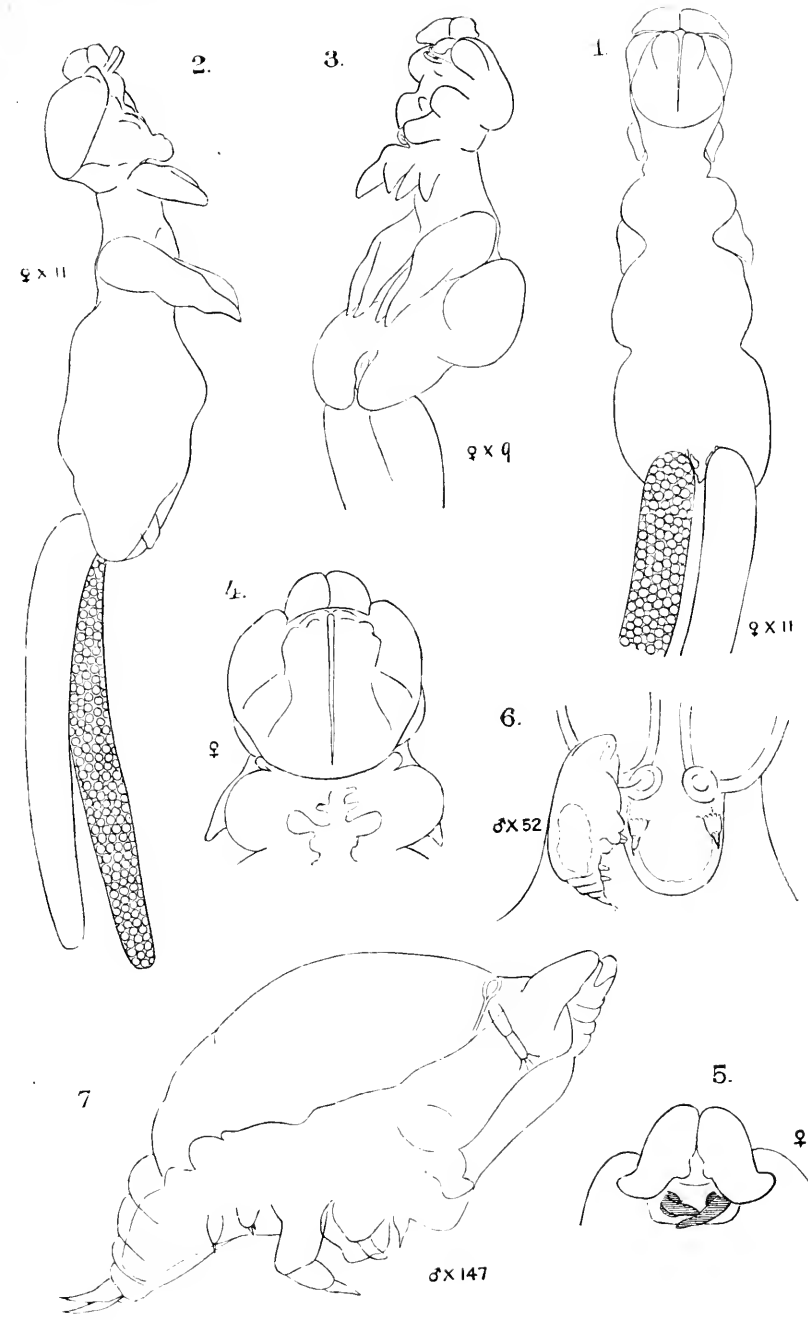
Fig. 4. Dorsal view of head and thorax of contracted specimen, similar to fig. 3, showing the manner in which the anterior antennæ may be partly withdrawn on to the ventral surface; enlarged somewhat more than fig. 3.

Fig. 5. Ventral view of anterior part of head, and of the anterior antennæ of same specimen as fig. 4.

Fig. 6. Male attached to posterior part of body of female, enlarged 52 diameters.

Fig. 7. Male, lateral view, enlarged 147 diameters.

PLATE VIII.



EXPLANATION OF PLATE IX.

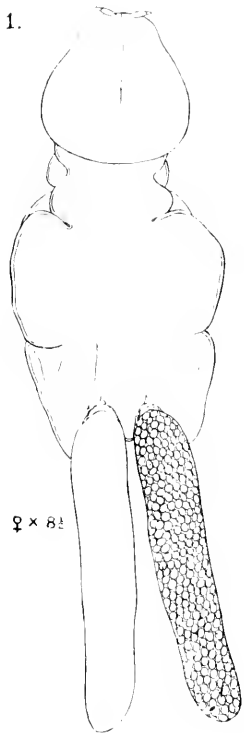
Chondracanthus phycidis, sp. n. (page 320).

Fig. 1. Female, dorsal view, enlarged 8½ diameters.
Fig. 2. Same specimen, ventral view, enlarged 8½ diameters.
Fig. 3. Same specimen, lateral view, enlarged 8½ diameters.
Fig. 4. Female, younger specimen, dorsal view, enlarged 14½ diameters.
Fig. 5. Same specimen, ventral view, enlarged 14½ diameters.
Fig. 6. Male, lateral view, enlarged 112 diameters.

2.

♀ × 8½

1.



♀ × 8½

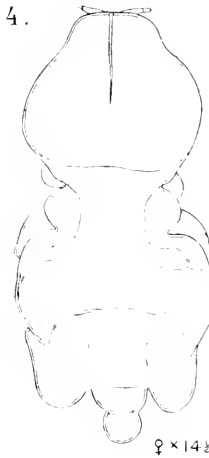
3.

♀ × 8½

5.

♀ × 14½

4.



♀ × 14½

6.

♂ × 11½

EXPLANATION OF PLATE X.

Chondracanthus galeritus, sp. n. ♀ (page 317).

Fig. 1. Posterior antennæ, and anterior antenna of one side, enlarged 35 diameters. The shaded portions represent the horny frame-work at the bases of the posterior antennæ.

Figs. 2, 3. Tips of the anterior antennæ of two specimens, showing the slightly lobed termination: enlarged considerably more than fig. 1.

Fig. 4. Posterior antennæ of a second specimen, enlarged 35 diameters. The shaded portions represent the walls of the antennæ and horny basal frame-work, the latter varying greatly in appearance, according to the treatment of the preparation.

Fig. 5. First pair of mouth organs, enlarged 250 diameters.

Fig. 6. Second pair of mouth organs, enlarged 125 diameters.

Fig. 7. Third pair of mouth organs, enlarged 125 diameters.

Chondracanthus phycidis, sp. n. ♀ (page 320).

Fig. 8. Anterior antenna of one side, enlarged 112 diameters.

Fig. 9. Posterior antenna of one side, enlarged 120 diameters.

