0981
597.09
S795

SMITHSONIAN
LIBRARY

ELAND STANFORD JUNIOR UNIVERSITY PUBLICATIONS
UNIVERSITY SERIES

THE FISHES

OF THE

Stanford Expedition to Brazil

BY

EDWIN CHAPIN STARKS

ASSISTANT PROFESSOR OF ZOOLOGY

WITH FIFTEEN PLATES

(ISSUED MARCH 17, 1913)

Smithsonian Instit
GILL
COLLECTIO
National Mu
23618

STANFORD UNIVERSITY, CALIFORNIA
PUBLISHED BY THE UNIVERSITY
1913

UNIVERSITY SERIES.

INHERITANCE OF SILKWORMS, I. Vernon L. Kellogg, Professor of Entomology. 89 pp., 4 plates. 1908. Price, $1.00.

THE OPISTHOBRANCHIATE MOLLUSCA OF THE BRANNER-AGASSIZ EXPEDITION TO BRAZIL. Frank Mace MacFarland, Professor of Histology 105 pp., 19 plates. 1909. Price, $1.00.

A STUDY OF THE NORMAL CONSTITUENTS OF THE POTABLE WATER OF THE SAN FRANCISCO PENINSULA. John Pearce Mitchell, Assistant Professor of Chemistry. 70 pp., 1 map. 1910. Price, 50c.

SYNOPSIS OF THE TRUE CRABS (BRACHYURA) OF MONTEREY BAY, CALIFORNIA. Frank Walter Weymouth. 64 pp., 14 plates. 1910. Price, 50c.

THE OSTEOLOGY OF CERTAIN SCOMBROID FISHES. Edwin Chapin Starks, Assistant Professor of Zoology. 49 pp., 2 plates, 1 text figure. 1911. Price, 50c.

A PHYSICAL THEORY OF ELECTRIFICATION. Fernando Sanford, Professor of Physics. 69 pp., 2 plates. 1911. Price, 50c.

THE MATZKE MEMORIAL VOLUME. Papers by John Ernst Matzke, late Professor of Romanic Languages, and Thirteen Colleagues. 162 pp. 1911. Price, $1.00.

DAS HISTORISCHE PRÄSENS IN DER ÄLTEREN DEUTSCHEN SPRACHE. Bruno Boezinger, Assistant Professor of Germanic Languages. 91 pp. 1912. Price, 50c.

THE EFFECT OF A STRICTLY VEGETABLE DIET ON THE SPONTANEOUS ACTIVITY, THE RATE OF GROWTH, AND THE LONGEVITY OF THE ALBINO RAT. James Rollin Slonaker, Assistant Professor of Physiology. 36 pp., 1 plate, 15 text figures. 1912. Price, 50c.

CATALOGUE DE TOUS LES LIVRES DE FEU M. CHAPELAIN. (Bibliothèque Nationale, Fonds Français, Nouv. Acq., No. 318.) Colbert Searles, Associate Professor of Romanic Languages. 119 pp., 2 plates. 1912. Price, 75c.

THE DUDLEY MEMORIAL VOLUME. Papers by William Russel Dudley, late Professor of Botany, and Several Colleagues. 137 pp., 12 text figures, 9 plates. 1913. Price, $1.00.

623
B8 S7X
1913
Fishes

LELAND STANFORD JUNIOR UNIVERSITY PUBLICATIONS
UNIVERSITY SERIES

THE FISHES

OF THE

Stanford Expedition to Brazil

BY

EDWIN CHAPIN STARKS

ASSISTANT PROFESSOR OF ZOOLOGY

WITH FIFTEEN PLATES

(ISSUED MARCH 17, 1913)

STANFORD UNIVERSITY, CALIFORNIA
PUBLISHED BY THE UNIVERSITY
1913

597.091
S715

TABLE OF CONTENTS

Introduction 3
Family Galeidæ 4
Family Sphyrnidæ 5
Family Rhinobatidæ 5
Family Pristidæ 6
Family Dasyatidæ 6
Family Elopidæ 8
Family Albulidæ 8
Family Clupeidæ 8
Family Engraulididæ 9
Family Osteoglossidæ 12
Family Symbranchidæ 12
Family Ophichthyidæ 12
Family Murænidæ 12
Family Characinidæ 13
Family Gymnotidæ 21
Family Electrophoridæ 25
Family Bunocephalidæ 25
Family Siluridæ 25
Family Hypopthalmidæ 34
Family Loricaridæ 34
Family Callichthyidæ 39
Family Synodontidæ 39
Family Poeciliidæ 39
Family Belonidæ 40
Family Hemiramphidæ 40
Family Exocœtidæ 40
Family Syngnathidæ 40
Family Atherinidæ 41
Family Mugilidæ 41
Family Sphyrænidæ 41
Family Holocentridæ 41
Family Scombridæ 42
Family Trichiuridæ 42
Family Carangidæ 43
Family Apogonichthyidæ 44
Family Centropomidæ 45
Family Serranidæ 45
Family Lutianidæ 46
Family Hæmulidæ 46
Family Sparidæ 47
Family Gerridæ 47
Family Polynemidæ 49
Family Sciænidæ 49
Family Cichlidæ 54
Family Pomacentridæ 58
Family Labridæ 59
Family Scaridæ 61
Family Ephippidæ 61
Family Chætodontidæ 61
Family Acanthuridæ 62
Family Balistidæ 63
Family Monacanthidæ 63
Family Ostraciidæ 63
Family Tetraodontidæ 63
Family Diodontidæ 64
Family Scorpænidæ 64
Family Gobiidæ 64
Family Echeneididæ 69
Family Malacanthidæ 69
Family Dactyloscopidæ 70
Family Batrachoididæ 71
Family Gobiesocidæ 73
Family Blenniidæ 74
Family Pleuronectidæ 76
Family Soleidæ 76
Family Antennæriidæ 77
Family Ogcocephalidæ 77

FISHES FROM BRAZIL COLLECTED BY THE STANFORD EXPEDITION OF 1911

THE following pages contain an account of the fishes collected by the author as a member of the Stanford Expedition to Brazil in the summer of 1911.

Several weeks were spent at Natal, in the State of Rio Grande do Norte, where the rock pools, though containing a rather small fauna, proved to be the most fruitful collecting ground in the vicinity. Seining was done in the harbor and as far up the estuary as Carnahubinha. Two trips were made in a trawling boat, equipped with an otter trawl, that a local company had imported from England, but on account of the great quantities of seaweed that filled and wrecked the nets few fishes were secured. The fish market was extemely poor, and contributed but very little to the collection. Seldom over six or seven of the commonest species were represented at one time, and the prices that they commanded proved the supply to be far short of the demand.

A trip was made to Lake Extremoz, nine or ten miles in a northwesterly direction from Natal. After several trials it was found impossible to do any seining in the lake owing to the great quantities of half disintegrated vegetable matter that is held in suspension in the water, and that quickly filled the net and made it too heavy to land, so that most of the specimens that were taken were secured by fishermen with cast nets.*

In the same direction as Lake Extremoz and about nine miles farther is the town of Ceara Mirim, where several days were profitably spent in collecting in the small creek and in several little muddy ponds that were disconnected from each other, but are doubtless connected during high water. Some seining was done, but more dependence was placed upon the very efficient boys, who waded about with dip-nets and caught fishes under the overhanging muddy banks.

---

* The fish fauna of Lake Extremoz is made up of the usual fresh water forms of the region and, in addition, many typical salt water ones, such as *Centropomus, Mugil* and *Gerres,* showing that the lake has been connected with the sea in recent years, though it is said to be cut off by sand hills at the present time.

Several days were spent at Lake Papary, about twenty-four miles south of Natal. The lake is large and shallow, with marshy banks and muddy estuaries choked with water-hyacinth, so that seining here, too, was impossible. On our account the fishermen were given permission to practice a certain method of destructive fishing that is ordinarily prohibited by law. The fishes were surrounded by a great gill-net, into which canoes were paddled and the fishes taken in extraordinarily large cast-nets or driven into the meshes of the gill-net. By this and the more usual methods of fishing a rather large collection was taken from the lake.

A few days were spent at Fortaleza, in the state of Ceara, with little results from an ichthyological standpoint, and a couple of weeks at Pará, where collecting was confined to the excellent fish-market and a very good collection secured.

Several specimens were taken by Dr. Fred Baker and Mr. W. M. Mann in the Madeira River during a trip taken after the conclusion of the main part of the expedition.

I wish here to especially thank Dr. J. C. Branner, chief of our expedition, not only for the opportunity of making this collection but also to thank him, and my colleagues as well, for much help of various sorts in the making of it. To Dr. Bashford Dean I am indebted for help without which my participation in the expedition would have been impossible. In this small paper it is scarcely possible to attempt to acknowledge much of the assistance that I at various times received, but I can not forbear the pleasure of here thanking Mr. José Joaquim de Carvalhoe e Araujo, whose hospitality and influence made our stay at Papary so pleasant and profitable.

This collection, including the types of the new species, is deposited among the collections of Stanford University. A set of duplicates has been sent to the American Museum in New York.

The accompanying plates, illustrating the new species, are from drawings made by Chloe Lesley Starks.

Family GALEIDÆ.

1. Carcharhinus platyodon (Poey).

A specimen 29 inches in length, secured at Pará, seems to be referable to this species. The mouth is twice as broad as it is long and the preoral part of the snout is contained 1½ times in the space transversely between the corners of the mouth. The front of the head is semi-circular in outline. The fins are all more or less concave behind. The pectorals when folded

back almost reach to opposite the posterior end of the dorsal base. The length of the caudal from the pit on the upper part of its base to its tip is equal to the space between the front of the head and the dorsal fin. The second dorsal is a little in front of the anal, and the base slightly exceeds that of the latter in length. The anal is unlike the second dorsal in form, being deeply notched behind with its lobes almost equal, while the dorsal is concave behind, with its inner lobe reaching far behind its outer.

The color is slaty blue above and pure white below. The dorsal and caudal are outlined in black, especially the caudal, which has a broad, black posterior margin. The tips of the other fins are dark.

2. Hyproprion brevirostris Poey.

A specimen, a couple of feet long, taken at Pará. Its teeth are not mature enough to note their final character. They are abruptly widened at the base and very slightly serrate. In general proportions of fins and body this specimen agrees very well with current descriptions.

Family SPHYRNIDÆ.

3. Sphyrna tiburo (Linnæus).

A small specimen collected at Natal.

Family RHINOBATIDÆ.

4. Rhinobatus percellens (Walbaum).

Two fine specimens were taken in a trawl in deep water by a fishing company at Natal, that has imported a trawler from England.

The greatest width of the disk is equal to the space from the tip of the snout to the middle of the eyes. The preoral part of the snout, from between the teeth, is contained 2¼ times in the length to the vent. The front of the vent is midway between the tip of the snout and the base of the caudal. The width of the mouth is contained 2¾ in the preoral part of the snout. The lower part of the tail has a projecting flap that is wider than the usual keel. Two papillæ are on the margin of the spiracle; the outer one much the larger. The distance between the dorsals is equal to the width of the tail behind the base of the ventrals.

The ground color is white or light sienna, with round brown spots a little smaller than the eye. Between them are smaller spots, similar in color but less regular in outline. The spots are scattered over the upper parts so closely that the ground color shows only as reticulations. There are

also a few small round, light spots scattered sparsely over the middle of the back. The dark spots are somewhat larger and more conspicuous on the tail and run back on the caudal fin. On one specimen there are two pairs of dark spots on the rostral ridges. The under part of the snout has a black blotch.

Family PRISTIDÆ.

5. Pristis perrotteti Valenciennes.

A large "saw," 4 feet in length, was obtained in Natal. It has 18 teeth on each side and is much more tapering than in *Pristis pectinatus*.

6. Pristis pectinatus Latham.

One small specimen was taken at Natal.

Family DASYATIDÆ.

7. Dasyatis gymnura (Müller).

A specimen taken at Pará.

8. Dasyatis say (Le Sueur).

Two specimens with the disk 11 inches in length, caught in a trawl in deep water at Natal, are referred to this species, though there are some discrepancies between them and current descriptions. The disk is no longer than broad, and is nowhere concave. The front of the disk is nearly straight on each side, meeting at an angle at the snout. The greatest width is opposite the gill openings. The caudal is no longer than the disk, and has a broad fold above and below. There are 6 or 7 tubercles on the median line of the back in front of the shoulder girdle, and one some distance behind this, in one of the specimens. A group of 2 or 3 very small spines is on the shoulder. The skin is otherwise perfectly smooth.

The color in one of them in life was light dusky green, growing reddish toward the edges of the disk. Posteriorly it was bordered with dusky and narrowly edged with white. The caudal was white, with the dorsal and ventral folds black. The other specimen is very much darker in alcohol, but the posterior white border of the disk is evident. Both of the specimens have large irregular black blotches below.

9. Potamotrygon hystrix (Müller and Henle).

The species of this genus are very much in need of revision. Doctor Eigenmann has included this and the next with several others under one

species (The Freshwater Fishes of British Guiana). Material at hand from Pará represents two distinct forms, which seem to be referable to this and the following species.

Seven specimens were collected in the market at Pará, and one near the mouth of the Madeira River (by Mr. Mann and Dr. Baker). They are from 10 to 20 inches in length, or measuring the length of the disk only, from 5 to 11 inches. In these the preoral part of the snout is contained in the length to the front of the vent from 4 to 4½ times. The width of the mandibular tooth-patch is contained from 13 to 13½ times in the same length. The interspiracular width is contained from 1⅓ to 1½ times in the length of the snout from the eyes. The teeth are stained brown in all of the large specimens, and usually in the small ones. Counting the longest rows of teeth in the mandible from the outer side obliquely to the median line they number from 12 to 14. The largest papillæ behind the teeth are about 3 times longer than broad, and nearly or quite half as long as the eye.

The color is variable. All of them are light dusky brown with lighter spots scattered over the back of cream or light sienna color. The spots are with blended edges shading into the ground color. Surrounding the spots at some distance from their edges are usually elongate, irregular, black blotches forming more or less regular broken rings of greater diameter than the eye. In one or two of the smaller specimens the rings are nearly complete, but in one they are entirely absent. Usually the black spots forming them are sharp-edged and very definite, but occasionally they are soft and blended. Sometimes they are so separated that they scarcely suggest rings, but run irregularly in various directions. The side of the tail is very distinctly barred with alternate light and dark spots.

10. Potamotrygon motoro (Müller and Henle).

Three specimens from 11 to 22 inches in length (or measuring the disk only, from 6 to 12 inches) were collected in the market at Pará.

The preoral part of the snout is longer than in *P. hystrix,* being contained in the length to the front of the vent from 3⅓ to 3½ times. The width of the mandibular tooth-patch is contained 10½ to 11 times in the same length. The interspiracular width is contained 1¾ times in the snout from the eyes. The teeth are not stained brown and the longest rows from the outer side to the middle of the mandibular patch number 19 or 20. The longest papillæ in the mouth are scarcely longer than broad, and do not exceed the length of the pupil. The disk is more thickly set with fine spinules than in *P. hystrix,* so that it is more like ordinary shagreen.

In life the disk is dark brownish drab, growing more drab toward the edges. Scattered everywhere are small orange spots as large as the pupil and sharply defined by rings of color similar to the ground color but of a darker shade. These are more crowded at the middle of the back and at the edges of the disk. On the tail they are less distinct and without much orange color. The side of the tail is mottled rather than barred.

Family ELOPIDÆ.

11. Elops saurus Linnæus.

A common species on the Brazilian Coast. A few specimens were collected in Lake Papary. The elongate, transparent, larval forms of this or *Albula* were frequently taken in the seine.

12. Tarpon atlanticus (Cuvier and Valenciennes).

One specimen was obtained at Lake Papary.

Family ALBULIDÆ.

13. Albula vulpes (Linnæus).

A single small specimen from Natal.

Family CLUPEIDÆ.

14. Sardinella sardina (Poey).

Specimens obtained in great abundance at Natal are placed here with some doubt. They have a distinct lateral band, which may be due to the action of formalin in destroying the overlying silvery pigment. The scales are thin and entire edged, not laciniate as in *Sardinella macrophthalmus,* which they resemble in form. The scales seem to be, moreover, more firmly adherent than is usual in *S. sardina.* In the lateral band they are very similar to the Pacific Coast species, *S. stolifera,* but the eye is considerably larger.

15. Opisthonema oglinum (Le Sueur).

Several specimens were collected at Natal. The variation of the depth is remarkable in this species as it is in the Pacific species, *Opisthonema libertate.* It varies from 2¾ to 3¾ times in the length to the caudal base.

16. Ilisha flavippinnis (Valenciennes).

A few specimens collected in the market at Pará.

17. Pristigaster cayanus Cuvier.

A couple of fine specimens were collected by Dr. Baker and Mr. Mann in the Madeira River about 400 miles above its mouth.

Family ENGRAULIDIDÆ.

18. Anchovia clupeoides (Swainson).

Several specimens from 5 to 8 inches in length were taken in Lake Papary. The anal rays vary fom 28 to 32 (not counting those in front of the first long one), but are usually 30, as described by Dr. Steindachner. His specimens were from 3½ to 5 inches ("9 to 12 cm.") in length. The smallest specimens at hand agree very well with his description, but the large ones are much deeper, the depth being much greater than the length of the head, and is contained from 3 to 3⅗ times in the length of the body, while the head is contained from 3¾ to 4 times.

19. Anchovia januaria (Steindachner).

Specimens that answer very well to the description of this species, which has hitherto been known only from the harbor of Rio Janeiro, were taken in abundance in the harbor of Natal.

20. Anchovia pallida Starks, new species.

Plate 1.

The head and body are deep and compressed. The depth is equal to the length of the head and is contained 3½ times in the length of the body to the caudal base. The snout is shorter than the eye and projects almost its full length beyond the tip of the mandible. The maxillary is broad and rounded behind, and scarcely reaches to the posterior end of the mandible. Small even teeth are present in both jaws. The diameter of the eye is contained 4¼ times in the head, and 2¾ times in the postorbital part of the head. The interorbital width slightly exceeds the length of the snout. The cheek is long and triangular, and measuring from the eye to the lower angle of the preopercular ridge, its length is twice that of the eye. The greatest width of the opercle is no greater than that of the eye. Forty slender gill-rakers, barely as long as the eye, are on the lower limb of the first gill arch.

The front of the anal is under the middle of the dorsal base, and the front of the dorsal is midway between the base of the caudal and the front margin of the eye. There are 14 dorsal rays, counting 2 rudimentary ones

in front of the first long one, and 21 anal rays with the 2 short anterior ones. The base of the anal slightly exceeds the length of the head. The length of the pectoral is two-thirds that of the head, and it reaches a little past the front of the ventral. There are 37 cross series of scales and 7 longitudinal series, counting under the front of the dorsal.