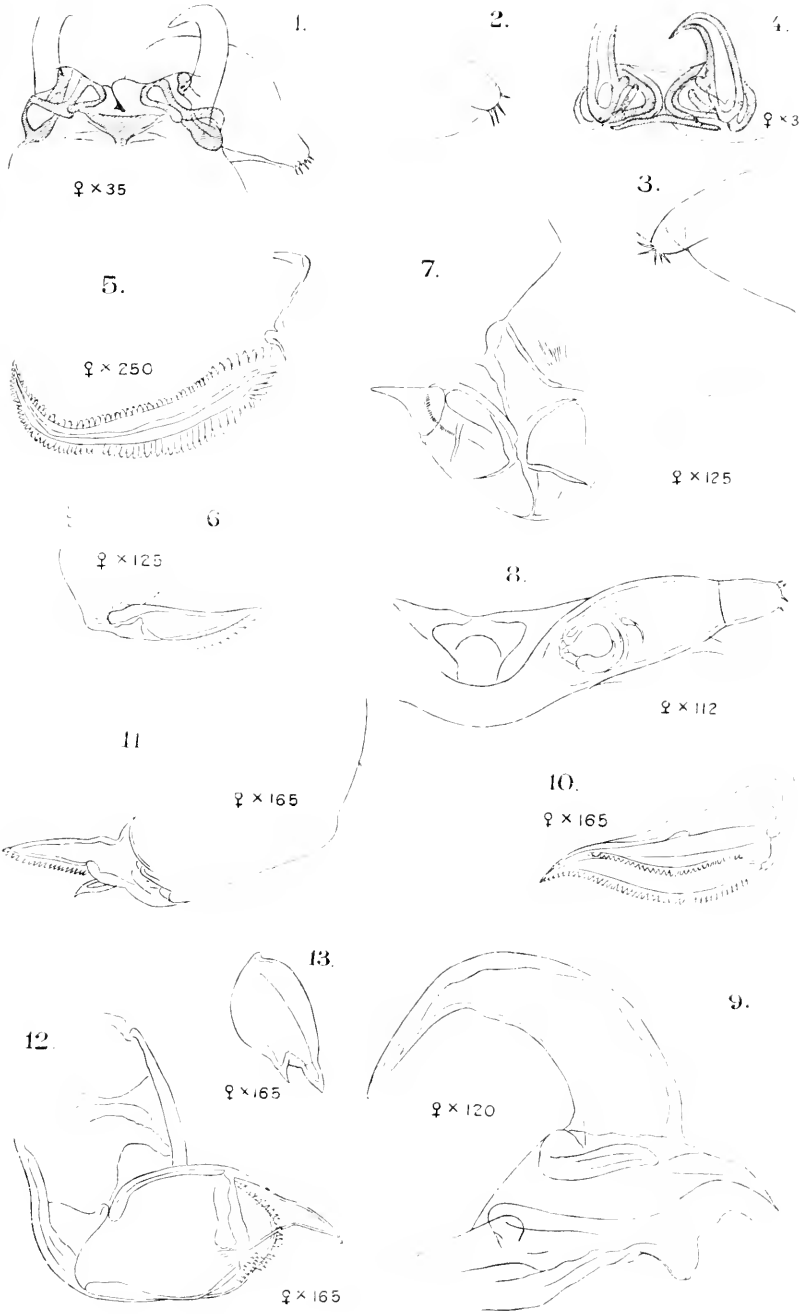
Fig. 10. First pair of mouth organs, enlarged 165 diameters.

Fig. 11. Second pair of mouth organs, enlarged 165 diameters.

Fig. 12. Third pair of mouth organs, enlarged 165 diameters.

Fig. 13. Palpus from side of mouth opening, enlarged 165 diameters.

PLATE X.



EXPLANATION OF PLATE XI.

Chondracanthus cottunculi, sp. n. ♀ (page 322).

Fig. 1. Dorsal view, enlarged 11 diameters.

Fig. 2. Ventral view, with male attached to caudal segment, enlarged 11 diameters.

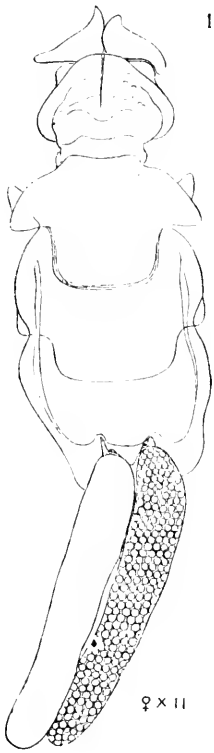
Fig. 3. Lateral view, enlarged 11 diameters.

Fig. 4. Anterior antennæ, basal joints of the second antennæ, and horny basal frame-work of the latter; enlarged 28 diameters.

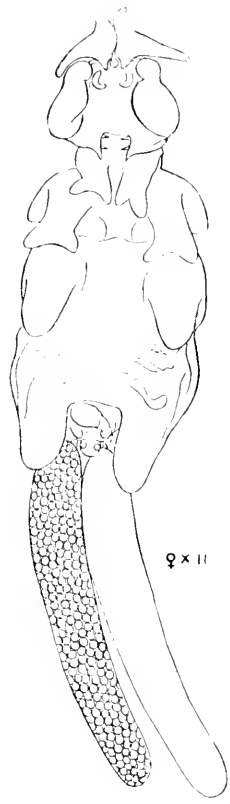
Fig. 5. Anterior antenna of another specimen, showing an apparent joint near the middle (see page 323), and posterior antenna, roughly drawn; enlarged slightly less than fig. 4.

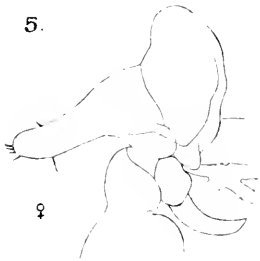
Fig. 6. Second pair of mouth organs, enlarged 55 diameters.

Fig. 7. Third pair of mouth organs, enlarged 55 diameters.

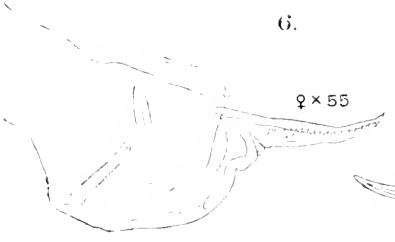

1
♀ × 11

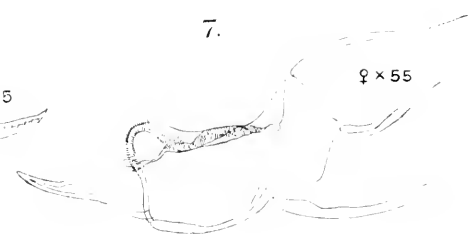

3
♀ × 11


♀ × 11


5.
♀

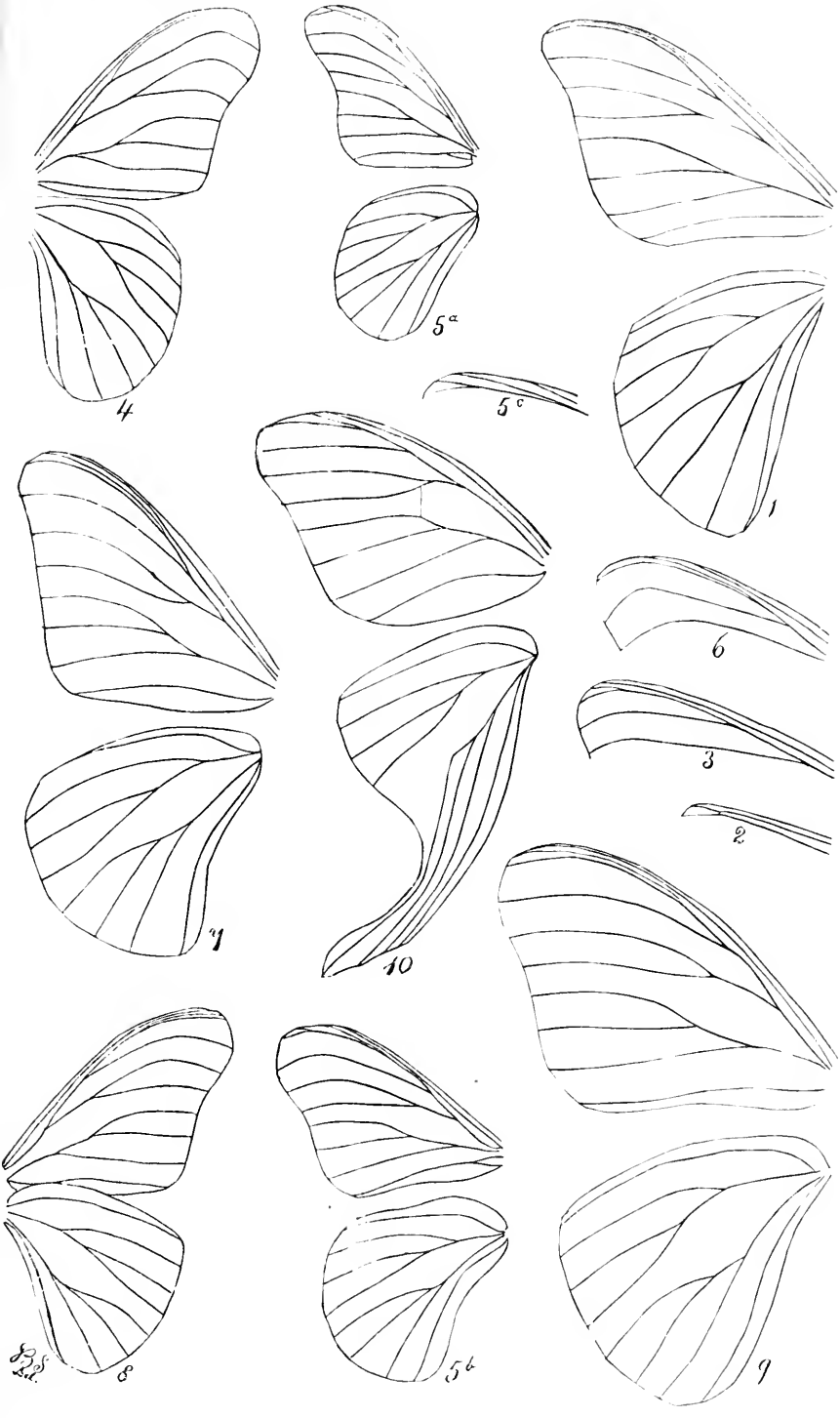

4.
♀ × 28


6.
♀ × 55


7.
♀ × 55

EXPLANATION OF PLATE XII.

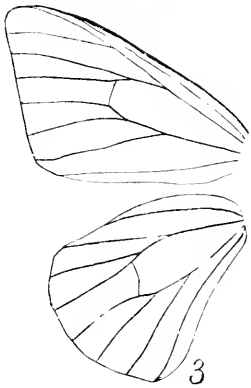
1. Venation of *Samia cynthia* (page 416).
2. Venation of *Attacus splendidus* (apex of primaries) (page 420).
3. Venation of *Attacus cinctus* (apex of primaries) (page 421).
4. Venation of *Attacus calleta* (page 423).
5*a*. Venation of *Attacus promethea* ♂ (page 423).
5*b*. Venation of *Attacus promethea* ♀ (page 423).
5*c*. Venation of *Attacus promethea* ♂ at tip of primaries.
6. Venation of *Attacus columbia* at tip of primaries (page 424).
7. Venation of *Attacus gloveri* (page 425).
8. Venation of *Attacus ceanothi* (page 426).
9. Venation of *Attacus cecropia* (page 427).
10. Venation of *Actias luna* (page 428).

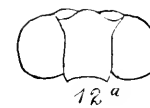

4
5a
5c
1
6
3
2
7
10
8
5b
9

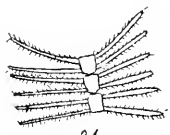
EXPLANATION OF PLATE XIII.

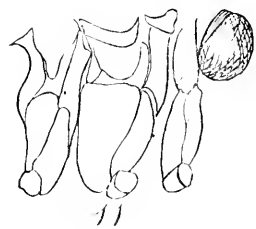
1. Venation of *Telea polyphemus* (page 429).
2. Venation of *Saturnia galbina* (page 431).
3. Venation of *Calosaturnia mendocino* (page 432).
4. Venation of *Hyperchiria io* (page 434).
5. Venation of *Hyperchiria pamina* (page 436).
6. Venation of *Coloradia pandora* (page 437).
7. Antenna of *Saturnia galbina* ♂ (page 431).
8. Antenna of *Telea polyphemus* ♀ (page 429).
9. Side view of thorax of *Samia cynthia* (page 416).
10. Dorsal view of thorax of *Samia cynthia* (page 416).
11. Side view of thorax of *Actias luna* (page 428).
12. Head of *Actias luna* (page 428).
13. Genitalia of ♂ of *Saturnia galbina*: *a*, side piece; *b*, supra-anal plate (page 430).

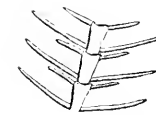
PLATE XIII.

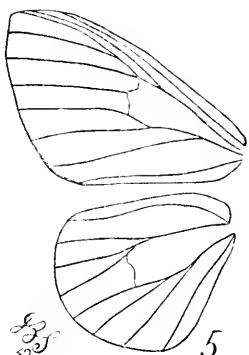






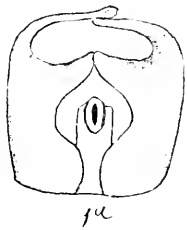


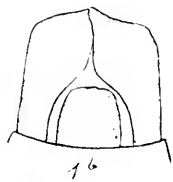




EXPLANATION OF PLATE XIV.