No color whatever is present in the alcoholic specimen, except a few fine, scattered dark points on the back.

The type and sole specimen is 4 inches in length, and was collected in the market at Pará.

In the shape of the head and body as well as in various other characters this species is very much like *Cetengraulis edentulus,* but there is no trace of membrane connecting the branchiostegal membranes that characterizes the genus *Cetengraulis.* Should future specimens, however, prove it to belong to that genus it may be known from *C. edentulus* by the much shorter operculum as compared with the long oblique cheek, longer maxillaries and pectorals, the anal under the middle of the dorsal base, and several other minor differences. *C. juruensis* differs in the same characters, and in addition is much more slender.

In the genus to which it is here referred it seems to be closest to *Anchovia vaillanti* (Steindachner), but it has twice as many gill-rakers and lacks a lateral stripe.

21. Anchovia brownii (Gmelin).

A few specimens seined at Natal from 2¾ to 3¾ inches in length. It was not taken so commonly as *A. januaria* or *Lycengraulis grossidens.*

These specimens were compared with some from Jamaica and agree in all respects, but they show some discrepancies with current descriptions. The depth is contained from 5 to 5½ times in the length to the caudal base. The eye is contained from 3¾ to 4 times in the head; the snout from 4¼ to 4½ times. The anal rays, counting back from the first long ray, number 18 or 19. The front of the anal is under the posterior fourth of the dorsal base. The front of the dorsal is midway between the base of the caudal and the front of the eye.

22. Pterengraulis atherinoides (Linnæus).

This species is very common in the market at Pará, where many specimens were secured. In the following notes specimens from 6 to 10 inches in length are considered.

The head is contained from 4 to 4⅓ times in the length to the base of the caudal; the depth from 3½ to 4 times. The eye is much longer than

the snout and is contained in the head from 5 to 5½ times. The maxillary has a bluntly rounded end which is even with the posterior end of the mandible.

23. Lycengraulis grossidens (Cuvier).

A few specimens were seined in the harbor of Natal, the largest 6½ inches in length.

The head is contained from 4 to 4⅕ times in the length to the caudal base; the depth from 4½ to 4¾ times. The eye is longer than the snout and is contained from 2 times in the postorbital part of the head (in specimens 3½ inches long) to 2½ times (in specimens from 5 to 6 inches long). The number of teeth in the mandible is very variable, as might be expected from their uneven size and position. The maxillary teeth are more even in size and smaller. Those on the anterior part of the bone are directed downward or slightly backward, while those on the posterior part are directed slightly forward. The mandible curves upward and is sharp at the tip. The maxillary is slender, slightly widened, lance-head-like, posteriorly, and ends in a slender point just behind the articulation of the mandible. The head is rather broadly rounded behind at the gill cover, and not particularly elongated obliquely.

The insertion of the dorsal is midway between the base of the caudal and a point varying from the middle to the posterior edge of the eye. The front of the anal is under the middle of the dorsal. In the large specimens the pectorals reach to, or nearly to, the ventrals.

The head and particularly an area just behind the upper half of the shoulder girdle is richly supplied with ramifying canals. On the cheek and on an area behind and above the eye the canals form a net-work, inclosing small spots that appear, at first sight, like well separated, imbedded scales.

24. Lycengraulis batesii (Günther).

A single specimen, 8 inches long, was collected in the market at Pará.

In this specimen the teeth in the mandible are fewer and a little farther apart than in *Lycengraulis grossidens,* though more were described for the type. Their number is doubtless variable. This species differs in being much more slender, in having the front of the anal only slightly behind that of the dorsal, in having the head shorter as compared with the entire length, and in having the gill-rakers shorter. The last are low on the side of the arch and are about as long as the mandibular teeth, though they are not "like tubercles," as originally described.

Family OSTEOGLOSSIDÆ.

25. Osteoglossum bicirrhosum Vandelli.

A specimen was collected in the market at Pará.

Family SYMBRANCHIDÆ.

26. Symbranchus marmoratus Bloch.

Numerous specimens were taken at Lake Papary and in the muddy little lagoons about Ceara Mirim.

Family OPHICHTHYIDÆ.

27. Myrichthys oculatus (Kaup).

A single specimen was seined in the harbor at Natal.

Family MURÆNIDÆ.

28. Rabula megalops Starks, new species.

Plate 2.

The head is contained 2⅖ times in the trunk to the vent, and 5 times in the entire length. The body is not much compressed, and the head and neck not at all. The depth of the body is a third of the length of the head. The gape does not quite extend to the posterior part of the eye, and is a fourth of the length of the head. The jaws are straight and capable of being completely closed. The teeth are sharp and easily detached. They are biserial in the upper jaw, with a group of enlarged curved teeth in front. There are no teeth on the shaft of the vomer running back between the lateral teeth. In the lower jaw the teeth are uniserial on the side and biserial toward the front. The eye is contained 1⅓ times in the length of the snout, and 8 times in the head. The snout is broadly rounded as viewed from above. The anterior nostril is in a tube, and the posterior one is in the upper lip, opening downward, and not visible in a side view.

The dorsal fin begins a distance behind the gill opening equal to the length of the snout. The longest rays are toward the posterior end of the dorsal, where their length is contained 2⅔ times in the length of the head.

The ground color is light, but made almost uniform dull brown by dark points which more or less run together. On the back and side this is scarcely appreciable except with the aid of a lens, appearing to the unaided eye uniform brown, but on the belly the points are better separated,

and also on the tail a few light spots of the ground color show. The fins are uniform dusky brown like the body, but posteriorly they grow slightly darker toward the margin, and are narrowly edged with white.

The type and only specimen is 5 inches in length, and was collected in the rock pools at Natal.

This species differs from *Rabula panamensis* (Steindachner) in having the jaws straight so that the mouth may be closed, and in having the dorsal beginning behind the gill opening.

29. Lycodontis moringa (Cuvier).

Several small specimens were taken in the rock pools at Natal. On some of them the dark spots have so run together as to leave none of the usual ground color, or just a trace of it showing as a few indefinite, irregular markings. The light border to the anal and posterior part of the dorsal seems to be constant.

In life this species is sienna yellow, with slaty brown spots scattered irregularly over the head and body. The anal is dusky, and narrowly and sharply edged with milk white. The white border is continued around the caudal and onto the dorsal, where it becomes narrow anteriorly and disappears. The dorsal has a dark border at the edge of the fin anteriorly and next to the white edge posteriorly. The base of the dorsal is spotted like the body.

30. Lycodontis funebris (Ranzani).

A single specimen a couple of feet in length was taken at Natal. It is uniform in color and shows no longitudinal lines on the fins.

Family CHARACINIDÆ.

31. Curimatus leucostictus Eigenmann and Eigenmann.

One specimen was secured by Mr. Mann and Dr. Baker in the Madeira River about 400 miles from its mouth. There are traces of a light longitudinal bar on the posterior part of the side, its upper edge at the lateral line.

32. Curimatus schomburgki Günther.

Several specimens collected at Pará are entirely similar to specimens from British Guiana collected by Dr. Eigenmann. It is probable that these should all be referred to *Curimatus cyprinoides* (Linnæus).

The dorsal reaches variably to the adipose dorsal or to as far back as the base of the caudal.

33. Curimatus elegans Steindachner.

Numerous specimens were taken at Lake Extremoz, Lake Papary and at Ceara Mirim. The largest ones are almost 6 inches in length. Small ones, 2½ inches long, have a black lateral band which tapers to a point and disappears anteriorly, or it may be continued as a narrow line to the operculum. The dorsal has a black spot at the middle of its base. In the large specimens there is a rather broad diffused dark lateral band most evident posteriorly where it follows the lateral line, and anteriorly arching just above the lateral line. The posterior part of the lateral line has a small black spot above and below the pore on each scale. The dorsal spot may be pale but it is usually evident.

34. Gasterotomus latior (Spix).

A specimen, 8 inches in length, was collected by Mr. Mann and Dr. Baker in the Madeira River 400 miles from its mouth.

The head is contained 3¾ times in the length to the caudal base, and the depth 2⅘ times, being considerably deeper than the picture published by Spix (Pisc. Bras. Pl. 41). The front of the dorsal is midway between the tip of the snout and the posterior part of the base of the adipose dorsal. The pectoral is contained 1¾ times in the head, and is not so long as the ventral. It does not reach to the ventral, and the ventral reaches a little over half way from its base to the anal. The dorsal contains 11 rays, and the anal 14. The base of the latter is equal to the combined length of the snout and the eye, and the tip of the adipose dorsal is above the base of the last ray. The caudal fin is broken. There are 90 series of scales, all of which are roughly denticulated, but to the touch scarcely feel rough. The ventral median line from the pectorals to the anal is trenchant. The scales scarcely meet on the median line in front of the dorsal, leaving an extremely narrow naked line.

35. Hemiodus microlepis Kner.

Four specimens were taken in the Rio Madeira about 400 miles above its mouth by Mr. Mann and Dr. Baker. Mr. Fowler (Proc. Phil. Acad. Sci. 1906, p. 319) found the "Lower lobe of caudal much longer than upper, just the reverse of that indicated by Kner." In the specimens at hand two of them have the upper lobe a trifle longer, one has them about equal, and the other has the lower lobe a little longer. Except that these specimens are considerably more slender (the depth is contained from 4½ to 4¾ times in the length) they agree very well with Mr. Fowler's description.

36. Anisitsia notata (Schomburgk).

Five specimens were collected at Pará.

37. Prochilodus migricans Agassiz.

Several specimens were collected at Pará, and a couple by Dr. Baker and Mr. Mann in the Madeira River. The latter differ in having the stripes, which follow the rows of scales on the back, and the dusky cross bars much more conspicuous. In the Pará specimens these markings are more or less obscure, but usually evident.

38. Schizodon elongatus Steindachner.

A specimen taken by Dr. Baker and Mr. Mann in the Rio Madeira about 400 miles from its mouth.

39. Schizodon fasciatus (Spix).

A couple of specimens collected by Mr. Mann and Dr. Baker at the mouth of the Madeira River.

40. Leporinus friderici (Bloch).

One specimen was taken at Pará.

41. Leporinus pachyurus Cuvier and Valenciennes.

A single specimen was found in the market at Pará.

42. Leporinus affinis Günther.

A specimen taken at Pará.

43. Leporinus fasciatus Bloch.

Several specimens were collected at Pará.

44. Leporinus maculatus Müller and Troschel.

One specimen was taken at Lake Extremoz.

45. Cheirodon insignis Steindachner.

A few specimens taken in the little ponds about Ceara Mirim. In the male the lower edge of the caudal peduncle is produced and armed with from 7 to 9 spines along its edge. The caudal spot is inconspicuous in the male and the first ray of the anal is longer, making the posterior margin of the fin more concave. There is considerable variation among the females in the concavity of the anal and in the depth.

46. Astyanax bimaculatus Linnæus.

Many specimens were taken at Pará, Lake Extremoz, Lake Papary and Ceara Mirim.

Specimens of 4 inches in length and over from Pará have the caudal spot and lateral band almost entirely absent. British Guiana specimens of all sizes (collected by Dr. Eigenmann) have the spot and band conspicuous. Comparing small specimens the difference is not so great. The anal has 31 or 32 rays, and there are from 30 to 33 series of scales.

The specimens from Lake Extremoz, Lake Papary and Ceara Mirim have the spot and band as in the British Guiana specimens or even darker, and the anal has from 25 to 27 rays. These are perhaps referable to *Astyanax bimaculatus novæ* Eigenmann, though the lateral band is not so definite as in the picture of the original specimen. Among the smaller specimens of from 2 to 2½ inches in length are many variations of the humeral spot. Sometimes it is elongate horizontally; sometimes it is round; sometimes the faint streak extends up and down from it; and sometimes the streak becomes so pronounced that the spot is elongate vertically. The larger specimens do not vary in this respect, the spot being always elongate vertically. There are breeding females among these only 2 inches in length.

In life the Lake Papary specimens were silvery with golden yellow tinges, which were more conspicuous over the faint lateral band. The pectoral and caudal were yellow, the latter much darker, and the anal and ventrals bright red.

I fail to appreciate the naked predorsal line in either these or the British Guiana specimens, though the latter have been referred by Dr. Eigenmann to the genus *Poecilurichthys,* which he differentiates by this character in his key.

47. Chalcinus angulatus curtus Garman.

Four specimens were collected by Mr. Mann and Dr. Baker in the Rio Madeira about 400 miles from its mouth. The depth is contained in the length to the caudal from 2⅗ to $2\,^{6}/_{7}$ times.

48. Chalcinus angulatus fuscus Garman.

A single specimen taken at the mouth of the Rio Madeira by Mr. Mann and Dr. Baker is evidently referable to the subspecies. The back is dark and has longitudinal dusky stripes following the rows of scales. The lips and barbels are dusky, and the latter are as long as the eye. All of the fins are dusky.

49. Chalcinus rotundus (Schomburgk).

One specimen was taken by Dr. Baker and Mr. Mann at the mouth of the Rio Madeira. Comparing it with a specimen collected by Dr. Eigenmann at British Guiana it differs only in having no dark pigment anywhere on the fins or body.

50. Chalcinus elongatus Günther.

A number of small specimens up to 8 inches in length were taken at Pará. The length of the pectoral is usually equal to half of the distance between the snout and the dorsal, but it varies from this to half of the distance between the snout and the last dorsal ray. It reaches to the middle of the ventral, which reaches half way from its base to the anal. The front of the anal is under the last dorsal ray or a little behind. The pectorals are sometimes colorless or sometimes dark with fine black points. The adipose dorsal is over the last anal ray and coterminous with it, or often the latter projects a trifle farther back.

51. Piabucus dentatus Koelreuter.

Three specimens, the largest 6 inches in length, were obtained at Pará. They agree very well with the description published by Dr. Eigenmann (F. W. Fish. of Brit. Guiana, p. 316) except in depth of body. It is there stated to be 3.6 of the length. Günther (Cat. V., p. 343) gives the depth as one-fifth or one-sixth of the total length, including the caudal, and the picture published by Bloch (Ausl. Fische, p. 382) agrees with this. In my specimens the depth is from 4⅓ to 4¾ in the length to the caudal base, or 5¼ to 5⅗ with the caudal. It is possible that Dr. Eigenmann's description should read 4.6 rather than 3.6.

52. Pygopristis gibbosus Starks, new species.

Plate 3.

Though this species was found to be one of the most common of the forms related to *Serrasalmo* in the market at Pará it seems to have remained undescribed, for it has been referred to *Pygopristis denticulatus*.

The type of *Pygopristis denticulatus* came from British Guiana, and as the specimen with which I compare this species was collected by Dr. Eigenmann at Lama Stop-off, British Guiana, there is every reason to suppose that it is a representative of that species.

The depth in front of the dorsal is contained in the length 1½ times, or sometimes a trifle less. In *P. denticulatus* it is 1¾ times (though Dr. Eigenmann reports 1.66). The outline of the body is much more angu-

lated and the curve from the dorsal to the snout much more pronounced than in the Guiana species, being more convex at the nape and concave above the eyes. The head is contained from 3½ to 3⅗ times in the length. The eye is contained from 3½ to 3¾ times in the head. Five trilobed teeth are at each side of the upper jaw, and 7 at each side of the lower. They are about as distinct, and sharp, and as well developed posteriorly on the mandible as anteriorly, while in *P. denticulatus* they are lower, blunter, and less projecting posteriorly. The mandible is rather slender; its depth in front is less than half of the diameter of the eye, and is contained 3 times in its own length. In the other species the mandible is very heavy, its depth being equal to three-quarters of the eye, or half of its own length.

There are 33 ventral scutes besides a paired one in front of the vent and another behind it, but there are none at the side of the vent as in *P. denticulatus,* where there are four at each side posterior to the median ones. There are 15 or 16 dorsal rays, and 32 or 33 anal rays. In other species there are 19 dorsal rays and 35 anal rays. The distance from the dorsal to the adipose dorsal is scarcely shorter than the base of the dorsal, while in *P. denticulatus* it is not over half as long as the dorsal base. The first anal rays are a little produced beyond the others. The length of the pectoral is contained 1⅓ times in the head; that of the ventral 2 times. The pectoral reaches to above the ventral base, and the ventral to the last unpaired ventral scute. The scales are larger than in the other species, there being 71 tubes in the lateral line, 82 cross series, and about 32 vertically from the lateral line to the front of the dorsal. The scales are rather uneven and difficult to count crosswise, but the difference in size when the scales above the lateral line are directly compared is very striking between the two species, being much finer in *P. denticulatus.*

The specimen at hand of *P. denticulatus,* and those described by Dr. Eigenmann, are uniform in color, without spots or a dark caudal margin. In alcohol this species is slate-blue above, silvery below and on the side, and the fins yellow at the base. Over the back and upper part of the side are scattered dark blue spots as large as the pupil and smaller. A dusky blotch is just below the anterior part of the lateral line. The caudal is edged with black.

The type is 6 inches in length, and several cotypes are as large and others slightly smaller.

53. Pygocentrus piraya (Cuvier).

One small specimen was taken at Pará. The side is closely covered with dusky spots and the posterior edges of the vertical fins are dark.

54. Serrasalmo spilopleura Kner.

A fine specimen of this species was taken by Mr. Mann and Dr. Baker at the mouth of the Madeira River.

55. Metynnis hypsauchen (Müller and Troschel).

A single small specimen was taken at Pará.

56. Metynnis maculatus (Kner).

One specimen was taken at Lake Papary and two at Lake Extremoz. One of the specimens from the last locality has the anal slightly convex and angulated in front, as in the picture accompanying the original description. The other has it more rounded in front and produced at a rounded angle at the anterior third; probably the mark of the male. It also has the spots larger and more definite than in the others. A much darker spot is present in all of them above the anterior end of the lateral line.

57. Myleus parma (Günther).

Four specimens 6 inches long and one 11 inches, taken in the market at Pará. The large one has the middle anal rays produced (male), and the procumbent predorsal spine is scarcely evident. The depth (in the smaller ones) is contained 1⅔ times in the length, and the head 4 times. The back is highest at the front of the dorsal, and the ventral outline deepest at the anal, so that the cross axis of the body is oblique. The anal lobe is a trifle longer than the head, and longer than the anterior dorsal rays. The pectoral does not reach to opposite the ventral, which reaches half way, or a little more, from its base to the anal. There are 36 to 38 ventral scutes. The front lobe of the anal is black, and all of the ventral fins are margined with black behind.

58. Mylosoma aureum (Spix).

Three specimens were taken at the mouth of the Madeira River by Dr. Baker and Mr. Mann. The depth is from 1⅓ to 1⅔ in the length to the caudal base. The anal is angulated behind the posterior third, as in the drawing published by Spix. There are 43 or 44 ventral scutes, with 4 or 5 paired ones surrounding the vent. One specimen has 49 scutes, all of them simple and running at one side of the vent. In this it is apparently abnormal.

59. Mylosoma albiscopus (Cope).

Two specimens taken at Pará seem to be referable to this species. The anal is less angulated than in *Mylosoma aureum* but more evenly rounded,

as in Dr. Cope's drawing of the type. There are from 47 to 50 simple scutes along the median ventral line, and from 7 to 9 pairs are crowded in around the vent.

60. Mylosoma herniarius (Cope).

Two specimens were collected by Mr. Mann and Dr. Baker just below the mouth of the Madeira River in the Amazon. They are slightly less deep than the picture published by Mr. Fowler (Proc. Phil. Acad. Sci. 1906, p. 477, fig. 56), which has the depth equal to the distance from the snout to the adipose dorsal. In these specimens the depth is equal to the same distance, less ¾ the diameter of the eye. The sigmoid curve of the ventral outline is scarcely so pronounced. The anal is covered with scales *(Mylosoma)* and on one of the specimens it is angulated posteriorly, as it usually is in *M. aureum,* while in the other it is more evenly rounded as in Mr. Fowler's drawing. The scutes along the ventral ridge number 40, and there are none surrounding the vent.

61. Raphiodon vulpinus Spix.

Several specimens, a foot in length, were collected at Pará. The depth of the body is equal to the length of the head, or is contained from 5¼ to 5½ times in the length to the caudal. The eye is contained from 4½ to 5 times in the head, and the maxillary 1½ times. The cheek is almost entirely covered by the expanded suborbitals. The adipose eyelid has a vertical elongate opening, as in some of the herring-like fishes. The pectoral is a trifle shorter than the anal base, or one-fourth of the length to the caudal. The front of the dorsal is a little behind that of the anal. The caudal is not rounded, as in the picture published by Spix (Pisc. Bras. tab. 26), but is angulated at the tips of the outer rays and double lunate behind, with the middle one or two rays produced considerably beyond the rest of the fin and carrying the lateral line to their tips. The ventrals are in front of the anal a distance equal to the combined length of the snout and the eye.

62. Hydrolycus pectoralis (Günther).

A couple of specimens, 8 inches long, were taken by Dr. Baker and Mr. Mann in the Amazon River near the mouth of the Madeira River.

The body is much deeper than the length of the head, and is contained 3½ times in the length to the caudal; the head, without the projecting jaw, 4½ times. The pectoral is scarcely as long as described for the type. In one specimen it scarcely extends to the front of the dorsal; in the other it extends just to, though its length as contained in the entire

length is the same (about 3 times). The anal has from 45 to 47 rays, and its base is contained from 3⅗ to 4 times in the length. The caudal is rounded and the middle rays are not produced with the lateral line. The ventrals are a little more than half as long as the head. The anal and caudal are very closely covered with scales. The scales on the body are slightly ctenoid. A large black spot is present on the shoulder girdle above, a small one on the base of the lower pectoral ray, and one on the adipose dorsal.

63. Hydrocynus cuvieri (Agassiz).

This species is not uncommon in the market at Pará, where a number of specimens were collected. As our steamer entered the Rio Pará, numbers of what appeared to be this form could be seen darting swiftly over the surface of the stream, with the greater part of their bodies out of the water.

64. Hoplias malabaricus Bloch.

This species was taken at Cedro Dam, near the town of Quixada, at Ceara Mirim, at Lake Extremoz and at Lake Papary.

65. Hoplerythrinus unitæniatus (Spix).

One specimen was found in the market at Pará. I may here call attention to an evident mistake in Dr. Eigenmann's key to the family Characidæ (Freshwater Fishes of British Guiana, p. 258). For the above genus and for *Erythrinus* the walls of the anterior portion of the air-bladder are said to be cellular. In our representatives of this genera it is the second chamber of the air-bladder, the part behind the pneumatic duct, that is cellular. The walls of the anterior chamber and the posterior part of the posterior chamber are simple in structure.

Family GYMNOTIDÆ.

66. Sternarchus macrolepis Steindachner.

A few specimens were taken at Pará. The teeth in the upper jaw are extremely easily lost, and in about half of the specimens at hand they are not to be detected. There is considerable variation in the length and slenderness of the tail and in the position of the vent.

67. Sternarchus albifrons (Linnæus).

A single specimen was found in the market at Pará. It has 15 scales between the lateral line and the median line of the back. The head is contained 6⅓ times in the length, and 1¼ times in the greatest depth.

The angle of the mouth is under the posterior edge of the eye. The snout is contained 3 times in the length of the head, and is equal in length to the longest anal rays. The anal has 152 rays, and its posterior end is distant from the caudal a distance equal to the length of the caudal.

The head is slate-color and darker than the rest of the body. On its upper surface is a white, rectangular, longitudinal spot, and from it a thin, light, broken line runs posteriorly along the back. An abrupt white band crosses the body above the posterior part of the anal fin, involving the latter, and a second one crosses the base of the caudal fin and caudal peduncle. The tip of the caudal fin is white. The fins are otherwise jet black.

68. Sternarchella sima Starks, new species.

Plate 4.

The ventral outline of the head and body is more strongly curved than the dorsal. The greatest depth of the body is 7 in the length. The head is small, with its dorsal contour abruptly rounded at the snout, and its ventral contour slightly and evenly curved to the tip of the mandible; its length is contained from 8 to 8½ times in the length of the body. The mouth is very small; its gape is more transverse than lateral, nearly straight in front and abruptly curved down at the end of the maxillary on the side. The maxillary reaches to under the very inconspicuous posterior nostril. Small, sharp, movable teeth are present in several series on both jaws. The eyes are small and the thick skin that covers them is continuous with the side of the head, so that their extent is difficult to appreciate. Their diameter is contained 8 times in the length of the head, 2 times in the snout, and 2 times in the interorbital space. At the isthmus is a deep longitudinal groove, at the middle of which the vent is placed a little nearer to a vertical line from the preopercle than one from the eye.

The scales are rather large and thin. There are from 75 to 80 tubes in the lateral line. Over an area extending above the base of the anal rays, and about equal in width to the length of the rays (the area of the interhaemal rays) the scales are abruptly smaller. There are 8 or 9 scales between the lateral line and the scaleless area of the back at the widest part of the body. The anal begins below the base of the pectoral or very slightly in front of it, and ends a distance from the caudal base nearly equal to the length of the head. It contains 193 rays, the longest of which are a trifle under half of the length of the head. The pectoral is contained 1⅓ in the head, and has 14 or 15 rays. The length of the caudal is equal to the diameter of the eye.

In life the color was flesh-color, with the back slightly darker with slaty brown. In alcohol the only pigment is a dusky brown narrow band along the back.

This species may be known from other members of its genus by its having a blunt, rounded snout overhanging a small mouth.

Four specimens were taken at Pará, all of them about 6 inches in length.

69. Sternarchogiton natterei (Steindachner).

A single small specimen was collected by Dr. Baker and Mr. Mann at the mouth of the Madeira River.

70. Sternarchorhamphus mulleri (Steindachner).

Many specimens of this species were taken at the market at Pará.

Among them there is a very great variation in the caudal and fin. In many of them the peduncle is nearly twice as long as the head and tapers almost to a point. Its narrowest part is scarcely wider than the very small eye, and the caudal fin is only a trifle wider. In others it is less than the length of the head and tapers more rapidly to a width similar to the first ones. In one specimen it is no longer than the snout and scarcely tapers at all, being three or four times as wide as the narrowest ones, or equal to one-fourth of the length of the snout, while the fin is correspondingly large. One specimen has the peduncle very wide and short, and the fin very diminutive as usual. These specimens do not otherwise differ from each other except in the position of the vent, and this variation has no correlation with the caudal variation. The vent may vary from a position a trifle behind the eye to one considerably in front of it.

These specimens are all colorless in alcohol except a slight tinge of orange-yellow on the fins and a slight dusky tinge on the back. One specimen, however, differs in being a rather dark slaty-brown, almost uniform, but slightly darker above; about the opercular region are blue shades; the fins are bright orange, growing yellow toward the tips of the rays, with the tips dusky, or on the pectoral, nearly black.

71. Sternarchorhynchus curvirostris (Boulenger).

This species is common at Pará, though it has not been before recorded from the lower Amazon.

72. Sternarchorhynchus oxyrhynchus (Müller and Troschel).

A small specimen was taken by Dr. Baker and Mr. Mann about 400 miles above the mouth of the Rio Madeira.

73. Rhamphichthys rostratus (Linnæus).

One specimen was collected at Pará. The postorbital part of the head is contained 1⅕ times in the length of the snout.

74. Rhamphichthys reinhardtii Kaup.

Many specimens of this common species were seen in the market, though on account of their large size only 5 were collected.

I follow Doctor Eigenmann in recognizing this species, while believing with him that it is probably a long-snouted variation of *R. rostratus.* Though there is little difference between these species, except the rather extraordinary one of the length of the snout, it seems better to keep them separate until intermediate variations are reported. In the specimens before me the body is more slender and more gradually tapering backward than in the single specimen of *Rhamphichthys rostratus,* but as this character shows considerable variation it is less remarkable.

The postorbital part of the head, measured obliquely to the middle of the gill opening, is contained in the length of the snout from 1½ to 1¾ times.

75. Steatogenes elegans (Steindachner).

Though this well-marked form was found to be rather common in the market at Pará it has not been reported except at the mouth of the Rio Negro and in the Rio Jurua. It agrees very well with the description and picture of the type, though it differs from the latter in having the tail a little more slender and tapering to a finer point, and in the anal not stopping so abruptly posteriorly but gradually growing lower until it disappears. It has the same number of anal rays.

76. Eigenmannia virescens (Valenciennes).

This species was found to be common in the market at Pará. Most of the specimens have the ventral outline more strongly arched than the dorsal, as alleged for *Eigenmannia humboldti,* and specimens of *E. virescens* mentioned by Dr. Eigenmann from Rio Grande do Sul. Others have both outlines equally arched. The character is very evidently due to preservation and cannot be used in classification. In the thick head and other characters these specimens agree very well with current descriptions.

77. Sternopygus macrurus Bloch and Schneider.

Several specimens of this form were taken at Pará.

The life color is dark olive-green on the back, shading downward to bluish-slate color on the lower parts. There is a dark bluish spot above

gill opening, a light stripe longitudinal along the posterior half of the side, which may be absent, and the fins are light straw-color.

78. Gymnotus carapo Linnæus.

Specimens were taken at Pará and at Lake Papary. The following color note was made from a fresh specimen from the former locality. The back is a very dark dusky-greenish-brown, shading through soiled sienna on the side to dusky-bluish below. The cross bars are black and the anal and pectoral are dusky.

Family ELECTROPHORIDÆ.

79. Electrophorus electricus (Linnæus).

Two specimens were taken at Pará. They were dusky-yellowish-green above, growing yellow on the sides and bright yellow on the lower part of the head, while the lower part of the body was drab, growing lighter anteriorly and merging with the yellow of the head. Blended light spots, as big as the eye, were scattered over the body, and the margin of the vertical fin was light yellow.

Family BUNOCEPHALIDÆ.

80. Platystacus cotylephorus Bloch.

A single specimen was taken at Pará.

81. Aspredo aspredo (Linnæus).

Three specimens of this species were collected at Pará.

Family SILURIDÆ.

82. Felichthys bagre (Linnæus).

Three specimens were collected at Pará. There is considerable variation among specimens of the same length in the length of the barbels. In two of them, 15 inches long, the maxillary barbel reaches to the end of the ventral in one, and to the end of the anal in the other. The mental barbel reaches nearly to the pectoral base in one, and scarcely past the eye in the other. The pectoral filament reaches past the tips of the middle caudal rays in one, and not to the caudal in the other. The pectoral filament reaches past the anterior fourth of the anal in one, and to the posterior fourth in the other. The interorbital bone cannot be described as flat in these specimens, for it is considerably convex.

83. Sciadeichthys proops (Cuvier and Valenciennes).

Two specimens were collected in the Pará market, and one at Ceara.

84. Selenaspis herzbergii (Bloch).

This was by far the most abundant of the subfamily Tachisurinæ in the market at Pará during our stay. The patch of teeth that develops behind the palatine patch and forms the "backward projecting angle" may be found in all stages of development. Sometimes it is not present at all; sometimes it forms a small disconnected patch; sometimes it is very large, connected with the palatine patch, and extends well back in the roof of the mouth. All intergradiations are present. It is not altogether a development of age or size as has been supposed, for it may be better developed in a specimen 8 inches long than in one a foot long, while other specimens of similar sizes, differing from these in no other manner, may or may not have it developed. However, it is usually best developed in large specimens, while specimens 7 or 8 inches long only occasionally have it.

There is considerable variation in the roughness of the top of the head, and of the sharpness of the median ridge on the occipital process. One or two specimens were seen with a narrow but very evident groove running back from the frontal but not reaching to the occipital plate.

85. Tachysurus nuchalis (Günther).

A few specimens were taken at Pará which differ from the description of the type in having the maxillary barbels extend scarcely to the middle of the pectoral spine instead of "nearly to the end." The tooth-patches on the palatines are the shape and size figured by Dr. Günther, and the palatine teeth are coarse. The inner mandibular teeth are coarse and all of the teeth are brown-tipped. The gill membrane forms a distinct free fold across the isthmus, thus differing from *Tachysurus spixi*.

86. Pimelodina flavipinnis Steindachner.

Three specimens, from 12 to 15 inches in length, were taken at Pará. The maxillary barbel in the large specimen reaches only to the end of the adipose dorsal, thus agreeing with *Pimelodina nasus* Eigenmann. In the other two it reaches to or a little beyond the caudal base, as described for *Pimelodina flavipinnis*. The length of the adipose fin is from 2¼ to 2⅓ in the length, thus coming about between these two species. The interorbital space is convex, and the head behind the eyes is not compressed as in *Pimelodina nasus*. The eye is contained about twice in the interorbital, or nearly midway between the condition described for these two species, as

is also the length of the pectoral as compared with the dorsal. In other respects (except "Die kopfbreite zwischen den kiemendeckeln erreicht ⅓ der kopflange," which is a mistake, as shown in Dr. Steindachner's picture of the type) these specimens agree with *Pimelodina flavipinnis*. The eye in the head, the depth above the ventrals, the net-work of sensory tubes over the head, the distance of the adipose dorsal from the dorsal, and the color, with several rows of brown spots on the upper half of the body, all agree with that species.

87. Pinirampus pinirampu (Spix).

Four specimens of this well-marked species were taken at Pará.

88. Rhamdia sebæ (Cuvier and Valenciennes).

A number of specimens were collected at Pará. Comparing a specimen 6 inches in length collected in British Guiana by Dr. Eigenmann with these of equal size the eye is a little smaller, the body and caudal peduncle not so deep or so compressed, and the fontanel a trifle wider.

89. Rhamdia quelen (Quoy and Gaimard).

A couple of specimens were taken in the ponds at Ceara Mirim. The maxillary barbels do not reach to the middle of the adipose dorsal, but otherwise these differ only in minor characters from *Rhamdia sebæ* and these are such characters that might be expected to intergrade in a sufficiently large series. It is probable that they represent only one species.

90. Pimelodus altipinnis Steindachner.

A common species in the market at Pará, where several specimens were taken.

91. Pimelodus clarias (Bloch).

A couple of specimens collected by Dr. Baker and Mr. Mann in the Rio Madeira about 400 miles from its mouth.

92. Brachyplatystoma filamentosum Lichtenstein.

A number of specimens of this species were collected at Pará.

93. Brachyplatystoma vaillanti (Cuvier and Valenciennes).

This species is a common one in the market at Pará, where a number of specimens were collected.

94. Brachyplatystoma rousseauxii (Castelnau).

A half dozen specimens, from 11 to 14 inches in length without the caudal filament, were collected at Pará. The following notes show some

slight differences from the description published by Dr. Eigenmann (South American Nematognathi, p. 198), and add a few variations.

The occipital crest reaches at least 3/5 of the distance from its base to to the dorsal spine. The eye is contained from 6½ to 7½ times in the snout; 3½ to 4 times in the interorbital space; and 14 to 16 times in the length of the head. The maxillary barbel often reaches to the tip of the pectoral, and the postmental is usually coterminous with it, or sometimes is a trifle shorter. The upper lobe of the caudal bears a long filament, variable in length, but often as long as the entire body. The lower lobe is in one or two case filamentous and twice the length of the head, though usually it is but little produced or half that length. The vent is only 6 diameters of the eye from the anal. The entire side of the body is not reticulated and porous, but it bears a lateral band which is about half as wide as the interorbital space under the dorsal, grows a little wider anteriorly and tapers to a point posteriorly. The head is contained from 3¼ to 3⅓ times in the length.

In life it is a strikingly beautiful fish, with metallic golden red, coppery and silvery reflections.

95. Tænionema platynema (Boulenger).

A single specimen, 22 inches in length, was collected at Pará. It is referred to this species, though in many of its characters it resembles as well *Tænionema steerei* Eigenmann and Bean, making it appear probable that the two are identical, as suggested in the original description of the latter species. The eye is contained 4 times in the interorbital space, 14 times in the snout, 20 times in the head, the adipose dorsal is 3 times as long as deep, and the ventral and pectoral are equal in length. All of these characters are as in *T. platynema.* The length of the head is 3 times as long as deep, and the length of the first dorsal ray is contained 1½ times in the head as in *T. steerei.* The depth of the body is 6½ times in the length, and the depth of the caudal peduncle is 2 times in its length. The fins and the sides are bright yellow in alcohol; its colors in life were not recorded.

Platypogon, new genus.

This genus is related to *Brachyplatystoma,* but has the barbels with their inner edges bearing a thin dermal membrane, and has not the characteristic small eye and flat, depressed snout. The teeth are freely movable and in broad bands. On the premaxillary, and to a less degree on the mandible, they grow longer posteriorly and point backward. The palatine and vomerine teeth form a continuous band. The fontanel does not extend

back as a groove, and the top of the head is covered with a moderately thick skin. The supraoccipital process barely reaches to the dorsal plate. The adipose dorsal is situated over the anal and is about equal to it in length. The anal is emarginate and the caudal is forked.