1. Genitalia of *Attacus splendidus* ♂: *a*, from below; *b*, from above; *c*, side piece detached; *d*, supra-anal plate (page 420).
2. Genitalia of *Attacus calleta* ♂: *a*, side piece from side; *b*, same from below; *c*, supra-anal plate (page 423).
3. Genitalia of *Attacus promethea* ♂: *a*, side piece from side; *b*, same from below; *c*, supra-anal plate (page 423).
4. Genitalia of *Attacus angulifera*: *a*, side piece from below; *b*, from side (page 424).
5. Genitalia of *Attacus ceanothi* ♂ (*gloveri* and *columbia* are exactly the same): *a*, side piece from side; *b*, from above; *c*, supra-anal plate (page 426).
6. Genitalia of *Attacus cecropia* ♂: *a*, side piece from above; *b*, same from side; *c*, supra-anal plate (page 427).
7. Genitalia of *Actias luna* ♂: *a*, from below, showing supra-anal plate and side piece; *b*, side piece from side (page 428).
8. Genitalia of *Telea polyphemus* ♂: *a*, half side view from above; *b*, side view (page 430).
9. Genitalia of *Hyperchiria io* ♂: *a*, side piece from side; *b*, supra-anal plate from side; *c*, same from above (page 434).
10. Genitalia of *Hyperchiria zephyria* ♂: *a*, from above; *b*, from below (page 436).
11. Genitalia of *Coloradia pandora* ♂: *a*, from above; *b*, from behind (page 437).
12. Head of *Samia cynthia* (page 416).


1a


1b


1d


1c


2a


2b


2c


3a

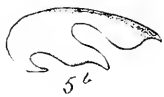

3b


3c


4a


4b

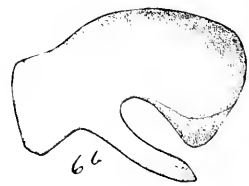

5a


5b


5c


6a


6c


6b


8a


8b


7a


7b


10a


10b


11a


11b


12a


12b

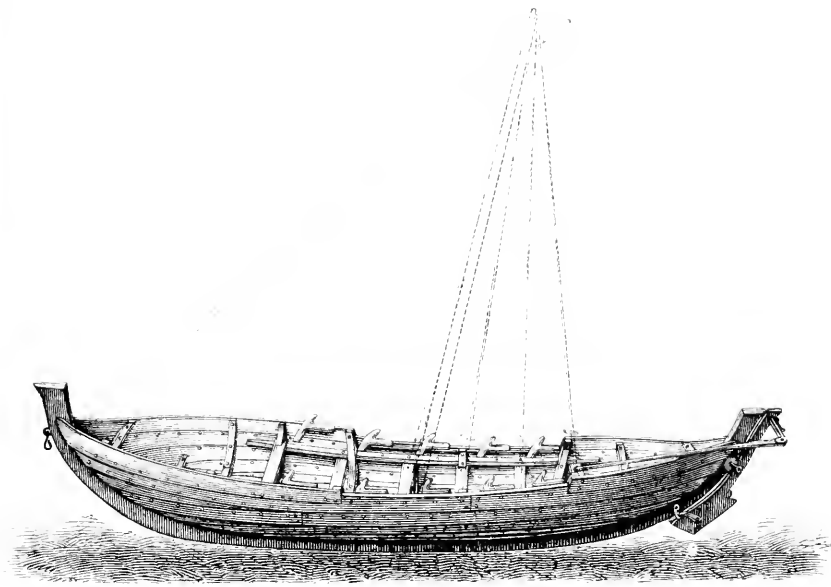

9c


9b


9a

EXPLANATION OF PLATE XV.

Boat used in the fisheries at Söndmöre, Norway, from Egersund, in Lister, round the North Cape to the frontier of Russia. Described on page 443.
(Drawing made fro ma model in the U. S. National Museum.)



THE SÖNDMÖRE BOAT.

EXPLANATION OF PLATE XVI.

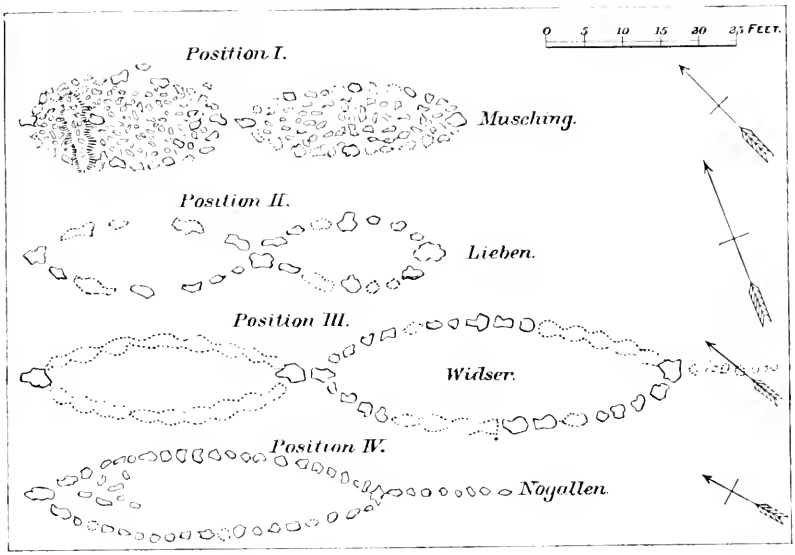
Runic stone found in Alskog parish, at Tjängvide, in the southern part of the island of Gotland, Sweden. Described on page 445.
(From figure in "The Land of the Midnight Sun," by Paul du Chaillu.)

RUNIC STONE FROM THE ISLAND OF GOTLAND, SWEDEN.

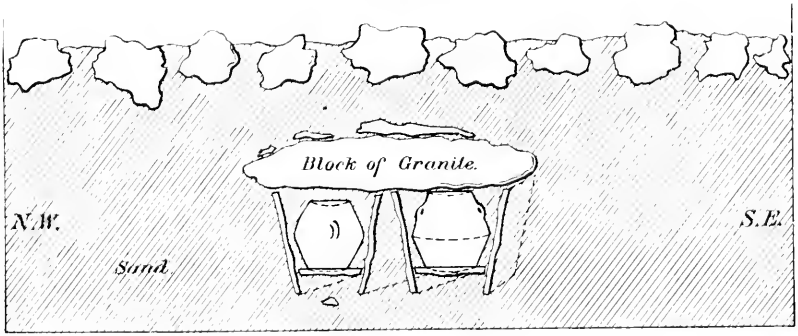
EXPLANATION OF PLATE XVII.

Boat-shaped groups in the diocese of Erwahlen, Courland, Russia.
Described on page 447.
(Copied from "C. Grewingk, Die Steinchiffe von Musching," &c.)

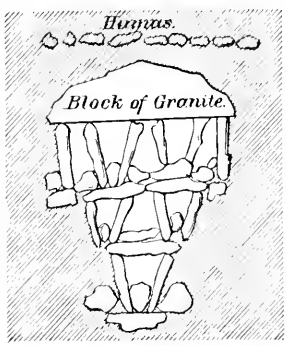
A.—*Boat positions of Erwahlen, Courland.*

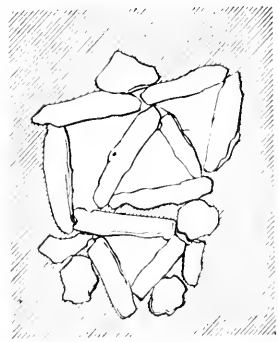


B.—*Sectional view.*



C.—*Stone chests in Boat-positions III.*

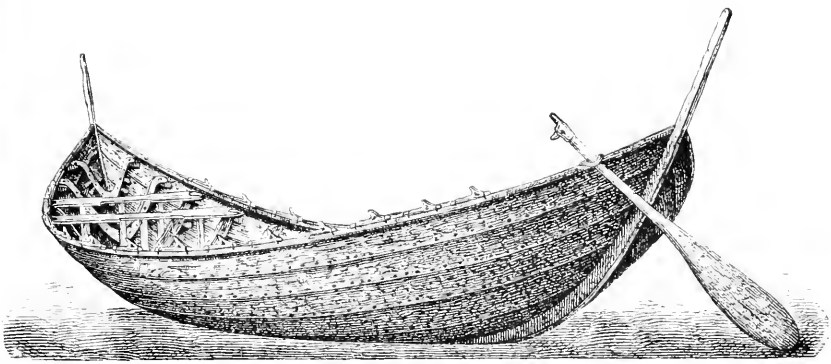




BOAT-SHAPED GROUPS IN COURLAND, RUSSIA.

EXPLANATION OF PLATE XVIII.

Boat found in Nydam Moss, in the Duchy of Schleswig, Germany.
Described on page 449. (Drawing as figured by Prof. C. Engelhard.)

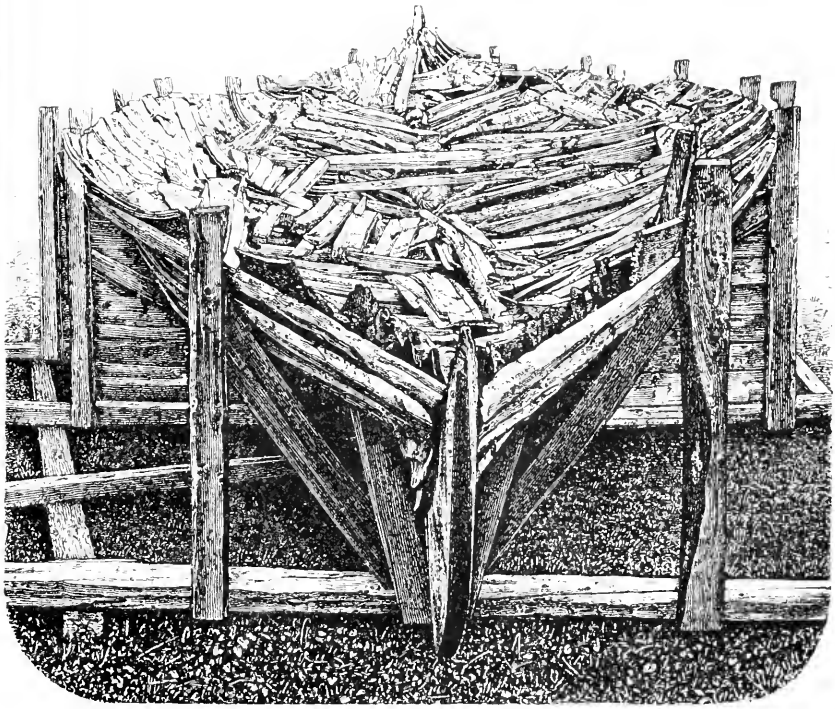


THE NYDAM MOSS (SCHLESWIG) BOAT.

EXPLANATION OF PLATE XIX.

The Gokstad ship found near the town of Sandefjord, west of the mouth of the Kristiania fjord, Norway.

Described on page 455.



THE GOKSTAD (NORWAY) VIKING BOAT.

EXPLANATION OF PLATE XX.

Protula diomedeæ Benedict, sp. nov.

FIG. 1. Thoracic uncinus, enlarged 650 diameters.
FIG. 2. Abdominal uncinus, enlarged 650 diameters.
FIG. 3. Long thoracic setæ, enlarged 433 diameters.
FIG. 4. Anterior abdominal setæ, enlarged 433 diameters.
FIG. 5. Posterior abdominal setæ, enlarged 433 diameters.
FIG. 6. Tube, natural size.

Protula americana McIntosh.

FIG. 7. Anterior uncinus, after McIntosh, enlarged 700 diameters.

Protula alba Benedict, sp. nov.

FIG. 8. Abdominal uncinus, enlarged 650 diameters.
FIG. 9. Anterior abdominal setæ, enlarged 433 diameters.

Hydroides dianthus Verrill.

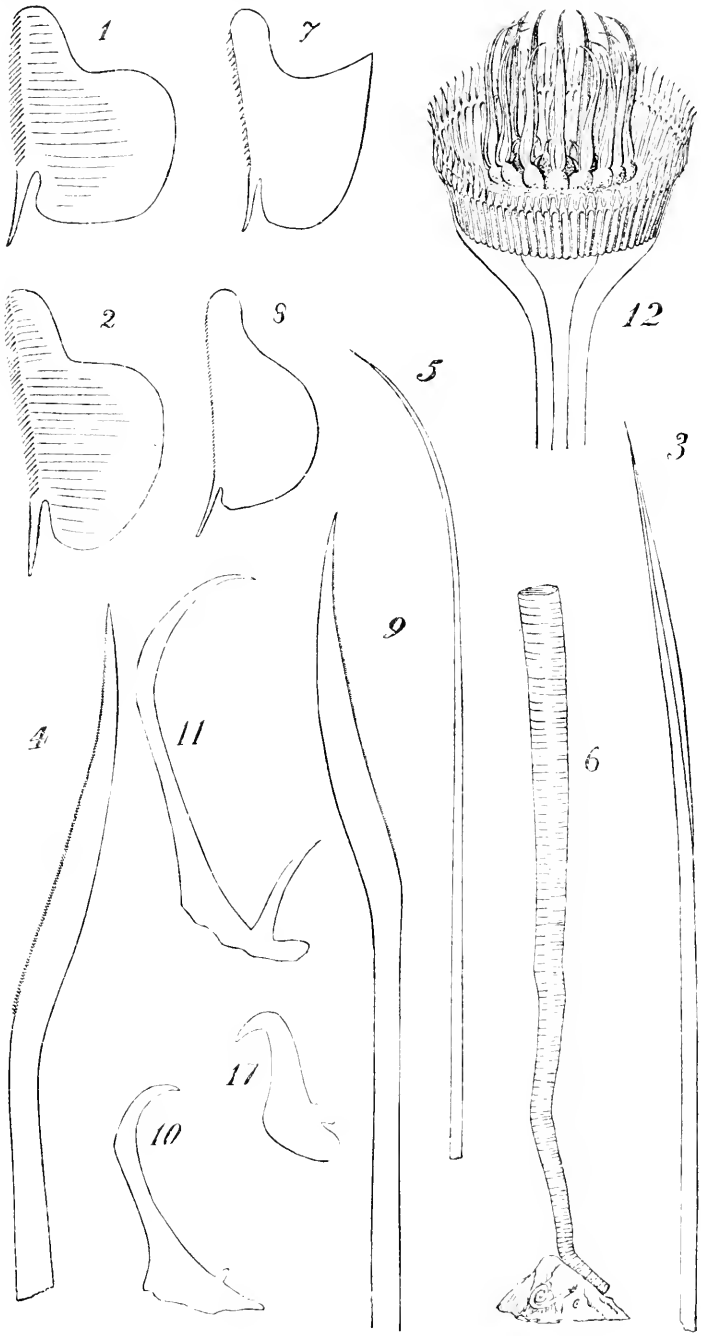
FIG. 10. Spine of operculum, showing conical process at base, enlarged 43 diameters.