96. Platypogon cærulorostris Starks, new species.

Plate 5.

The head is conical, as deep as wide opposite the posterior edge of the operculum, and equal to two-thirds of its length. It is contained 4 times in the length of the body to the caudal base. The depth of the body slightly exceeds its width, and is contained from 5⅓ to 5⅔ in the length. The depth of the narrowest part of the caudal peduncle is contained from 3⅓ to 3½ times in the head. The skin forms a moderately thick covering to the bones of the top of the head, forming a smooth surface with fine striations barely indicated. The fontanel does not extend behind the eye, and a very short groove, not longer than the pupil, extends back and terminates abruptly. This is only made evident by removing the skin. The occipital process tapers back to a rather narrow point at the dorsal plate, being scarcely, or barely, in contact with it and not at all connected. The eye is large and round. Its diameter is contained 2½ times in the interorbital space, 6 times in the head, and 2¼ times in the snout. The premaxillary band of teeth is widest at the middle, where it is equal to two-thirds of the diameter of the eye. The teeth grow long posteriorly and lie flat, pointing straight backward. The vomerine and palatine patches of teeth form a continuous band, a little narrower than the premaxillary band, and slightly narrower in the middle than at either side. All of the teeth are freely movable. The snout is convex above, and moderately broadly rounded in front. Its length is contained 3 times in the head. The rictus reaches to under the anterior margin of the eye. The barbels have a membraneous posterior margin, especially the mentals and postmentals, where the membrane is as wide, or a little wider, than the fleshy part of the barbel. The maxillary barbels reach to the base of the ventrals, the postmental barbels a little past the middle of the pectorals, and the mental barbels to the base of the pectorals.

The dorsal spine is filamentous, a third longer than the head, and reaches to the adipose dorsal. The dorsal has 6 rays, and its base is contained 2½ times in the space between it and the adipose dorsal. The base of the adipose dorsal is almost as long as that of the anal, and is situated directly opposite to it. Its vertical height is half of the length of its base.

The anal has 14 rays, counting two in front of the longest ray. It is deeply emarginate, and its longest anterior rays reach past the tips of the last ones. The ventrals are situated a little less than the length of the head in front of the anal, and reach three-fourths of the distance to the anal. The caudal is widely forked, and its lower lobe is a trifle the longer. Its longest rays slightly exceed the length of the head.

The ground color is slaty-brown on the back, grading downward to soiled white on the lower parts. On the upper part of the side two more or less definite rows of dark brown spots with blended edges, their diameter about half that of the eye. The top of the head is brown, with a conspicuous white spot over the fontanel. The tip of the snout has a deep blue spot almost the exact color of modern blue-black writing ink. The fins and humeral processes are deep orange-yellow, more intense on the caudal. Counting from the middle of the caudal fin downward the sixth to the eighth rays are abruptly black.

Three specimens were collected at Pará, from 9 to 12 inches in entire length.

97. Sorubim lima (Bloch and Schneider).

A single specimen, 10 inches long, was collected by Dr. Baker and Mr. Mann in the Madeira River about 400 miles above its mouth.

The plates on the head are finely striate, granulate, and separated by well-marked sutures. The anterior half of the occipital plate is bounded laterally by parietal and temporal plates. Its granulated surface does not reach to the dorsal plate, but below the thin membrane that covers it it extends to, and joins, the dorsal plate. The dorsal plate is spearhead-shaped, with its point forward. The fontanel is open from the middle of the eye to within a diameter of the eye of the occipital plate, and anteriorly is represented as a groove to in front of the eye. A membraneous groove in the middle of the occipital plate appears like a second fontanel, but it does not pierce the bone.

98. Platystomatichthys sturio Kner.

Several specimens were collected at Pará, the longest 14 inches in length. They show some variation from Dr. Eigenmann's description. The projection of the snout beyond the lower jaw is contained from 2⅓ to 2⅔ in the length of the head. The eye is contained from 10½ to 12½ times in the same distance. In none of them are the palatine teeth as far remote from the vomerine, as described and figured by Dr. Eigenmann. Usually the palatine teeth are almost in contact with the vomerine teeth, there being

only a fine line of naked skin between. Occasionally the space is a little wider, but in none is it as wide as in the picture.

99. Doras dorsalis Cuvier and Valenciennes.

Many specimens of this common species were collected at Pará. In most of them the stomach was tightly filled with a small univalve shell.

The dorsal median plates and the ventral plates on the caudal peduncle are apparently never present in specimens as small as 5 inches in length, but in those 6 inches long some of them are present at least as rudiments. Though they are usually the best developed in the largest specimens they may be almost entirely absent. There is also much variation in the roughness of the head. In one specimen the bones of the head are so finely granular as to appear almost perfectly smooth.

These specimens show some slight variations from Dr. Eigenmann's description (S. Am. Nematog. Cal. Acad. Sci.,1890). The caudal peduncle measured at the bases of the spines is as wide as deep. Usually a series of slight broken ridges extends from the frontal to the dorsal plate, and a well-developed groove on the dorsal plate extends to its tip, but only occasionally "a marked groove extends form it [the frontal] to the tip of the dorsal plate." The pectoral spine is as long as the dorsal spine or often a trifle longer, and in the young of 6 inches in length it is equal in length to the head, or slightly shorter, but in specimens 10 or 11 inches in length it is considerably longer than the head.

100. Centromochlus heckelii (Filippi).

Several specimens of this peculiar little species were taken at Pará, the largest 4 inches in length.

101. Trachycorystes galeatus (Linnæus).

Several specimens were collected in the market at Pará. The following color notes were made from fresh specimens. The ground color is opaque, soiled light yellow, usually with black blotches scattered over the head, body and fins. These may be absent or often take the shape of horizontal elongate spots, or the form of irregular lines suggesting penciled lines. The under parts are milk-white, often more or less soiled with groups of small dark dots.

102. Trachycorystes striatulus Steindachner.

A few specimens were collected in the little ponds about Ceara Mirim. These much resemble *Trachycorystes galeatus,* but the head is not so rough

or naked; the humeral process is shorter and does not project so much laterally at the base over the base of the pectoral spine; no pectoral pore is present; the top of the head between the eyes in the adult is a little flatter; and in the specimens at hand the color is darker and the under parts dusky with fine points. These differ from the original description in having 2 or 3 fewer anal rays.

103. Pseudauchenipterus nodosus (Bloch).

A number of specimens from 6 to 9 inches in length were taken at Pará, which I refer, with considerable hesitation, to this species, though they agree very well with the picture* and short description of *Pseudauchenipterus guppyi* Regan (Proc. Zool. Soc. 1906, Pl. XXIII). The head cannot be described as having the "upper surface, excepting the snout, rugose, not covered by skin; frontal bones not swollen." On the contrary, the top of the head is as described by Dr. Eigenmann (S. Am. Nematognathi, p. 290) for *P. nodosus,* with the frontals swollen and of distinctly "honey-comb structure." It is covered with thin skin. These specimens have the color markings as described and figured for *P. guppyi,* with the same light lateral band and vertical row of light spots, and with or without the black border to the caudal. These markings are occasionally obscure, though they are usually very conspicuous. They differ from Dr. Eigenmann's description of *P. nodosus* as follows: The pectoral spine is usually sharp-pointed and does not end in a filament. Its length is from 4 to 4¾ (not from 2⅔ to 3⅓), thus agreeing with the pictures published by Bloch and by Bleeker. The humeral process usually extends to the middle of the pectoral spine or a trifle beyond.

104. Auchenipterus nuchalis (Spix).

Very common at Pará, where a large number were collected.

There is a remarkable variation in the maxillary barbel. In most of them the barbel extends straight back under the eye. It is very slender, its anterior end ossified, and it fits into a shallow groove immediately below the eye. In the opposite extreme the base of the barbel is a wide curved bone, much wider than the pectoral spine, and its curve forms at least a fifth of a complete circle (though it is not an even curve, being more abrupt below the eye). It extends upward from the eye, and ends above the level of the eye a little behind the head. It does not taper much posteriorly, but ends

* The title of the picture and the reference in the text are transposed with those of *P. pascæ.*

abruptly at the beginning of the fine soft part of the barbel. The groove that it occupies encroaches somewhat upon the eyeball below. There is only about one of these specimens to a dozen of the others.

Between these extremes are nearly all of the intermediate stages, and coördinating with it are the size and shape of the first anal rays. These are enlarged and form a process in the specimens with the large, bony, curved maxillary barbel, but not at all differentiated from the other rays in those with the straight, fine, scarcely ossified barbel, while they are slightly enlarged in those with the barbel slightly enlarged, curved and ossified.

The enlarged anal process suggests a copulatory organ. It is as long as the pectoral spine, or two-fifths longer than the rays behind it, and is formed of two rays, with a third slightly enlarged and closely attached to it. These appear to be the first rays, but upon dissecting away the integument two slender shorter rays are found in front of them. The enlarged rays, though they become stiff and spine-like, do not lose their articulations. The tip of the process is strongly hooked up and back. In a specimen with the ossified portion of the barbel no wider than the pectoral spine, and the ossified portion shorter and passing into the fleshy portion imperceptibly, the anal process is enlarged but not hard and spine-like at the tip, and not hooked up. In those where the condition of the barbel is about midway between the extremes, that of the anal process is also about midway between, perceptibly enlarged, but not longer than the other rays.

Whether these characters go with sex I am unable to ascertain with the specimens at hand. Some specimens have the abdominal cavity filled with fat, and the bases of the fins thickened with fat. This gives to the fins of preserved specimens an orange-yellow color. In other specimens this condition is not apparent. It cannot be correlated with the condition of the barbel or anal process.

105. Ageneiosus ucayalensis Castelnau.

Many specimens were taken in the market at Pará, where it seems to be as abundant as *Ageneiosus dentatus,* which it much resembles. From the latter it may be known by the slightly more slender body, the longer snout as compared with the width of the head at the eyes (as compared with the length of the head or the body the difference does not appear), the smaller eyes, the wider band of teeth on the premaxillary, the longer and more strongly curved mouth, the more strongly projecting upper jaw, and the slenderer spines. The color is usually more bluish, less spotted above, becoming more abruptly white on the sides, and seldom with a black or dusky

spot on the base of the caudal rays above and below. The difference in the width of the band of teeth as given by Dr. Eigenmann, "depth of intermaxillary band of teeth in front equals a diameter of the eye" in this species, and "depth of intermaxillary band of teeth scarcely more than half as wide as eye" in *A. dentatus* is not such a difference as might appear, for it is usually considerably more than half as wide as the eye in the latter species, and the difference between them is as much a variation in the size of the eye as of the teeth. When the bands of teeth are directly compared with each other it is only a little wider in *A. ucayalensis*.

106. Ageneiosus dentatus Kner.

Common in the market at Pará, where several specimens were taken. On the back are indications of cross bands or mottled spots, especially in the young, and the color is made up of rather coarse dots.

Family HYPOPHTHALMIDÆ.

107. Hypophthalmus edentatus Spix.

This species is very common in the market at Pará, where a series of specimens from 4 to 16 inches in length was collected. These show very well the branching tubes of the lateral line system developing with size, and also shortening of the barbels, as described by Dr. Eigenmann.

108. Cetopsis cæcutiens Lichtenstein.

A single specimen from Pará, and two from the Rio Madeira, the latter collected about 400 miles above the mouth of the river by Dr. Baker and Mr. Mann.

In the largest one, 10½ inches in length, the skin has so grown over the eye as to almost completely hide it.

Family LORICARIDÆ.

109. Farlowella hargreavesi Eigenmann.

This species was described as new in my manuscript, but it has recently appeared under the above name in Doctor Eigenmann's Freshwater Fishes of British Guiana (Mem. Carnegie Mus. Vol. V, p. 252). I leave my description and comparisons stand as I have written them, however, as they show some slight variation from, and add a little to, the description of the type.

A single specimen, 8 inches in length, was collected in the market at Pará.

The head, measured to the end of the temporal plate, is contained 3¾ times in the length to the caudal. It is wider than in related species, and rapidly tapers, as viewed from above, to a point half way between the eyes and the tip of the snout, thence the taper is scarcely perceptible to the slightly expanded tip of the snout. The length of the snout is contained 4⅚ times in the entire length to the caudal. Opposite the eyes the depth of the head is contained 1⅘ times in its width. The surface of the head and snout are everywhere finely granular, with the granulations not bristle-like or otherwise differentiated at the side. The teeth of the upper jaw are long and slender, hooked inwards, their points flattened and unevenly divided into two or three unequal cusps. There are at least 24 of them on each side of the jaw. The diameter of the eye is contained 14 times in the length of the head; 3 times in the interorbital; once in the space to the anterior nostril; and 1½ times in the space to the upper end of the gill opening.

The breast has a median series of plates; the one between the ventrals and just in front of the vent is enlarged. At the vent a lateral plate extends entirely across the body and is pierced by the vent. Directly behind it is the last median ventral plate. Seven plates are in the median series between the occipital plate and the dorsal. The same number of lower lateral plates are between the pectoral and ventral.

The pectoral is contained 2⅙ times in the head, and reaches a diameter of the eye past the front of the ventral. The ventral is contained 3⅖ times in the head, and does not reach to the anal. The anal has 6 rays, is inserted behind the front of the dorsal and reaches a trifle past it. Its first ray is contained 1¾ times in the head. The caudal lobes are produced.

A conspicuous dark band, about twice the diameter of the eye at its widest part, runs from the tip of the snout to the caudal. The entire snout is dark and the color parts into the lateral band of each side where the snout grows broad. The band thence curves upward, surrounding the eye, and arches backward, following the contour of the back. It follows along the side of the caudal peduncle with a round white spot at the posterior edge of each plate, and divides on the caudal fin in a black stripe along each lobe near the edge. The other fins are colorless, and except the ventral, have round dusky spots on the first two or three rays.

This species is related to *Farlowella gladius* and *F. gracilis,* but differ as shown in the appended table. Of the only other two species with a median series of ventral plates *F. kneri* has a much blunter, shorter, and wider snout, and a much larger eye, while *F. oxyrhynchus* has the post-dorsal part of the body much shorter as compared with the predorsal part.

TABLE SHOWING DIFFERENCES BETWEEN FARLOWELLA HARGREAVESI, F. GLADIUS AND F. GRACILIS.

For *F. gladius* the measurements are taken both from the original description and from a description published by Regan (Trans. Zool. Soc. Lond. XVII, 1904, p. 303).

	hargreavesi	*gladius*	*gracilis*
Length of head in length of body	$3\frac{3}{4}$	$3\frac{1}{2}$ ①	$3\frac{2}{3}$
Width of head in length of head	3	4	4
Eye in head	14	18 ②	$12\frac{1}{2}$
Eye in interorbital	3	$3\frac{1}{2}$	3 ④
Interorbital in head	$5\frac{1}{3}$	5	$5\frac{3}{5}$
Distance from supraoccipital to first dorsal ray in length of body	$6\frac{1}{4}$	6	$6\frac{1}{4}$
Postorbital part of head in snout from naked oral area	$2\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{3}{4}$ ③
Number of lateral scutes	35	33	33
Length of 2nd and 3rd dorsal scutes in their width	2	3 ⑤	$2\frac{2}{5}$ ④
Pectoral ending in relation to front of ventral	past	not to	just to ④
Length of dorsal ray	$1\frac{3}{4}$	2	$2\frac{1}{6}$ ④
Length of first anal ray	$1\frac{5}{6}$	$2\frac{1}{2}$	$2\frac{1}{5}$ ④
A black lateral band	present	absent	absent

①According to Boulenger. According to Regan and the picture it is $3\frac{2}{3}$.
②According to Regan. According to the picture it is $16\frac{1}{2}$.
③According to Regan. The picture shows it to be $2\frac{1}{2}$.
④According to the picture. These characters not described by Regan, who states "other characters similar to the preceding species [*F. gladius*]."
⑤According to picture. Boulenger describes them "as more than twice as long as broad."

110. Loricaria cataphracta Linnæus.

Three specimens from Pará.

111. Plecostomus emarginatus (Cuvier and Valenciennes).

A few specimens were collected by Dr. Baker and Mr. Mann in the Madeira River about 400 miles from its mouth.

112. Plecostomus pusarum Starks, new species.

Plate 6.

In the following description only specimens between 6 and 8 inches in length are considered, though smaller ones were taken.

The head to the temporal plate is contained 3 times in the length. The temporal and occipital ridges are only very slightly indicated, not nearly so well developed as in *Plecostomus plecostomus*. The width of the

head is from 1 to 1½ diameters of the eye less than the length of the head. The depth of the head at the point of the supraoccipital is equal to the length of the snout. The interorbital space is contained 2½ times in the head, and the length of the snout from 1¾ to 1⅘ times. The distance from the anterior nostril to the tip of the snout is equal to the interorbital space. The middle of the interorbital space is only a trifle higher than the supraorbital rim, while the intermediate space between these two points is somewhat sunken on each side. The eye, inside of the eyelids, is contained from 9 to 10 times in the head, and 3½ to 4 times in the interorbital space. The band of teeth on each side of the mandible is contained 3½ times in the interorbital space, and the width of the lower lip 2½ times. The barbel does not reach to opposite the posterior edge of the lip, and is equal to the space between the eye and the posterior nostril.

The distance from the tip of the snout to the first dorsal spine is contained from 2⅓ to 2½ times in the length of the body. The vent is midway between the base of the caudal and the pectoral spine. The depth of the body in front of the dorsal spine is contained from 4 to 4½ times in the length, and the greatest width from 3 to 3¼ times. The caudal peduncle in front of the adipose dorsal is as wide as it is deep. The first dorsal spine is a trifle less than the length of the head, and when the fin is reclined its tip does not reach to the middle of the last ray. The last ray is equal to the length of the snout, and for a short distance near its base it is adnate to the back. The tips of the last rays broadly overlie the adipose dorsal, reaching at least to its middle. On the posterior margin the dorsal fin is convex. The length of the pectoral spine is contained from 3 to 3¼ times in the length of the body, and almost a third of its length extends past the base of the ventral. The ventrals reach well past the posterior end of the anal base, or half way or more from their base to the caudal fin. The anal has a spine and 4 soft rays, and the tips of its rays do not reach so far back as the dorsal rays, but reach half way, or nearly, from their base to the caudal. The lower caudal lobe is longer than the upper, and the lowest branched ray reaches nearly to the tip of the lower simple ray, which is scarcely filamentous at the tip. The lower simple ray is contained from 2⅓ to 2½ times in the body, the upper ray from 2⅔ to 2¾ times.