Hydroides spongicola Benedict, sp. nov.

FIG. 11. Spine of operculum, enlarged 43 diameters.
FIG. 12. Operculum, enlarged.

Hydroides protulicola Benedict, sp. nov.

FIG. 17. Large spine of operculum, showing protuberance on inner base, enlarged 43 diameters.


1
7
12
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EXPLANATION OF PLATE XXI.

Hydroides spongicola Benedict, sp. nov.

FIG. 13. Collar setæ, enlarged 325 diameters.
FIG. 14. Abdominal uncinus, enlarged 650 diameters.
FIG. 15. Thoracic uncinus, enlarged 650 diameters.
FIG. 16. Spatulate setæ of abdomen, enlarged 325 diameters.

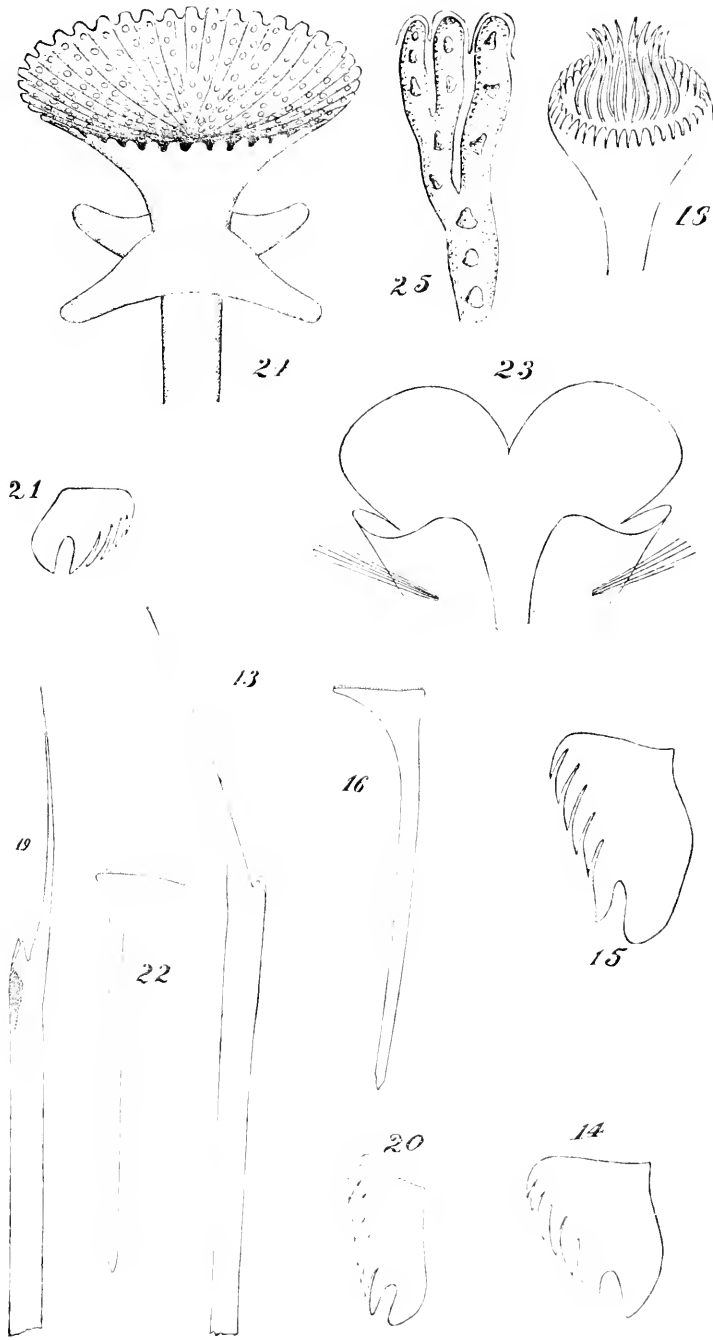
Hydroides protulicola Benedict, sp. nov.

FIG. 18. Operculum, enlarged.
FIG 19. Collar setæ, enlarged 210 diameters.
FIG. 20. Thoracic uncinus, enlarged 650 diameters.
FIG. 21. Abdominal uncinus, enlarged 650 diameters.
FIG. 22. Spatulate setæ, enlarged 325 diameters.
FIG. 23. Outline of collar, enlarged 37 diameters.

Crucifera Websteri, Benedict sp. nov.

FIG. 24. Disk of operculum, enlarged.
FIG. 25. Radii, enlarged.

PLATE XXI.



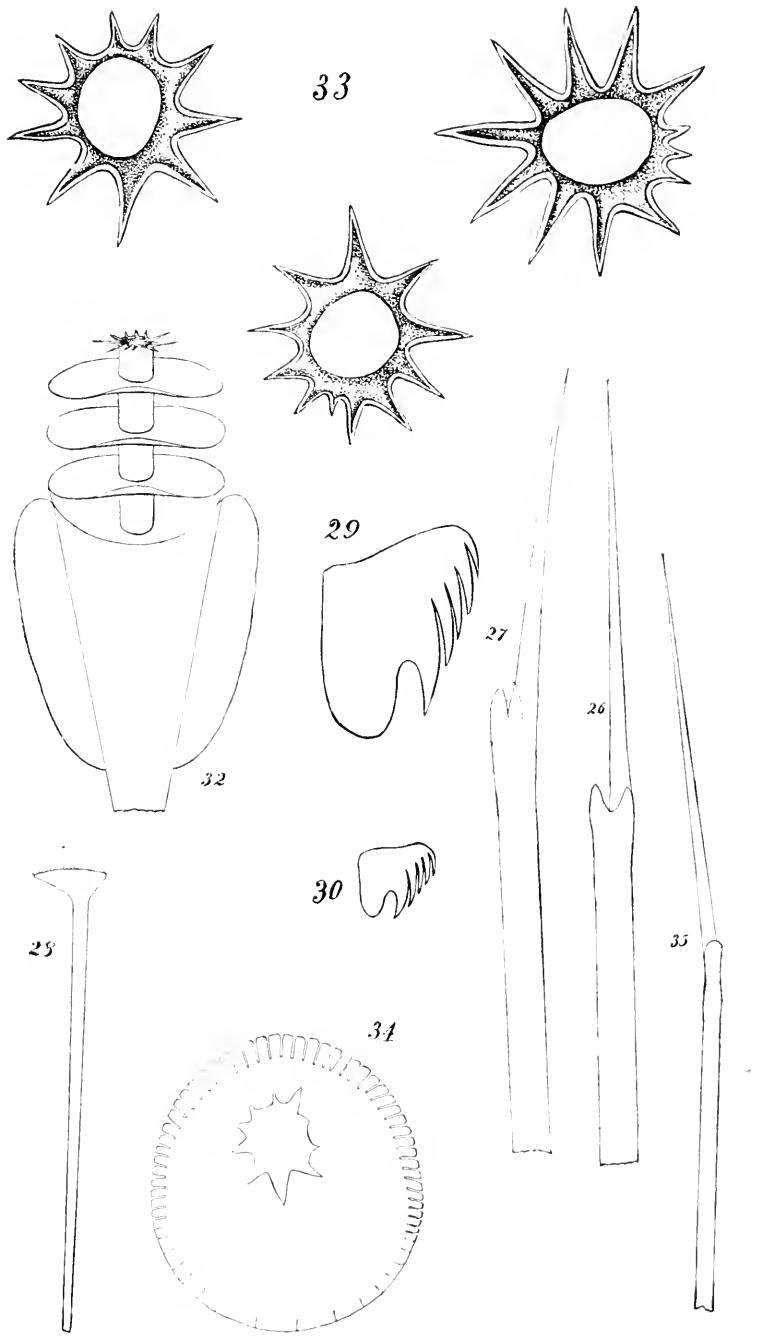
EXPLANATION OF PLATE XXII.

Crucifera Websteri Benedict, sp. nov.

FIG. 26. Collar setæ, front view, enlarged 210 diameters.
FIG. 27. Collar setæ, side view, enlarged 210 diameters.
FIG. 28. Spatulate setæ, enlarged 325 diameters.
FIG. 29. Thoracic uncinus, enlarged 650 diameters.
FIG. 30. Abdominal uncinus, enlarged 650 diameters.

Pomatostegus stellatus Schmarda.

FIG. 32. Operculum and pedunele, enlarged.
FIG. 33. Stellate ends of opercula, enlarged.
FIG. 34. Lower disk of operculum, enlarged.
FIG. 35. Collar setæ, enlarged 210 diameters.


33
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28
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34

EXPLANATION OF PLATE XXIII.

Pomatostegus stellatus Schmarda.

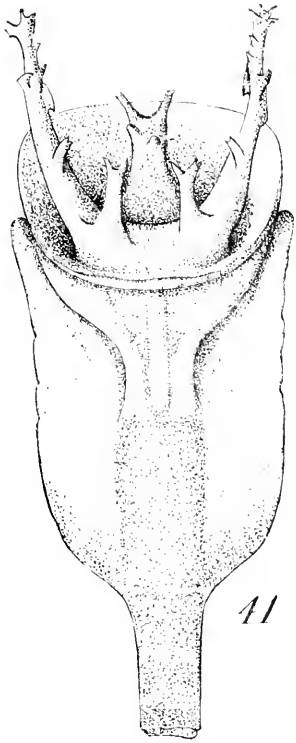
FIG. 36. Thoracic uncinus, enlarged 650 diameters.
FIG. 37. Abdominal uncinus, enlarged 650 diameters.

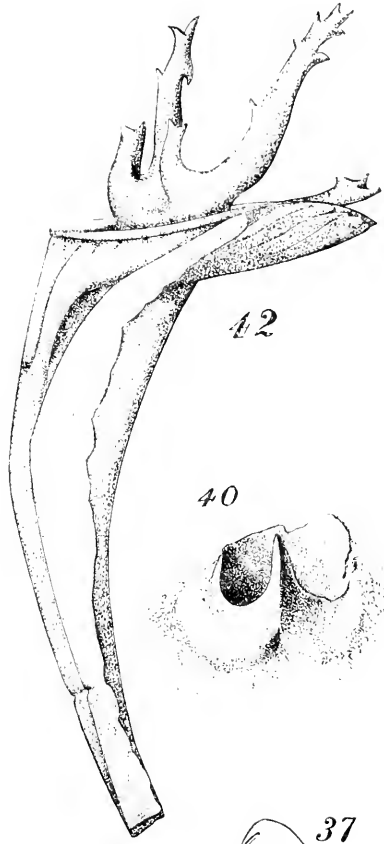
Spirobranchus giganteus (Pall.) Morch.

FIG. 38. True outline of disk of operculum, small specimen, enlarged 5 diameters.
FIG. 39. True outline of disk of operculum, large specimen, enlarged 5 diameters.
FIG. 40. Mouth of tube, enlarged 3 diameters.
FIG. 41. Operculum, front view, enlarged.
FIG. 42. Operculum, side view, enlarged.

Spirobranchus incrassatus (Kroyer) Morch.

FIG. 48. True outline of operculum, enlarged 5 diameters.


41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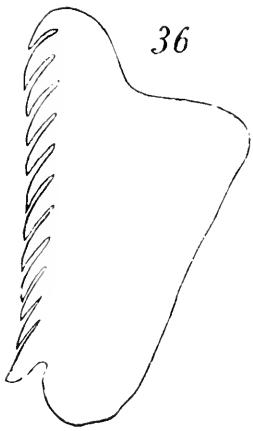
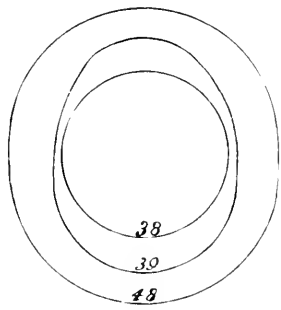

36


38
39
48

EXPLANATION OF PLATE XXIV.

Spirobranchus giganteus (Pall.) Morch.