The supraoccipital is bounded behind by a single plate. Two upper rows of plates are slightly carinate, and four plates extending back from the pectoral are bluntly carinate; the carinations are scarcely evident elsewhere. The longitudinal spinules grow coarser on the caudal peduncle, and are coarser and less numerous than in *P. plecostomus*. There are 25 or 26

lateral plates; 3 between the occipital and dorsal spine, the last very narrow medially; 7 between the dorsals; 4 between the adipose dorsal spine and the caudal; 12 between the anal and the caudal. The cross lines on the belly divide the granulations into much larger plates than in *P. plecostomus,* and there is a larger naked area at the bases of the ventral fins.

Dark spots cover the body, on the ventral as well as the dorsal surface, and the fins. Each dorsal membrane bears two rows of them.

This species is most closely related to *P. plecostomus,* but differs in having a smaller eye, the occipital and temporal ridges scarcely developed, the dorsal fin overlapping the adipose dorsal, the plates on the belly coarser, the spinules on the lateral scales coarser, and the whole posterior part of the body shorter, so that the anal and ventrals and vent are more posteriorly placed in relation to the caudal base.

Numerous specimens from 2 to 8 inches in length were collected in the little disconnected ponds and in the muddy stream at Ceara Mirim, the boys catching them under the overhanging grassy banks in their hands and in dip-nets. The type is 8 inches in entire length. (*Pusarum,* named in memory of the boys to whom I owe the collection of fishes at Ceara Mirim—the best collectors we found in Brazil.)

113. Plecostomus plecostomus (Linnæus).

Three specimens were taken at Pará, the largest 8 inches in length. This species resembles *Plesoctomus verres* very closely. It differs not only in having the supraoccipital bounded behind by a single plate, but the dorsal is less angulated, less oblique and straight on its posterior edge, and its outline more rounded. The scales on the breast and belly are more segregated into little square areas formed by diagonal cross lines.

114. Plecostomus verres (Cuvier and Valenciennes).

Several specimens were collected at Pará, the largest a foot in length. They agree very well with current descriptions except that "scutes carinate except on caudal peduncle" (Regan Trans. Zool. Soc. Lond. XVII, p. 209) does not adequately describe these, for the scales on the caudal peduncle have low keels, not so sharp and high as they are anteriorly, but still very evident.

115. Acanthicus hystrix Spix.

A specimen of this rare species, 14 inches long without the caudal filaments, was collected in the market at Pará. It has 8 soft rays in the dorsal. The barbels, unlike the specimen described by Dr. Eigenmann, scarcely reach as far posteriorly as the edge of the lower lip.

Family CALLICHTHYIDÆ.

116. Callichthys callichthys Linnæus.

Three specimens were taken at Pará.

117. Hoplosternum thoracatum (Cuvier and Valenciennes).

Several specimens were taken at Lake Papary and two at Pará.

Family SYNODONTIDÆ.

118. Synodus fœtens (Linnæus).

Two small specimens taken at Natal.

Family PŒCILLIDÆ.

119. Anableps anableps (Linnæus).

A single specimen from Pará.

120. Pœcilia vivipara Bloch and Schneider.

A large number of specimens from 1 to 2¾ inches in length were collected in the little ponds at Ceara Mirim, and in a pond in a deserted part of a public park at Ceara. They are identical with specimens collected in British Guiana by Dr. Eigenmann.

The head is contained from 3½ to 4 times in the length to the caudal base; the depth from 3 to 3⅓ times. The eye is contained from 3½ to 4 times in the head, or 2 times in the interorbital space. The width of the mouth is 1½ times in the interorbital space. The front of the dorsal is midway between the base of the caudal and the opercle, or varying to slightly in front of the last point. The length of the pectoral is equal to the combined length of the eye and the postorbital part of the head, or to the depth of the caudal peduncle. There are 6 or 7 rays in the dorsal, and the same number in the anal, though the base of the latter is much shorter. The cross series of scales number from 26 to 28.

The males do not exceed a length of 2 inches. They have from 4 to 6 cross bars, usually a little narrower than the interspaces but not always, behind the front of the dorsal. Just above the point of the pectoral on the upper part of the side is a brown spot as large as the eye. It is conspicuous in specimens up to 1½ inches in length, but in large ones it becomes lengthened into an anterior cross bar. The females have no conspicuous cross bars except a slight trace of them in the younger specimens. They may retain the dark side spot until they are 2¼ inches in length, but usually it dis-

appears by the time they are 2 inches long. On both sexes the scales are bordered with brown, and the upper and lower rays of the caudal sometimes bear a spot irregular in size, and varying in color from black to its complete absence.

Family BELONIDÆ.

121. Tylosurus almeida (Quoy and Gaimard).

Specimens were secured at Lake Papary, Natal and Pará.

Family HEMIRAMPHIDÆ.

122. Hyporhamphus unifasciatus (Ranzani).

Numerous specimens from 6 to 10 inches in length were taken at Natal. None of them has the mandible, from the tip of the upper jaw, shorter than the rest of the head, as stated by Jordan and Evermann (Fishes of N. and Mid. Am. p. 720), nor are the ventrals always inserted midway between the eye and the base of the caudal, but their insertion varies from that point to midway between the base of the caudal and the gill opening as in *Hyporhamphus rosæ*. These specimens were compared with some from Jamaica and found to agree in all of their characters.

Family EXOCŒTIDÆ.

123. Cypselurus rubescens (Rafinesque).

A large specimen of this fish flew on board of our steamer while en route between Ceara and Natal. The light area on the pectoral is not nearly as large or distinct as usual.

Family SYNGNATHIDÆ.

124. Hippocampus punctulatus Guichenot.

A few specimens of this form were collected in the harbor at Natal.

Two distinct color phases are represented, but no other differences appear. The following colors were taken from live female examples. The only male collected is of the color of the second one here described.

(1) The lower parts of the head, belly and tail are bright canary yellow, and the upper parts are yellowish green. Two dark brown cross bars occur between the head and the dorsal fin. The second one is more conspicuous, covering two rings, and covered with irregular, longitudinal, white lines. A third cross bar is on the tail four rings behind the dorsal. Be-

hind this are some scarcely distinguishable bars on top of the tail. Very fine white points are scattered over the body and head.

(2) The belly and under parts of the head are light gray, almost white, while the upper parts grow gradually darker to almost black. There is no yellow anywhere. The head and body are nearly everywhere covered with dark spots as large as the pupil and smaller, with numerous fine white points in between, some of which are arranged as irregular light lines. The body color is very much the same as the cross bars on the yellow specimens. A few light lines radiate from the eye. No cross bars are present. Another specimen of this type of coloration has the white dots run together into large, numerous solid lines, giving a much lighter general effect.

Family ATHERINIDÆ.

125. Menidia brasiliensis (Quoy and Gaimard).

Many specimens were seined in the harbor at Natal and collected by the fishermen in Lake Papary. These specimens have 3 or 4 dorsal spines, not 4 or 5 as described by Doctor Günther (Cat. III, p. 404).

Family MUGILIDÆ.

126. Mugil brasiliensis Agassiz.

This species was very abundant at Lake Papary and Lake Extremoz. In the former lake specimens were taken nearly three feet in length.

127. Mugil curema Cuvier and Valenciennes.

Specimens were taken at Pará, Natal and Lake Extremoz.

128. Mugil trichodon Poey.

This was the commonest mullet in the harbor and rock pools at Natal, where several specimens were taken.

Family SPHYRÆNIDÆ.

129. Sphyræna barracuda (Walbaum).

A few small specimens taken at Natal.

Family HOLOCENTRIDÆ.

130. Holocentrus ascensionis (Osbeck).

A few specimens of this brilliant fish were taken in the tide-pools at Natal. In life it is very resplendent with metallic golden-red and coppery

color having brassy reflections. The under parts are clear white, and the side is crossed with longitudinal light pearly stripes. A white stripe runs back from the maxillary to below the base of the preopercular spine, involving the upper half of the maxillary. The vertical limb of the preopercle is edged with white. The dorsal spines are light yellow, and the membrane between them is pink. The other fins are pinkish, and the iris is dark red.

Family SCOMBRIDÆ.

131. Scomberomorus cavallo (Cuvier and Valenciennes).

This species is common in the market at Pará, where several specimens about a foot in length were obtained.

These specimens do not have fewer dorsal spines than *S. maculatus,* as alleged by Week and Newland (Proc. Acad. Nat. Sci. Phila. p. 233, 1884), nor is the spinous dorsal without a black blotch anteriorly, as stated by Jordan and Evermann (Fishes of N. and Mid. Am., p. 875). Compared with *S. maculatus* the teeth are much more compressed and wider at the base in the mandible and not so numerous, there being only 8 or 10 on each side. The species may be most readily recognized by the very short, scarcely developed, gill-rakers which are less than half the pupil in length.

132. Scomberomorus maculatus (Mitchill).

A single large specimen was taken in Natal.

Family TRICHIURIDÆ.

133. Trichiurus lepturus Linnæus.

Only a single specimen, a couple of feet in length, was taken at Pará. but it is an extremely common species, especially at Ceara. Great quantities of them are dried and they may be seen in the stores at Ceara and Natal in big bales corded together like so much firewood.

The bones are subject to hyperostosis, or a deposition of bone cells on the surface of the normal bones until they are several times their ordinary size. It appears in the form of tubercles, or abrupt enlargements of irregular size scattered over the interspinous bones at irregular intervals, and not confined to certain bones as appears to be the case among the species of the family Carangidæ.

The specimen at hand resembles *Evoxymetopon tæniatus Poey* in color but in no other respect. There are conspicuous orange-colored longitudinal

lines on the body; one at the base of the dorsal; two narrow pale ones above the middle of the side; one wide, dark and well-marked one parallel to the lateral line; the fifth one following the lateral line; and two narrow ones on the lower part of the side.

Family CARANGIDÆ.

134. Oligoplites saurus (Bloch and Schneider).

A few small specimens were seined at Natal.

135. Oligoplites saliens (Bloch).

Several specimens of this species were taken at Pará.

The following key to the species of *Oligoplites* is founded upon specimens in Stanford University. All of the species are represented by an abundant number of specimens except *Oligoplites altus* and *Oligoplites refulgens*, of which only a single well-preserved specimen of each is available.

Key to the Species of Oligoplites.

a Top of head everywhere densely covered with pores opening into short canals ramifying beneath the skin.

b Depth from 2¾ to 3 in length; body angulated at front of soft dorsal and anal; outer mandibular teeth conical and no more crowded or movable than other teeth; the band of mandibular teeth not so wide; maxillary reaching considerably past the eye. *mundus.*

bb Depth 3⅖ in length; body scarcely angulated; outer mandibular teeth crowded, slender and movable, projecting above other teeth and laterally flattened; the band wider; maxillary reaching but slightly past eye. *altus.*

aa Top of head without pores or only a few at the side running forward from above opercle, but never any medially on top of head between eyes or on snout.

c Maxillary reaching to middle of eye; depth equal to length of head; side abruptly silvery below a double dark stripe on back. *refulgens.*

cc Maxillary reaching to posterior border of eye or beyond; depth greater than length of head, the dark color of back more gradually merging into the silvery color of side.

d A well-developed membrane connecting anterior part of branchiostegal membranes; posterior half of maxillary gently and evenly curved downward; maxillary reaching past eye in specimens over 7 inches long; depth 3¼ to 3⅓. *saliens.*

dd No membrane between branchiostegal membranes*; maxillary straight to its posterior fourth, then rather abruptly curved downward; maxillary not reaching past eye; depth 3⅔ to 3¾. *saurus.*

136. Caranx hippos (Linnæus).

Several specimens were taken at Pará.

137. Caranx crysos (Mitchill).

A single specimen was collected at Natal.

138. Hemicaranx amblyrhynchus (Cuvier and Valenciennes).

A single specimen, 8 inches in length, was taken at Pará. There can be little doubt but that this is referable to the above species, but there are several discrepancies between it and the description published by Jordan and Evermann (Fishes of N. and Mid. Am., p. 912). The head is 3⅘ in length. Fifty scutes may be counted if the extremely small ones are included at each end of the straight part of the lateral line. The maxillary reaches a little past the front of the pupil (not "the front of the orbit"); the caudal lobes are equal. The arch of the lateral line is contained 2½ times in the straight portion (not 3 times). The pectoral is considerably longer than the head and reaches well past the front of the anal. In all of these respects the specimen at hand resembles the plate by Cuvier and Valenciennes.

Family APOGONICHTHYIDÆ.

139. Amia brasiliana (Gilbert).

A few specimens taken in the tide pools at Natal, from 1 to 3½ inches in length. They agree perfectly with the description of the type. They lack the caudal spot of *Amia imberbis,* but in the smallest ones there is a dusky, wide, transverse band across the caudal peduncle, though this does not resemble the spot in the middle of the peduncle of *A. dovii.* They all have the opercular spot, and the small ones have a black spot in line with it behind the eye.

* Occasionally a very slight narrow membrane is present, but nearly always it is entirely absent, and it is never well developed as in *O. saliens.*

Family CENTROPOMIDÆ.

140. Centropomus mexicanus Bocourt.

Specimens of what are apparently referable to this species were taken at Pará, Natal, Lake Extremoz and Lake Papary. The lateral line is usually slightly dusky as in the picture published by Vaillant and Bocourt (Miss. Sci. Mex. 1875, Pl. I) except in a large individual (14 inches long) where a dark spot above and below the pore on each scale gives the line a distinctly darker appearance, or in others where it is nearly colorless.

Centropomus constantinus Jordan and Starks is synonymous with this species. It was separated chiefly on account of its lateral band being colorless, its dorsal spines more slender and shorter, and its body deeper. In all of these characters it falls within the range of variation of the specimens at hand. The type of *C. constantinus* has a slightly shorter anal spine than the others, but the difference is not of sufficient value to separate the species.

Doctor Boulenger has united *C. mexicanus* with *C. parallelus* Poey, but if the latter was correctly described as having 90 series of scales it seems scarcely probable that it can be the same. In the large numbers of specimens of *C. mexicanus* at hand the variation is only between 68 and 73.

141. Centropomus undecimalis (Bloch).

This species is common in Lake Papary, where several specimens were taken.

Family SERRANIDÆ.

142. Cephalopholis fulvus (Linnæus).

Two specimens from Natal represent both the brown type of color with blue spots *(Bodianus fulvus punctatus)* and the scarlet type with black spots *(Bodianus fulvus ruber.)*

143. Epinephelus adscensionis (Osbeck).

Three small examples taken at Natal.

144. Promicrops guttata (Linnæus).

One specimen, a foot in length, was taken at Pará. As compared with a specimen of similar size from Jamaica the head is a little shorter, and the eye a little larger. The greater length of the head in the Jamaica specimen is all in the postorbital region.

145. Rypticus coriaceus (Cope).

Two small specimens were collected at Natal. Dr. Boulenger has placed this species, perhaps correctly, in the synonymy of *Rypticus sapo-*

naceus. Comparing the specimens at hand with some specimens of the latter species from Jamaica considerably larger in size they are somewhat more slender, darker and more uniformly colored. One of them, however, has 3 opercular spines on one side as in the typical *R. saponaceus* and 2 on the other, while the other specimen has 2 on each side. There is little difference in the connection of the dorsal fins between the two species. The lower of the preopercular spines is the longer.

Family LUTIANIDÆ.

146. Lutianus griseus (Linnæus).

A single specimen was taken at Natal.

147. Lutianus jocu (Bloch and Schneider).

A specimen from Natal and one from Pará.

148. Lutianus apodus (Walbaum).

Several specimens were taken at Natal, all of which are deep reddish brown with wine-color on the lighter parts, and have the dark-ringed spots on the cheek as described by Doctor Gilbert (Wash. Acad. Sci. Vol. 2, 1900, p. 170) for specimens from Maceio, Brazil.

149. Lutianus analis (Cuvier and Valenciennes).

A single adult and a few small ones were taken at Natal.

150. Lutianus synagris (Linnæus).

Several specimens were collected at Natal.

Family HÆMULIDÆ.

151. Harmulon parra (Dasmarest).

A large specimen was collected in the market at Natal, and the young were commonly taken in the tide pools.

152. Hæmulon steindachneri (Jordan and Gilbert).

Two small specimens were taken in the tide pools at Natal.

153. Hæmulon plumeri (Lacépède).

This is a common species at Natal, where 3 specimens were collected.

154. Anisotremus virginicus (Linnæus).

A single small specimen from Natal.

155. Genyatremus luteus (Bloch).

A small specimen, 2 inches long, was taken in a tide pool at Natal. It differs from one 6 inches long from Bahia (Albatross Collection) in having the preopercular teeth much coarser, or about 12 of them rather than 21 as in the larger one, the caudal truncate, rather than concave, the posterior outlines of the dorsal and anal more nearly vertical, and in having 6 wide, dark cross bars in the side.

Family SPARIDÆ.

156. Calamus calamus (Cuvier and Valenciennes).

Several specimens were taken by a steam trawler a few miles off Natal. In life this species is a bright silvery with delicate blue, green and yellow reflections most conspicuous on the snout. A clear blue streak runs from the upper end of the gill opening forward below the eye. (In preserved specimens this shows as a dark blue streak below the eye, but not extending past the eye either before or behind). Below this, running forward on the preopercle, are several pale blue, obscure, wavy lines. Sometimes these are dusky blue and run together more or less, forming a net-work around the gold and silvery color, as described in current descriptions. Many of the scales are bright blue at the center, making faint longitudinal lines.

157. Archosargus unimaculatus (Bloch).

A single small specimen was taken at Natal.

Family GERRIDÆ.

158. Eucinostomus pseudogula Poey.

Specimens collected at Natal and Lake Papary. Among the former is one with only two anal spines that differs in no other respect from its fellows.

159. Eucinostomus harengulus Goode and Bean.

A few small specimens taken at Natal.

160. Eucinostomus gula (Cuvier and Valenciennes).

A single small specimen was collected at Lake Papary.

161. Ulæma lefroyi (Goode).

This species, though unrecorded from Brazil, is not uncommon at Natal, where several small specimens were taken. The young are marked with irregular, oblique, broken blotches on the back extending forward and downward to the middle of the side.

162. Xystæma havana Nichols.

Six specimens, up to 6 inches in length, collected at Natal and described in my manuscript as new are referable to this species, the description of which has just appeared. I publish my description as it stands, however, as it contains some additions to Mr. Nichols' description (Notes on Cuban Fishes. Bull. Am. Mus. XXXI. p. 189, Aug. 1912).