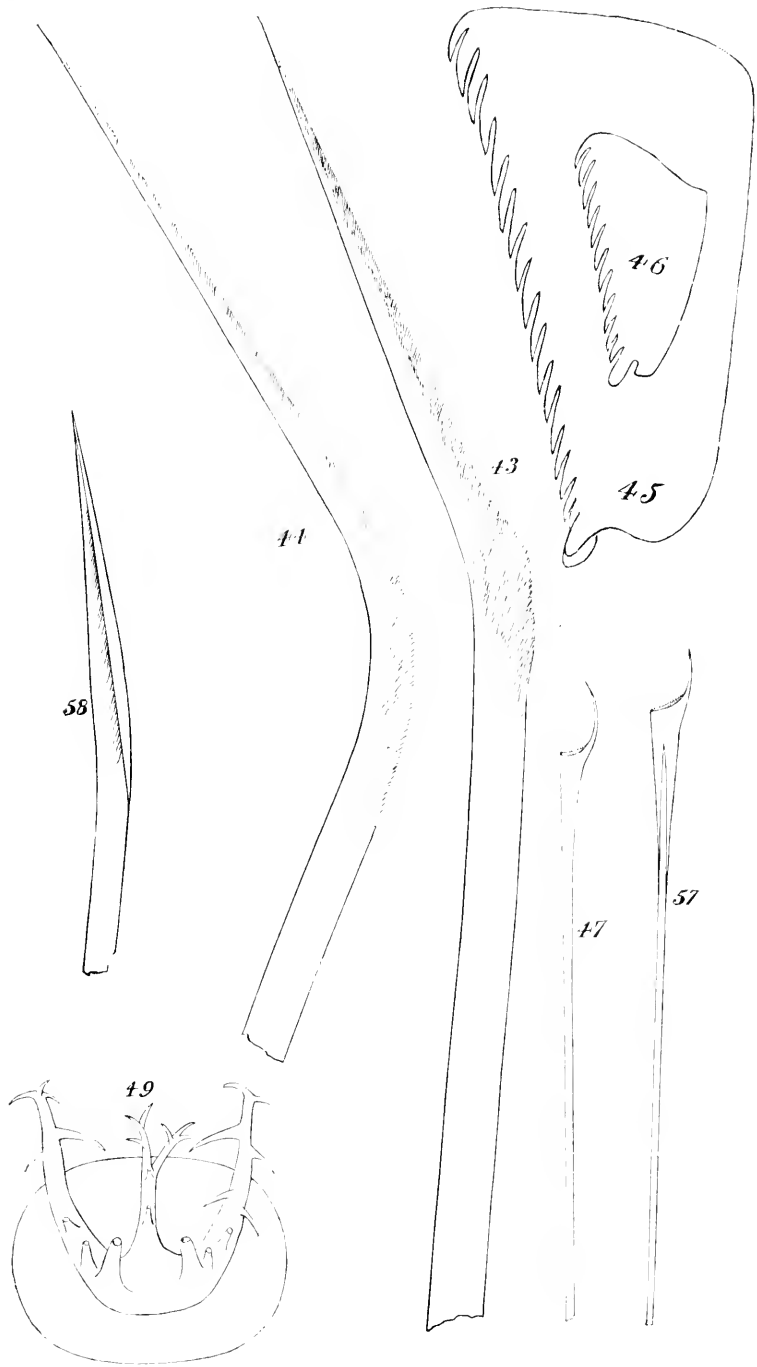
FIG. 43. Straight collar setæ, enlarged 210 diameters.
FIG. 44. Bent collar setæ, enlarged 210 diameters.
FIG. 45. Thoracic uncinus, enlarged 650 diameters.
FIG. 46. Abdominal uncinus, enlarged 650 diameters.
FIG. 47. Abdominal setæ, enlarged 325 diameters.

Spirobranchus incrassatus (Kroyer) Morch.

FIG. 49. Operculum, enlarged.

Spirobranchus dendropoma Morch.

FIG. 57. Abdominal setæ, enlarged 325 diameters
FIG. 58. Thoracic setæ, enlarged 325 diameters.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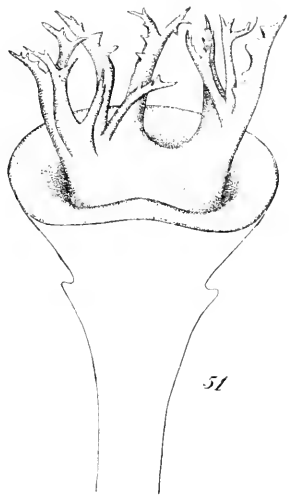
57
49

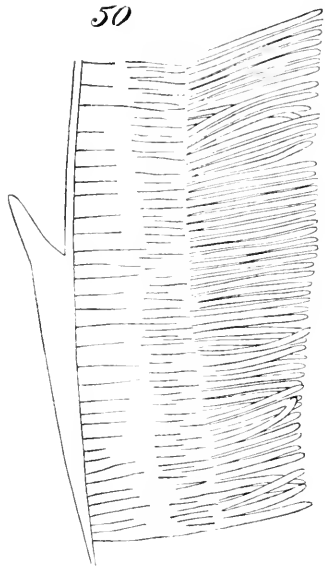
EXPLANATION OF PLATE XXV.

Spirobranchus dendropoma Moreh.

FIG. 50. Portion of branchial filament, enlarged.
FIG. 51. Operculum, front view, enlarged.
FIG. 52. Operculum, side view, enlarged.
FIG. 53. Operculum of a large specimen, enlarged.
FIG. 54. Collar setæ, enlarged 650 diameters.
FIG. 55. Thoracic uncinus, enlarged 650 diameters.
FIG. 56. Abdominal uncinus, enlarged 650 diameters.

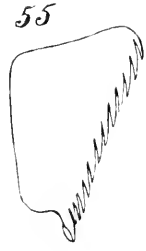


51

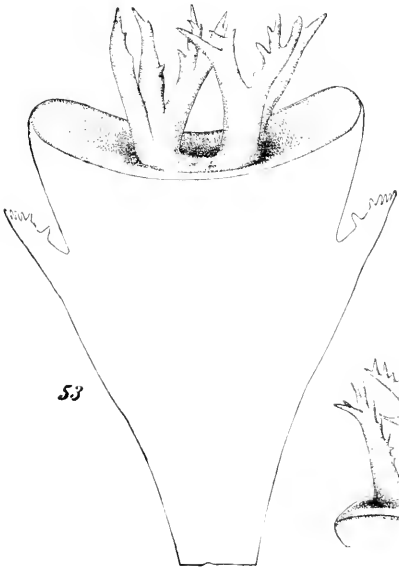


50

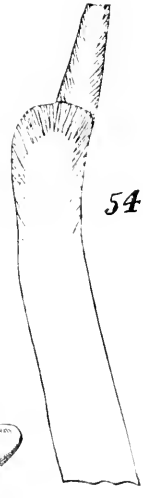
56



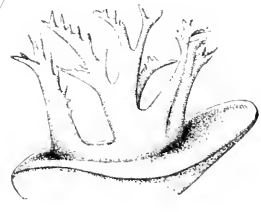
55



53



54



52