The head is sharp and the body is symmetrical, with no angles and scarcely elevated. The length of the head is contained 3¼ times in the length to the caudal base, and the depth 3 times. The diameter of the eye is a little greater than the length of the snout and is contained from 2⅘ to 3 times in the head. The premaxillary groove is very well defined and narrow, being only a trifle more than half of the pupil at its widest part; anteriorly it becomes constricted and sometimes nearly closed. The cheek from the eye to the preopercular angle is equal to the diameter of the eye, and the least distance backward from the eye is equal to one-third of the eye. The preopercular and preorbital margins are entire.

The fin formula is, dorsal IX, 10; anal III, 7 or 8. The second dorsal spine is equal in length to the distance from the front of the eye to the upper angle of the gill opening. The second anal spine is equal in length to the third but is very much stouter; it is a little longer than the eye. The pectoral does not nearly reach to the anal. There are 45 cross series of scales, and 3½ longitudinal series between the lateral line and the middle of the dorsal.

The color is plain silvery except in the young of 2 or 3 inches in length, where dusky lines follow the rows of scales longitudinally.

This species has the typical long simple first interhæmal that distinguishes *Xystæma* from *Eucinostomus,* but in external characters it is strikingly like *E. pseudogula.* The spines, however, are always stouter and less flexible at the tips, and the premaxillary groove is constricted in front. It differs from *Xystæma cinereum,* its nearest relative, in being more slender, in having a very narrow premaxillary groove, which is convergent anteriorly rather than broad and divergent, in having no cross bars, and in other minor characters.

163. Gerres brasilianus (Cuvier and Valenciennes).

Several specimens were taken in Lake Papary and one at Natal.

164. Gerres rhombeus Cuvier and Valenciennes.

Specimens were collected at Lake Papary and Natal. Those from Natal are much darker in color and show traces of dark stripes along the

rows of scales, while those from the lake are almost entirely colorless in alcohol.

165. Gerres olisthostomus Goode and Bean.

Specimens were taken at Natal and Lake Papary. Those from Natal are darker, the young have 4 or 5 narrow vertical cross bands on the middle of the side, and in addition, lighter longitudinal bands following the rows of scales. No trace of cross bands is on the Papary specimens, though the others are evident.

Family POLYNEMIDÆ.

166. Polydactylus virginicus (Linnæus).

This fish was found in abundance about Natal.

Family SCIÆNIDÆ.

167. Cynoscion microlepidotus (Cuvier and Valenciennes).

This species is apparently common at Pará, as several specimens were collected in the market.

They agree very well with the description published by Steindachner, but show the following differences. The interorbital space (bone only) is contained from 4¾ to 5 times in the head. The maxillary usually scarcely reaches to the posterior margin of the orbit, but in the largest specimens, a foot in length, it reaches to the margin. The vertical fins are covered with small, thin, inconspicuous scales but they can scarcely be said to be thickly covered, not, at any rate, as compared with *Cynoscion squamipinnis*.

168. Cynoscion leiarchus (Cuvier and Valenciennes).

Two specimens were collected at Pará. This species resembles *Cynoscion phoxocephalus* most closely. The head is more compressed, the caudal is weakly double concave rather than simply concave, the eye is larger, the postorbital part of the head not so long, and the posterior outline of the anal is not so oblique.

169. Cynoscion phoxocephalus Jordan and Gilbert.

A single large specimen of this species was taken at Natal. It has been compared with specimens from Panama and no important differences appeared. The body and head are a trifle deeper, and it has 23 dorsal rays rather than 21. This form has heretofore been known only from Panama Bay.

170. Sagenichthys ancylodon (Bloch and Schneider).

Sagenichthys mordax Gilbert and Starks (Mem. Cal. Acad. Sci. IV., 1904).

Three specimens from 7 to 8 inches in length were collected at Pará, which enable me to compare directly, for the first time, this species with *Sagenichthys mordax* from the Pacific.

When *Sagenichthys mordax* was described it was compared with current descriptions of *S. ancylodon* and from these it appeared to differ in having larger scales in the lateral line, smaller scales on the rest of the body, and shorter gill-rakers. All of these characters have been inaccurately described for *S. ancylodon* and a direct comparison of the specimens from both coasts fails to show any specific differences. There are about 100 oblique series of scales above the lateral line in *S. ancylodon* (not 85) and half as many scales on the lateral line (not 75). The gill-rakers are one-third of the diameter of the eye (not two-thirds). The specimens from Pará have a somewhat larger eye than those from Panama, but the difference is not too great to be accounted for by the difference in size of the specimens.

171. Nebris microps Cuvier and Valenciennes.

Four large specimens of this species were taken at Pará, each of them a little over a foot in length. This makes a direct comparison between this species and its representative in the Pacific, *Nebris occidentalis* Vaillant, for the first time possible.

Comparing them with some specimens from Panama of similar size the mandible is strikingly weaker and does not protrude nearly so much, lacking the large, sharp process at the symphysis. The lips are thinner and the mouth is less oblique. There are 95 series of scales above the lateral line, counting the nearly vertical series, and 11 scales between the lateral line and the front of the soft dorsal. These counts in *Nebris occidentalis* are respectively 115 and 20. The scales on the belly are very much larger in *Nebris microps*. The pectoral is shorter, or $1\frac{1}{5}$ in the head, while in the other species it is almost equal to the head. The radiating striations on the preopercle are not nearly so coarse and do not end in such coarse pectinate processes. The body is marked with 6 or 7 wide, conspicuous, dark cross bars, which are not evident in *Nebris occidentalis* and have not been described.

The following is the color of fresh specimens. The back is dusky drab, with wide, nearly black, cross bars, anteriorly not so wide as the interspaces, posteriorly more crowded and equal to them. There is a trace of one over the opercle, one under the spinous dorsal, four under the soft dorsal, the first

of which is under the 8th to the 11th rays, and the last under the last rays, and one across the caudal peduncle. The lower parts are very bright chrome yellow, or sometimes deep orange, being brightest on the head. The ventrals, pectorals and anal are bright yellow or orange, the first two growing coal black toward their points, and the anal dusky with dots. The dorsal rays grow dark toward the edge of the fin, and the caudal is slightly yellow, obscured by dark points.

172. Plagioscion squamosissimus (Heckel).

Several specimens were collected at Pará, the largest 9 inches in entire length.

This species may readily be separated from *Plagioscion auratus* and *Plagioscion surinamensis* by the short, slender, second spine of the anal, which is contained from 3½ to 4½ times in the head, and is about as thick as the distance from the front of one anal ray to the front of the next, or scarcely wider than the ventral spine. In the other two species it is twice or more times wider than this. In the mandible there is a row of small, fine, sharp teeth, and just inside of them is a row of from 7 to 10 widely spaced canines, many times larger than the outer row. The two rows are so closely approximated that they appear like a single row with a tooth enlarged at intervals. In the premaxillary there are two rows similar in size to the lower teeth, but the outer row is the large row in this case, instead of the inner, and the rows are more distinctly separated. The differences in size between the teeth in this species is much greater than in the other two species here considered, or in other words, the enlarged teeth are much more enlarged.

TABLE OF MEASUREMENTS EXPRESSED IN HUNDREDTHS OF LENGTH.

Length in mm. to caudal base	181	174	125
Head in 100ths of length	31	32	32
Length of maxillary	15	15	15
Long diameter of eye	5	5½	5½
Width of interorbital space	7	7	7
Length of snout	8	8	8
Length of pectoral	25	23	23
Length of ventral	21	21	22
Length of second anal spine	9	9	9
Width of second anal spine	1	1	1
Length of fourth dorsal spine	13	13	13
Length of caudal	26	25	26
Number of dorsal rays	X-I, 34	X-I, 32	X-I, 33
Number of anal rays	II, 6	II, 6	II, 6

173. Plagioscion auratus (Castelnau).

Several specimens from 4 to 15 inches in length were collected at Pará in the market. These are all very much darker than the other two species at hand, with the exception of one 6 inches long, and, to a less degree, one twice as long. The darkest ones are almost black on the back, the head, and all of the fins, and dark dusky on the lower parts. The lightest one is slightly dusky on the back, the dorsals and caudal; the balance is without color, the color being as in the other two species.

This species may be known from *Plagioscion surinamensis* by the smaller elliptical eye, not so near the anterior profile; the wider, more convex, interorbital space, which is from half again as wide as the vertical diameter of the eye to twice as wide. The snout is a little more produced, and the lower jaw is always included. The length of the pectoral is equal to the distance from the tip of the snout to the preopercle. The first ray of the ventral, in all sizes, is filamentous and projects beyond the other rays about one diameter of the eye. The gill-rakers number 10 or 11. Other differences are indicated under the description of *Plagioscion surinamensis* and in the tables of measurements.

TABLE OF MEASUREMENTS EXPRESSED IN HUNDREDTHS OF LENGTH.

Length in mm. to caudal base	260	251	133
Head in 100ths of length	28	28	30
Length of maxillary	13	13	14
Long diameter of eye	4	4½	5½
Width of interorbital	8	8	8
Length of snout	7½	7½	8
Length of pectoral	19	20	21
Length of ventral without filament	20	20	21
Length of second anal spine	12	12	14
Width of second anal spine	2	2	2
Length of fourth dorsal spine	12	12	14
Length of caudal	25	25	26
Number of dorsal rays	X-I, 34	X-I, 35	X-I, 36
Number of anal rays	II, 6	II, 6	II, 6

174. Plagioscion surinamensis (Bleeker).

A few small specimens and one large one, a little over a foot in length, were collected at Pará. They are all very light in color; only slightly dusky above and on the edges of the dorsal fins. This species appears from literature to be much more rare than the other two here reported upon, and it was not found nearly so abundantly in the market during our stay at Pará.

It may be readily known from *Plagioscion auratus* (Castelnau) by the larger, rounder eye nearer to the anterior profile; by the narrower interorbital space, which is less in width opposite the middle of the eye than the vertical diameter of the eye; by the snout which does not overhang the mouth so much, the lower jaw being scarcely, or not at all included; by the longer pectoral, which is equal in length to the distance from the tip of the snout to a point on the opercle midway between the preopercle and the gill opening; by the first ray of the ventral, which, though a trifle longer than the other rays, does not end in a filament. It has 2 or 3 more gill-rakers on the lower limb of the arch, or 12 or 13; the preorbital is a little narrower, the second anal spine a little longer, and the scales on the interorbital space are ctenoid a little farther forward. Little difference exists between these two species in the character of the teeth. The character of the interorbital space will the most readily separate them.

Most of these differences are well shown by the drawing of the type of *Plagioscion auratus* and the drawing published by Steindachner of *Plagioscion surinamensis* (Fische-Fauna des Magdalenen-Stromes. Pl. I), though there are also many differences there shown that do not exist owing to the inaccurate drawing of the former species.

TABLE OF MEASUREMENTS EXPRESSED IN HUNDREDTHS OF LENGTH.

Length in mm. to caudal base	250	128	115
Head in 100ths of length	32	34	32
Length of maxillary	15	15	15
Long diameter of eye	6	7	7
Width of interorbital space	5	5	6
Length of snout	7	8	7
Length of pectoral	26	25	24
Length of ventral	25	22	23
Length of second anal spine	14	14	15
Width of second anal spine	2	2	2
Length of fourth dorsal spine	14	13	15
Length of caudal	23	25	26
Number of dorsal rays	X-I, 33	X-I, 32	X-I, 33
Number of anal rays	II, 6	II, 6	II, 6

175. Bairdiella armata Gill.

A single specimen was taken in the market at Pará. Comparing it with specimens from Panama the snout is not so sharp, the spines of the preopercle are more blunt and wider at the base, the mouth is a little more oblique and more curved, the gill-rakers below the angle of the first arch number 16 rather than 13, and the second anal spine is a trifle longer. It appears probable that with more material the Atlantic form may be separable

from the Pacific, but all of the differences are too slight to warrant their separation with the material at hand.

176. Micropogon opercularis (Quoy and Gaimard).

Three specimens were taken at Pará.

Comparing them with specimens of *Micropogon furnieri* from Jamaica the snout is sharper and projects farther over the mouth, the head is not so deep and is more depressed above the eyes. The scales scarcely differ in size, there being 6 or 7 in a vertical series between the first dorsal spine and the lateral line, 8 or 9 between the first anal spine and the lateral line, and 50 lateral line pores. There are 26 or 27 rays in the dorsal in the Brazilian specimens, and 28 or 29 in the specimens from Jamaica.

Family CICHLIDÆ.

177. Aequidens tetramerus (Heckel).

A half dozen specimens were taken in the market at Pará.

178. Cichlosoma bimaculata (Linnæus).

A large number of specimens were taken at Ceara Mirim, Lake Papary, Ceara and Lake Extremoz. The largest is 6½ inches in total length. Among them are 3 specimens which have only 3 anal spines, or one less than the usual number.

There are two scales between the upper lateral line and the soft dorsal, without the pore-bearing scale, but with a small scale at the base of the fin. The lateral lines are separated by 2 scales besides the pore-bearing scales. The upper lateral line covers 18 scales, and the lower one 6.

On specimens 1½ inches in length the tip of the ventral scarcely reaches past the front of the anal, and the longest rays of the soft dorsal and the anal do not reach to opposite the middle caudal rays. In specimens 6 inches in length the ventrals reach well past the anal spine, and the soft dorsal rays reach beyond the tips of the caudal rays, while the anal rays do not quite reach to the tips of the caudal rays. In none of them do the ventral rays reach past the middle of the anal ("Ventral often extending to the posterior end of the anal." Regan Ann. Mag. Nat. Hist. ser. 7 XVI, p. 68).

Following is the color taken from life. The back is dark green growing light bluish on the side of the body. The breast and belly are dusky bluish. There are 7 or 8 dark cross bars wider than the spaces between them. A dark spot is usually present below the posterior part of the eye, sometimes conspicuous, or sometimes nearly or quite absent. A larger, more

definite and darker spot is just below the lateral line midway between the front of the eye and the base of the caudal. A smaller one is on the upper part of the caudal peduncle, usually ringed with bluish body color. A dark band, more or less conspicuous, runs back from the eye through the middle spot to the spot on the caudal peduncle. It is often interrupted by the middle spot, and is usually more conspicuous in front of it than behind it. The fins are very dark, sometimes nearly black; the pectorals are always lighter; the caudal, soft dorsal, and anal are usually with numerous light spots of the bluish body color, but these are absent when the fins are nearly black.

179. Cichlosoma temporale (Günther).

A single specimen of this species was taken in the market at Pará. It agrees in all essential respects with current descriptions.

180. Crenicichla lepidota Heckel.

Specimens from Lake Papary, Lake Extremoz and Ceara Mirim are referable to this species, though it has hitherto been known only from Southern Brazil, Paraguay and Buenos Ayres. They agree very well with the description published by Mr. Regan (Proc. Zool. Soc. Lond. 1905, p. 158).

They resemble specimens of *Crenichichla saxatalis* from Pará, but have larger scales, which number from 40 to 45 below the lateral line, instead of from 50 to 56. They are deeper, being from 26 to 30 hundredths of the length (without the caudal) instead of from 23 to 25 hundredths. The head is usually larger and the suborbital a little deeper. The anal rays are usually 8 or 9, while in *Crenicichla saxatilis* they are occasionally 9, but nearly always 10. They have 7 or 8 large spots along the side, which are nearly always evident and usually conspicuous.

The following life colors, taken from the specimens from Lake Papary, show three color phases. In the first specimen the ground color is greenish slate, with a series of large black blotches along the sides edged with pearly spots. Similar small pearly spots are scattered over the side of the body. On the head a dark band runs back from the eye, giving place to an irregular pearly stripe on the side of the body. A small black spot is present at the base of the upper caudal rays. All of the vertical fins are edged with dusky and the anal and caudal are inconspicuously spotted with white. The dorsal is bluish with metallic spots. The pectoral and ventrals are light yellowish, and the caudal is tinged with the same color.

In the second specimen the ground color is very dark olive-green above, growing lighter below with yellowish tinges on the side of the body and slate

color on the belly. Pearly green spots are scattered over the side, but these do not ring the dusky blotches. A black streak runs back from the eye, and a small black spot is present below the eye. The dorsals are very dark green, almost black, with a few inconspicuous greenish pearly spots scattered over them. The caudal and anal are tinged with yellow and bordered with dusky, and the ventrals and pectoral are light dusky brown.

In the third type of color the ground color on the upper parts is as described for the second specimen, but lighter and growing to white below, while the belly is tinged with wine-color. The shoulder spot is slightly ringed with light green. The usual streak runs back from the eye, and the usual side blotches are present, but there are no pearly spots. The dorsal is black toward the tips of the rays, and a very conspicuous milk-white band with bluish tinges runs near its edge, but leaves a clear-cut black border. The base of the dorsal is yellowish. The anal is dusky yellowish green, and the caudal is similar but blackish at the base and edged with dusky below, while on the upper edge the black bordered white band of the dorsal is continued. The pectoral and ventral are yellowish.

181. Crenicichla saxatilis (Linnæus).

Several specimens were taken in the market at Pará, the largest 10 inches in length. Among them are two that differ from the others, but the difference seems to be due to disease or lack of nourishment. The larger one is covered with large, black, irregular blotches different on the different sides of the body. The teeth have disappeared except a few on the sides of the upper jaw, and a spongy, papilose growth of tissue has taken their place. Inside of the mouth are several copopods. The lower jaw projects more than usual and a large symphyseal knob has developed. The body is a little more slender and the eye is a little larger. The other is somewhat smaller and less emaciated. Only one or two black spots are present; the lower jaw is not at all projecting, and the spongy growth has not replaced the teeth to so great an extent.

The following is the life color. The upper parts are very dark green shading below to drab posteriorly, to wine-red on the posterior part of the belly, and to white on the breast. The side of the head is bright yellow and the ventral part is white. A dark shoulder spot is irregularly ringed with silvery pigment and has silvery spots scattered over it and about it for a short distance. A dark streak runs through the eye to the opercular flap. A dark spot is present at the base of the upper caudal rays. The entire length of the dorsal is black toward the tips of the rays, with a vivid white

streak running through the black. The black and white streak is continued along the upper border of the caudal fin. A blended yellowish streak runs along the middle of the dorsal and the base of the fin is bluish. The pectoral is straw-color and the ventral is tinged with red, which grows to a dark red on the first ray and spine. The anal is bluish, with a black border continued along the lower edge of the caudal.

182. Crenicichla cincta Regan.

A specimen a foot in entire length was taken in the market at Pará. It is much larger than the type, which was 172 mm. in length, and consequently differs considerably from the original description.

The head without the projecting jaw is contained 3½ times in the body length; the diameter of the eye 6 times in the head; the snout equals the interorbital width, and is contained 3¼ times in the head. The maxillary extends to under the pupil, and the depth of the preorbital is equal to three-fifths of the diameter of the eye. The teeth of the front of the mandible are in five series, and the gill-rakers are represented by 8 or 9 low bony tubercles. There are 147 longitudinal series of scales above the lateral line, 18 cross series between the front of the spinous dorsal and the lateral line, and 45 between the lateral line and the median line of the belly. The pores of the lateral line number 29 + 15. The length of the last dorsal spine is contained 3¼ times in the head; the pectoral 2 times; and the ventral 2⅕ times. The depth of the caudal peduncle is contained 1⅗ times in its length from the base of the anal.

There are 12 well-marked cross bars, counting a short one at the nape and a faint one on the base of the caudal rays. No spots are evident on the soft dorsal; the caudal shows about five light, broken cross bands, and the basal caudal spot is ringed with light body color. The dark band from the eye to above the pectoral base is faintly indicated along the entire length to the caudal spot. The spine and outer ray of the ventral are dusky.

183. Crenicichla johanna Heckel.

Half a dozen of this well-marked species were collected in the market at Pará. The following color description was made from one of them before it was preserved.

Light metallic green above, shading to darker slaty-blue on side. The back has 11 or 12 dark green cross bars not extending down to middle of side. Shades of light metallic green, similar to that on side, are on opercle and base of pectoral. The dorsal is bluish, with a narrow black border and

a very narrow marginal line of dark red; this is continued along upper part of caudal. Anal bluish with dusky border, and a dusky band following contour of fin a short distance above margin (the last entirely disappearing in alcohol). Pectoral tinged with straw color; ventrals with orange, and with a dusky outer margin. Some of the preserved specimens show a pair of light bars on caudal a short distance from the tips of the rays and converging to a point behind. The largest specimen (32 cm. in length) shows no trace of cross bars.

184. Geophagus surinamensis (Bloch).

Several specimens were collected at Pará, from 5 to 6 inches in length.

The color in life is as follows: Dusky silvery blue on head and body, with about 4 golden longitudinal lines on side above the level of the pectoral. Indefinite dusky cross bars are often present, especially in the smaller specimens. Soft dorsal and caudal dusky bluish with large pale spots so close as to leave little more than a net-work of the ground color. A small dark spot is usually present on the side just below the middle of the upper lateral line. The pectoral is straw color, the anal light dusky brown, and the ventral orange brown.

Family POMACENTRIDÆ.

185. Pomacentrus fuscus (Cuvier and Valenciennes).

Pomacentrus leucostictus (Müller and Troschel).

This is one of the most abundant tide-pool fishes about Natal. Its variation in intensity of color is remarkable, and all of the phases between the typical *Pomacentrus leucostictus* and *P. fuscus* are represented. The following are the life colors of a young individual. Below a line from the tip of the snout to the end of the soft dorsal the body is bright canary-yellow. Above it is dark blue with vivid electric-blue spots. An irregular stripe of similar electric blue runs from the tip of the snout, across the nape, to the spinous dorsal. Another runs from the eye backward along each side of the back. The dorsals are bright blue, with the tip of the soft dorsal yellow and all of the other fins are bright canary-yellow. A large dark spot, ocellated with bright blue, is on the base of the spinous dorsal posteriorly. A small dark spot is on the base of the caudal peduncle.

186. Abudufduf marginatus (Bloch).

Many specimens of this common species were taken in the tide pools at Natal.

Family LABRIDÆ.

187. Halichœres penrosei Starks, new species.

Plate 7.

The form of the head and the body is about as in *Halichœres bivittatus*. The head is contained 3¼ times in the length to the caudal base, and depth 4 times. The posterior canine is well developed and sharp. The eye is contained 4½ times in the head, and the snout 3¼ times.

The fin formula is, dorsal X, 10; anal III, 11. The pectoral reaches past the tip of the ventral, but not to the vent. The ventrals are not filamentous and their length is equal to the combined length of the snout and eye. The caudal is double truncate behind. The scales are reduced in size in front of the dorsal and are continuous over the median line. About 12 series are present in front of the dorsal. The lateral line crosses 26 scales. It is continuous and drops to a lower level on the seventh and eighth scales from the posterior end. The pores are simple.

A broad, solid black band, much wider than the eye medially, runs from the tip of the snout to the base of the caudal. Behind the opercle its lower edge is on a level with the middle of the eye. It is separated above from the color of the back by a narrow light band, which meets its fellow of the opposite side on the top of the snout, where they form a V-shaped mark, as viewed from above. The dark color of the back is well-defined above the light streak, but it is very much lighter than the lateral band. Below the lateral band are faint dusky traces of a second band. With this exception there is no color below the lateral band except on the pectoral, which is slightly dusky and has a black dot on its base above. From the sixth to the seventh dorsal spines is a black spot; otherwise the fins are entirely without color.

This species differs from most of the species of its genus in having the scales in front of the dorsal reduced in size and crossing the median line of the back as in *Halichœres semicinctus,* and in having 10 dorsal spines. These characters will separate it at once from *H. maculipinna* and *H. bivittatus,* which it somewhat resembles in color.

The type and only specimen is 2¾ inches long, and was taken in a tide pool at Natal.

I take pleasure in naming this species for Dr. R. A. F. Penrose Jr., sometime lecturer on geology in Stanford University, in recognition of his interest in the Stanford Expedition to Brazil.

188. Halichœres irideus Starks, new species.

Plate 8.

The head is contained from 3¼ to 3½ times in the length to the base of the caudal, and the depth from 3¾ to 4 times. The eye is equal in diameter to the interorbital bone (though the interorbital space is somewhat wider) and is contained 5 times in the head. The snout is contained from 2⅗ to 3 times.

The fin formula is, dorsal IX, 11; anal III, 12. The pectoral usually reaches well past the ventral to opposite the vent. Its length is contained 1½ times in the head. The ventrals are sharp-pointed but not filamentous. The caudal is slightly rounded, but conspicuously angulated at the tips of the outer rays. The front of the anal is midway between the middle of the eye and the base of the caudal, or varying from the former point to the front of the eye. The lateral line is on 28 scales, and the pores are trifurcate. The scales in front of the dorsal are not reduced in size, and do not cover the median line of the back.

In life the colors of this species are particularly brilliant. The ground color of the side of the head and anterior part of the body is clear yellow, which gradually changes to green posteriorly, then to electric blue, and to a brilliant darker blue on the caudal, while dorsally the color of the body shades into brownish orange, and ventrally into lavender. Two narrow, longitudinal, brilliant orange stripes cross the lower part of the side. A bright blue stripe runs from the snout to the eye, and two run from the eye to the nape. The lower jaw is lavender. A large coal-black spot almost as wide as the eye and twice as long is about equally on the base of the first dorsal rays and the back. A smaller one is on the base of the last two rays and the back. This is much more conspicuous than in other species that have a spot under the last ray. A third one is on the last scales at the base of the caudal just above the middle caudal rays. All of these spots are conspicuously ocellated with blue. The dorsal is marked with longitudinal stripes of blue and orange, and the anal with blue and pinkish color.

In alcohol the ocellated spots are very clear black and plain. A black dot is on the upper part of the pectoral base, and two dark brown stripes run irregularly from the eye to the nape. The two stripes on the lower part of the side are scarcely, or but slightly, evident. The median caudal rays are dusky, and the other fins are almost colorless.

The species may be at once known from all other American species by the large, black, ocellated spots on the back.

Five specimens, ranging in size from 3 to 5 inches in length, were collected in the rock pools at Natal.

189. Halichœres poeyi (Steindachner).

One specimen, 4 inches in length, was taken in a tide pool at Natal. In alcohol it is marked as follows: The body is light and some of the scales above the middle of the side are dark brown at the base and are clustered into more or less definite blotches. One of these blotches is just behind the opercular flap, another is above the end of the pectoral, and posteriorly two or three of them are run together. A large dark spot is behind the eye, a small one is at the base of the last dorsal ray, and another is on the upper edge of the pectoral base. The fins are all abruptly colorless.

Family SCARIDÆ.

190. Sparisoma frondosum (Cuvier).

A rather common species in the tide pools about Natal.

191. Scarus croicensis (Bloch).

A single small specimen, slightly less than 2 inches in length, taken in a tide pool at Natal, seems referable to this species, agreeing in all characters but the color of the teeth, which are green as in the sub-genus *Pseudoscarus*.

Family EPHIPPIDÆ.

192. Chætodipterus faber (Broussonet).

Three specimens were taken in the market at Pará, one of them very large, with a gibbous forehead caused by hyperostosis. In one only 10 inches in length the bones of the frontal and occipital region have become greatly thickened. These specimens scarcely show any cross bars. Comparing them with some of similar size from Jamaica they are much lighter in color, and the dorsal and anal rays are not so much produced.

Family CHÆTODONTIDÆ.

193. Holocanthus tricolor (Bloch).

A small specimen was collected at Natal.

194. Pomacanthus paru (Bloch).

A specimen 8 inches long was taken in deep water by the trawl off Natal. The discrepancies in the description published by Jordan and Evermann (Fish. N. and Mid. Am., pp. 1679-1680) have led me to make an ex-

amination of our available material of *Pomacanthus* from the Atlantic. These separate easily into two species as in the following key.

(a) Caudal truncate, or lunate in large specimens, with outer angles sharp and a broad white border behind; dorsal spines 8 or 9; small scales crowded in about larger ones, all of them with a light posterior border, but the larger ones most conspicuous; no white lines from eye to nostril; no large light spot on pectoral base. *P. arcuatus* (Linnæus).*

(aa) Caudal broadly rounded and scarcely or bluntly angulated at the outer rays, and with a very narrow or no white margin; dorsal spines 10; scales more nearly uniform in size and only part of them with a light border (those corresponding with the large scales of the other species); a light bar from eye to nostril; and a light spot on base of pectoral.

P. paru (Bloch).

Of *P. arcuatus* we have 7 specimens, from 5 to 12 inches long, from Brazil and the West Indies. Of *P. paru* we have 5 specimens, from 5 to 7 inches long, from the same localities.

In Jordan and Evermann's description of the first species the dorsal spines and the color are correctly described, but the caudal is incorrectly said to be rounded. There is said (correctly) to be no pale stripe before the eye, but in the description of *P. paru, P. arcuatus* is said to have a "white stripe from the eye to nostril," and the caudal is said to have no pale edge. In the last description *P. paru* is first said to have the caudal truncate and farther on in the same description it is correctly said to be rounded.

The following is the color in life of the specimen of *P. paru* from Natal. The ground color is dark lead-color, nearly black, with scales at regular intervals edged with canary-yellow, making the flesh appear as if it had much larger scales than it has. The iris, preopercular spine, and a large blotch at the caudal base are bright yellow. The upper jaw is dusky yellow, and the lower jaw light. The cross bars on the body and fins are bright yellow.

Family ACANTHURIDÆ.

195. Hepatus hepatus (Linnæus).

Several specimens were taken by the trawl boat from deep water, and the young were abundant in the rock pools about Natal. The following is the color in life. The body is dusky yellowish above and slaty brown below. Narrow vertical dark bars cross the side, and narrow yellow and blue streaks run forward and backward from the eye and merge into the ground color of

* If either of the species here considered is to be identified with *P. arcuatus* it must be this one, for the only differential character Linnæus gives is the number of dorsal spines, though the other species has been in the past so identified.

the body. A bright blue spot surrounds the caudal spine. The dorsal has wavy longitudinal streaks of light blue, or lavender, and light yellow. The anal is dark blue edged with light blue, and the caudal is tinged with blue. The ventrals are dark brown, nearly black. The young has all of the vertical fins edged with bright blue, and a broad, light diffused stripe crosses the caudal peduncle.

Family BALISTIDÆ.

196. Balistes vetula Linnæus.

Specimens were taken at Natal.

Family MONACANTHIDÆ.

197. Monacanthus hispidus (Linnæus).

One specimen was procured at Natal.

198. Monacanthus ciliatus (Mitchill).

A single specimen taken at Natal.

199. Alutera punctata Agassiz.

Three specimens, from 15 to 17 inches in length, were caught in a trawl in deep water. The head, from the upper end of the gill opening, is contained from 3⅓ to 3⅗ times in the entire length to the caudal; the depth is from 2⅙ to 2¼ times. The dorsal numbers 36 or 37, and the anal 38 or 39. In life they were dark slate-color, with small yellow spots scattered over the side.

Comparing these with a specimen of similar size of *Alutera schœpfii* from Florida, the latter is found to be rougher, with enlarged sharp spinules scattered among the finer ones; the double curve from the tip of the snout to the dorsal spine is much more pronounced, and the color is very much lighter, or almost white, with considerable silvery pigment and no spots.

Family OSTRACIIDÆ.

200. Lactophrys tricornis (Linnæus).

A couple of specimens from Natal.

Family TETRAODONTIDÆ.

201. Spheroides testudineus (Linnæus).

This fish is as common at Natal as it is reported to be throughout its range. There is an astonishing variation in the size of the eye.

Family DIODONTIDÆ.

202. Chilomycterus antillarum Jordan and Rutter.

The dried skin of what appears to be this species was picked up on the beach at Natal.

Family SCORPÆNIDÆ.

203. Scorpæna plumieri Bloch.

A few large specimens were taken in the tide pools at Natal. In life this species is elaborately mottled with purplish wine-color, reddish brown, and sienna, on a light drab and slightly greenish ground color. The breast and belly are cherry-red, with many small white points. The caudal fin is crossed by three dark brown blotches. A red blotch is at the base of the pectoral, and the pectoral is light red with cross bars of reddish brown. The inner surface of the pectoral is jet black at the base, with several sharp-cut, very conspicuous, milk-white spots, a yellow area across the middle of the rays, and wine-color distally.

Family GOBIIDÆ.

204. Dormitator maculatus (Bloch).

A number of specimens up to five inches in length were collected at Lake Papary, and a couple from a pond in a deserted part of the park at Ceara.

The males have the dorsal and anal higher than the females, but in none of the Papary specimens are the longest dorsal rays nearly as long as the head, while in one of the Ceara specimens (5 inches in length) the last dorsal and anal rays broadly overlap the caudal, and the longest dorsal ray is considerably longer than the head. It differs further in having a more definite white border to the dorsal and anal.

The following color note was taken from a fresh Papary specimen. The body and head are dark brown, shading to green above and with the sides washed with blood-red. The side of the head has a green tinge, and light brown bars radiate from the eye. Bright green shades are in front of the pectoral, and a blackish blotch is at the caudal base. The dorsals have oblique brown bars on the mebrane, but these do not involve the rays. The anal is dark brown spotted with white and narrowly margined with white. The ventrals and pectorals are dusky.

205. Eleotris carvalhonis Starks, new species.

Plate 9.

The top of the head between the eyes is but little compressed. A rather thick layer of muscle lies between the skin and the bone in this region, while in *Eleotris perniger,* its nearest relative, the interorbital area is much depressed and flattened, leaving the maxillary process protruding, and the skin lies directly upon the bone. The head is contained from 3 to 3¼ times in the body length. The eye is contained 2½ times in the interorbital space and 2 times in the snout. The mouth is very oblique, and the maxillary scarcely reaches to below the middle of the eye. The teeth are in slightly narrower bands than in *E. perniger,* and scarcely so much enlarged at the side of the mandible. The gill-rakers, though only one or two more in number, are much more widely spaced.

The fins are very similar to those of *E. perniger,* except that all of them are more posteriorly placed in relation to the tip of the snout. The dorsal numbers VI-10, and the anal 9 or occasionally 10. The spinous dorsal is nowhere angulated in outline, and when the fin is reclined the tips of the longest spines barely touch the base of the first ray of the soft dorsal. The dorsal rays increase in length backward, and the last one is half as long as the head. The anal is more rounded posteriorly than the dorsal, the last ray not being so long as the next to the last. The ventrals reach half way or more between their base and the anal.

The scales are ctenoid on the body and cycloid on the head. There are from 60 to 63 in a longitudinal series as in *E. perniger,* but the number from the front of the anal in a series running up and back to the dorsal is 14 or 15, while in the other species they number 17 or 18.

The color in life is dark brown, with darker longitudinal lines following the rows of scales. Sometimes the body is so dark (almost black) that the lines do not show. The belly is lighter than the side, and lighter than the under parts of the head, which may sometimes be very dark. There are fine yellow and black lines across the dorsal and caudal rays, but the other fins are uniformly dusky or sometimes nearly black.

This species differs from *E. perniger* particularly in the fewer cross series of scales, the larger head, and the greater distance of the fins from the tip of the snout.

The specimens of *E. perniger* with which these were compared came from Jamaica.

Seven specimens, from 4½ to 6 inches in entire length, were collected in Lake Papary.

I take pleasure in naming this species for Colonel José Joaquim de Carvalho e Araujo, whose influence and kind hospitality made our stay at Lake Papary possible.

TABLE OF MEASUREMENTS EXPRESSED IN HUNDREDTHS OF LENGTH, SHOWING COMPARISONS BETWEEN ELEOTRIS CARVALHONIS AND ELEOTRIS PERNIGER.

SPECIES	*E. perniger*			*E. carvalhonis*						
Length to caudal in mm	124	132	141	117	110	107	98	102	93	98
Head in length	35	37	38	32	32	31	32	32	31	30
Eye	5	5	5	4	4½	4½	5	4½	5	4½
Maxillary	14½	15	15	13	13	13	14	13	13	13
Interorbital space	9½	9	10	10	10	10½	10½	9½	10½	10
Dorsal to snout	45	47	47	41	41	42	41	42	42	41
Ventral to chin	36	38	36	33	32	34	34	32	33	32
No. of gill-rakers	7	6	7	9	8	8	8	8	8	8

206. Erotelis smaragdus (Cuvier and Valenciennes).

A few specimens of this species, from 3½ to 5 inches in length, were seined in a large shallow pool in the sand near the mouth of the harbor at Natal. The pool was isolated from the bay except at high tide. The species was not found in seining elsewhere, or in the rock pools.

The preoperculum of this species has the hooked process as in *Alexurus armiger,* and it has as many unbranched accessory caudal rays (12 or 13). These being the characters upon which the genus *Alexurus* is based it becomes invalid, and *armiger* should be referred to the genus *Erotelis.*

A few specimens of *E. smaragdus* from Havana, Cuba, were examined in this connection, as well as the type and the only other known specimen of *E. armiger.* In the Havana specimens the preopercular spine was not so easily seen, the specimens being small, but dissecting the skin away made it very evident. The specific differences between these two are slight and of minor importnace, and they may prove to be identical, but to pass definitely upon this will necessitate more and better material than this at hand.

207. Awaous taiasica (Lichtenstein).

A single specimen was taken at Lake Papary. The following are its life colors. The ground color is yellowish, with golden and greenish reflections about the head. Irregular dusky spots are scattered over the back and

side of the body and head, on the latter taking the form of broken lines. The top of the head is black, and two dark lines run downward and forward from the eye. The dorsals and caudal are yellow, and dark spots on the rays form cross lines. Excepting a spot on the upper part of the pectoral base the other fins are colorless.

208. Gobionellus stomatus Starks, new species.

Plate 10.

The head is blunt with a sharply curved snout overhanging the mouth. The length is contained from 4⅓ to 4½ times in the length to the base of the caudal. The body tapers backward and ends in a long, pointed caudal fin. The depth varies from 5½ to 6¼ in the length. The eyes stand slightly above the level of the head with a raised supraorbital rim, and they are narrowly separated by a bony interorbital space equal in width to that of the pupil. The diameter of the eye is contained 5 times in the head, and 1½ times in the snout. The lower jaw is included, and the length of the maxillary, as in other large-mouthed gobies, is variable. It reaches to the posterior margin of the eye in the smallest specimens, and to one diameter of the eye past in the largest ones. The teeth are in narrow bands of about 4 rows in each jaw. In the upper jaw those in the outer row are enlarged, while in the lower jaw those of the inner row are enlarged. These tooth characters can best be appreciated in a dried specimen. The blunt snout forms a third, or sometimes a little less, of the length of the head.

The spinous dorsal is composed of 6 spines, and the longest ones are as long as the head. When the fin is depressed they reach slightly past the front of the soft dorsal. There are 13 dorsal rays in the soft dorsal, which is about three-fifths of the height of the spinous dorsal; they scarcely decrease in length posteriorly. There are 14 anal rays which increase in length posteriorly. The ventral reaches a trifle past the pectoral but not nearly to the anal. The length of the broadly rounded pectoral is from one-half to one diameter of the eye less than that of the head. The caudal is long and pointed, and its length is twice that of the head. The head is naked, and the scales on the body are fine and cycloid, and increase slightly in size backward. There are 58 transverse series of scales and 16 longitudinal.

The color in alcohol is light gray, with about 6 rather wide cross bars of dark slate-color on the side. Their upper ends run obliquely down and forward, but most of their length is vertical. They fade away a short distance below the middle of the side. Between the wider bars is usually a narrow, less conspicuous one. Often on the back are several oblique dark lines. The head is nearly always darker than the body, and is more or less

mottled with dark slate blue. There is a dark spot on the pectoral base in front. The fins, except the dorsals, are dusky, the ventral being darker than the others. The dorsals are crossed by many fine, dark oblique lines.

This species differs from the other gobies of this genus with lanceolate caudal fins in having cycloid scales.

Numerous specimens were taken with the seine in a large pool in the sand left by the high tide near the mouth of the harbor at Natal. A few were seined on the muddy mangrove tide flats, but none were found in the rock pools. They are from 4 to 5 inches in entire length.

209. Mapo soporator (Cuvier and Valenciennes).

This commonest of all tropical American gobies was found in abundance in the rock pools at Natal and Ceara.

210. Ctenogobius boleosoma (Jordan and Gilbert).

Several specimens were taken in the rock pools at Natal, thus materially increasing the range of this species. It has been taken hitherto only at Pensacola, Florida. They have been compared with the cotypes.

211. Ctenogobius glaucofrænum (Gill).

Three specimens of this goby were taken in the rock pools at Natal. Up to this time the species has been known only from the West Indies. They had no blue spots on the body or blue markings across the cheek such as was described for the type, or by Dr. Eigenmann for specimens from the Tortugas.

The following color notes were taken from living specimens. The ground color of the head and body is translucent flesh-color. Two rows of rusty red spots extend along the side at regular intervals, and another along the base of the dorsal fins. There are two black spots at the base of the caudal fin, which are more or less run together in a dumbel-shaped spot. A dark brown wavy band extends back from the snout through the eye to above the pectoral base, and a narrower one below it and parallel with it, from the snout across the cheek to the base of the pectoral. The caudal is pinkish, and the other fins are colorless, except the pectoral which is slightly yellow at the base.

212. Microgobius omostigma Starks, new species.

Plate 11.

The head is contained from 3¼ to 3½ times in the length to the caudal base, the depth from 4 to 4¼ times, and it is twice that of the width. A fleshy ridge runs forward from the dorsal fin and ends at the occiput. The

eye is longer than the snout, contained 3½ times in the head, and is two-fifths longer than the interorbital space. The mouth is very oblique. The maxillary reaches to under the middle of the eye, and is half of the length of the head. The teeth are in very narrow bands, with the outer ones enlarged and curved. The length of the dorsal spines is extremely variable, the longest spines reaching in one specimen nearly to the posterior end of the soft dorsal; in another to opposite the middle of the soft dorsal, and in another only a little past its front. The fin formula is, dorsal VII-18; anal 17. The pectoral is wide and broadly rounded, and its tip reaches a little past the front of the soft dorsal. The ventral scarcely reaches to the anal. The caudal terminates in a rather narrow point, much sharper than shown in the picture of *Microgobius meeki*. Its length is equal to the base of the anal, and is contained 2⅘ times in the length of the body. The scales number from 45 to 48 and are finely ctenoid. The head and body anterior to the front of the spinous dorsal are naked.

The head and body are uniform dusky bluish, very slightly lighter below. The color consists of rather coarse dots. Just behind the head and above the pectoral is a rounded black spot encircled with a dark bar around its upper part, leaving a light ring between. The fins are uniform bluish, with the ventral sometimes very dark, and the soft dorsal, anal, ventral, and caudal with a narrow white margin.

Three specimens were collected, from 1¼ to 1½ inches in length, in the rock pools at Natal. This species is related to *Microgobius eulepis* Eigenmann and Eigenmann and *Microgobius meeki* Evermann and Marsh. It differs from the former in having ctenoid scales, a compressed form, and in color. From the latter it differs in having a much smaller mouth, and a longer, more pointed caudal.

Family ECHENEIDIDÆ.

213. Remora remora (Linnæus).

A specimen taken at Natal.

Family MALACANTHIDÆ.

214. Malacanthus plumieri (Bloch).

One large specimen, 18 inches in length, was collected at Natal. The interorbital space is twice as wide as the eye, which is contained 7 times in the head. In a specimen from Cuba, 9 inches long, the eye is contained 1⅓ times in the interorbital space, or 5½ times in the head.

Family DACTYLOSCOPIDÆ.

215. Dactyloscopus crossotus Starks, new species.

Plate 12.

The head is conical, with the strongly projecting symphysis of the lower jaw forming its point. The length of the head (without the mandible) is contained 4½ times in the entire length to the base of the caudal, and the depth of the body from 6½ to 7 times. The mouth is moderately oblique, or on an angle of about 45 degrees; the maxillary reaches to opposite the posterior margin of the eye. The teeth are slender and inclined backward. They are in two rows on each jaw, and are a trifle larger on the lower jaw than on the upper. The eye is longer than the snout, twice as wide as the entire interorbital space, and is contained 7 times in the length of the head. There are from 9 to 12 opercular fringes.

The dorsal spines run imperceptibly into the rays, so that a microscope is necessary to distinguish them from each other. There are 12 spines and 29 articulated, unbranched rays. The anterior 4 spines are detached, the membrane of one spine scarcely reaching the base of the next; the fifth is slightly attached to the sixth, which in turn is broadly attached to the seventh as in the succeeding ones. The anal has 2 spines and 31 rays. Its origin is considerably behind the tips of the opercular fringes, which reach over the base of the pectoral, while in *Dactyloscopus trigiditatus* its origin is opposite the tips of the fringes.

There are from 40 to 44 transverse series of scales and 9 longitudinal series, counting at the tip of the pectoral. The head and breast are naked. The lateral line runs high anteriorly, there being only a scale and a half between the pore-bearing series and the dorsal. There are 12 scales in the anterior part of the lateral line, 3 in the descending portion, and 31 in the portion behind.

In life the body and head were translucent pink or flesh-color. In alcohol the color is white and very slightly dusky, with dark points above. The beginning of about 10 light cross bars are indicated on the back, but do not descend to the side. The fins are without color.

This species is not closely related to any other known form, but is probably closest to *Dactyloscopus tridigitatus* Gill, differing in having fewer opercular filaments, a much larger eye, a heavier, more protruding mandible, and the anal more posteriorly placed. It is more slender than any of the others.

A few specimens were taken in the sandy tide pools at Natal in company with *Dactyloscopus tridigitatus*. The type and largest specimen is just two inches in entire length.

216. Dactyloscopus tridigitatus Gill.

A few specimens of this form were taken in sandy tide pools on the open beach at Natal. It has not before been recorded south of the West Indies.

In life they are of a transparent flesh-color. When frightened they bury themselves in the sand.

Family BATRACHOIDIDÆ.

217. Batrachoides surinamensis (Bloch and Schneider).

This species was rather common in the market at Pará. Comparing a specimen about 10 inches in length with one of similar size of *Batrachoides pacifici* (Günther), the eye is smaller, being contained 11 times in the length of the head, while it is contained 9 times in *B. pacifici;* the fin rays are less deeply incised; the cross bars on the body are much more conspicuous; the teeth are finer; the pairs of spines on the opercle and preopercle are closer together, and the interruption in the lateral lines is much greater. The alleged difference in the number of dorsal rays cannot be relied upon to separate these species, as *B. surinamensis* may have as few as 26, which is the usual number in the other.

I am now able for the first time to compare this species directly with *B. boulengeri* Gilbert and Starks. A specimen 14 inches in length, or an inch longer than the type of *B. boulengeri,* has a slightly sharper mandible projecting a little more. The eye is little if any smaller; the dorsal membrane is not so deeply incised; the interruption in the lateral lines occurs a little farther from the base of the caudal; the last dorsal and anal rays do not project so far past the caudal base, and the scales are a little smaller. Imbedded scales occur in front of the ventrals where the breast is entirely naked in the other species. Perhaps the greatest difference lies in the entire absence of the interradial canals and pores on the inner surface of the pectoral, which is such a characteristic feature in *B. boulengeri.* The teeth on the outer end of the vomer are in two irregular rows for a short distance in the large specimens, but in the small ones they are in a single row as in the other species. The teeth do not otherwise differ. The cross bars are more definite, and the interspaces and the head are not so much freckled with small spots.

In life this species is light reddish brown, growing lighter below to nearly white on the belly. Dark brown, irregular cross bars are on the body.

A narrow one is across the top of the head just behind the eyes; two wider ones are between it and the spinous dorsal; one is under the spinous dorsal; two under the soft dorsal, and one at the base of the caudal fin.

218. Thalassophryne branneri Starks, new species.

Plate 13.

The head is as long as it is wide, and its length without the projecting mandible is contained 2⅘ times in the entire length to the base of the caudal. The mouth is not so nearly vertical as shown in Günther's picture of the type of *Thalassophryne maculatus,* being on an angle of about 45 degrees. The maxillary reaches back to opposite the posterior margin of the orbit. Short, blunt teeth are in a single row on the vomer, palatines, and sides of the jaws. On the front of the lower jaw they are in two rows, and on the front of the upper jaw a second row is less evident, being represented by a few teeth irregularly placed. The eye-ball is contained 10 times in the length of the head; 2 times in the entire interorbital space, and is equal to the bony part of the interorbital space. The width of the iris is not over half of that of the eye-ball. The top of the gill opening is a trifle below the base of the top pectoral ray and extends to a trifle below the lowest one. The spine on the opercle is about twice as long as the dorsal spines, and is equal to a third of the length of the head.

The base of the first dorsal spine is a very little anterior to the point of the opercular spine, and its distance from the tip of the snout is contained 3 times in the length. The dorsal has 20 rays and the anal 19. The longest rays are toward the posterior end, and the fourth from the last one is almost half as long as the head. The last dorsal and anal rays reach past the caudal base a distance contained 6 times in the head. They are scarcely, or barely, joined to the base of the caudal; not so much so as in *Thalassophryne reticulata* Günther. The caudal fin is rounded and forms a sixth of the entire length. The pectoral reaches to opposite the base of the sixth anal ray, and is contained 1⅗ times in the head.

The color is dark slaty brown above, growing lighter downward to milk white on the ventral side. There is a faint suggestion of the beginning of blended cross bars on the back; one on the caudal peduncle, two under the soft dorsal, and one under the spinous dorsal. The skin surrounding the dorsal spines is darker than elsewhere on the body. The fins are slate-color, growing darker toward the outer ends of the rays; the ventral and anal are white at the base, and all of the fins but the spinous dorsal are conspicuously margined with white.

This species is closest to *Thalassophryne maculatus* Günther, but differs in having a longer caudal, longer posterior dorsal and anal rays, longer pectorals, in the character of the teeth on the front of the premaxillary, and in the color. From *T. punctata* Steindachner, it differs especially in having a much longer pectoral, in having the dorsal and anal scarcely joined to the caudal, and in color.

A single specimen, 7 inches in entire length, was taken in the lagoon some miles above Natal.

This species is with much pleasure named for Dr. John Casper Branner, Vice-President of Stanford University, and Director of the Stanford Expedition to Brazil.

Family GOBIESOCIDÆ.

219. Gobiesox barbatulus Starks, new species.

Plate 14.

The head is as wide as it is long, and is contained 2¾ times in the entire length to the caudal base. The depth at the occipit is equal to a half of the width at the same point. The diameter of the eye is contained 5 times in the length of the head and 2 times in the interorbital space. The edges of the nostrils are somewhat raised and the anterior nostril bears a flap widened fan-like toward its distal end. Thick barbels or fleshy papillæ are on the lips and are scattered numerously over the anterior part of the head below. The opercular is flexible and covered with skin. All of the teeth are with entire edges and are very small.

On the front of the upper jaw is a short row of 6 or 7 teeth larger than the others. Close behind them is a longer row extending past the first row and forming part of the lateral marginal teeth. Behind the second row is a still longer third row extending behind the second row and forming the posterior marginal row. In the lower jaw are two rows with their chisel-like edges so closely approximated as to form a single cutting edge. All of these rows are so close together and so small that only one row will be appreciated on each jaw unless the jaws are dried and examined under a compound microscope. No teeth are on the vomer or palatines.

The disk is as wide as it is long and its diameter is a little less than the length of the head. The dorsal has 10 rays and the anal 7. The distance of the front of the dorsal from the base of the caudal is equal to the length of the head. The front of the anal is a trifle behind that of the dorsal. The pectoral is very broad and is equal in length to the postorbital

part of the head. The skin is nearly everywhere covered with fine pits, giving it a granular appearance.

The color is light brown, with darker brown blended spots on top of the head. These run together or become elongate on the body, forming irregular longitudinal streaks. The median fins are dark and have a light border. The pectoral is without color.

This species seems to be related to *Gobiesox papillifer* Gilbert in having fleshy papillæ about the head, but differs in the number of fin rays, in color, and in other characters. Four specimens, about an inch in length, were collected in the tide pools at Natal.

Family BLENNIIDÆ.

220. Labrisomus nuchipinnis (Quoy and Gaimard).

This was one of the commonest of the fishes in the tide pools at Natal.

In a couple of specimens from the Canary Islands the band of filaments on the nape is scarcely more than half as long as in the Brazilian specimens, and, as Dr. Gilbert has pointed out (Proc. Wash. Acad. Sci. V. II, p. 179), there is a second row of teeth on the vomer. Thus it appears probable that *Labrisomus canariensis* Valenciennes is a valid species.

221. Auchenopterus rubicundus Starks, new species.

Plate 15.

The head is sharp, with the dorsal and anal contours similar. The head is contained 3½ times in the length to the caudal base. The body depth is contained 4⅓ times. The jaws are equal anteriorly, and the maxillary extends to opposite the posterior edge of the pupil. The teeth are sharp and even, in a single row on the outer edge of the jaws, and a short row of smaller teeth behind them. The eye is a little longer than the snout, and is contained 4 times in the head. There is a multifid tentacle on the anterior nostril, one above the eye, and one at the nape.

The fin formula is, dorsal III-XXVI, 1; anal, II, 15. The origin of the dorsal is opposite the preopercle. The first dorsal spine is a little lower than the second, and all of the anterior spines are considerably lower than the highest spines of the second dorsal. The membrane between the third and fourth spines joins the latter about a third of its length above its base. The ventrals reach a little more than half way between their base and the front of the anal. The pectoral is broadly rounded, and scarcely reaches to the front of the anal.

The scales are crowded anteriorly and grow gradually larger posteriorly. They number 28, counting longitudinally, and 8 transversely, opposite the front of the anal. There are 35 pores in the lateral line including those in the curve. On the ventral region 12 scales lie in a median line between the anal and the ventrals. The head and the fins are entirely naked.

The color of the head and body is uniformly bright red, growing only very slightly lighter below. A broad white streak runs back across the cheek. The dorsal is alternately red and colorless; the red areas are about three spines wide and the others a little shorter. A small black spot is on the base of the twentieth spine, but it is not ringed. The caudal is yellowish and has no bar at its base.

A single specimen was taken in a tide pool at Natal. It is 1⅜ inches long.

This species differs from all of the others of its genus in having a shorter anal, and in color. It seems to be closest to *Auchenopterus fasciatus* (Steindachner).

222. Blennius cristatus Linnæus.

Numerous specimens were taken in the rock pools at Natal. The largest males have a moss-like growth on the tips of the first two anal rays. The color is variable. Some of them are uniform dark brown, nearly black above, and only slightly lighter below, while no cross bars are evident. The fins are all nearly black. Others are very light grayish or slate-color, with about 6 double cross bars on the back and side, and with the fins light or slightly dusky. These two extremes merge into each other, and all of the intermediate shades of color are represented.

223. Salariichthys textilis (Quoy and Gaimard).

This species and *Labrisomus nuchipinnis* were the most abundant of the fishes in the tide pools at Natal.

The head is short and steeply declivous in front of the eyes, descending in a straight line at an angle of about 70 degrees. The top of the head is horizontal, and the part just above and behind the eyes is broadly rounded. The mouth is inferior, very broad, and more transverse than lateral. Its greatest width is equal to the distance of its corner from the edge of the operculum in a horizontal line. The teeth on the jaws are very fine, in a single row, and very freely movable. There is a canine on each side of the mandible a considerable distance inside of the marginal teeth, its length is about a third of the diameter of the eye. A single row of small conical teeth are on the vomer. There is a multifid barbel at the anterior nostril,

one on the upper part of each eye-ball, and a short simple one at the nape about one diameter of the eye in front of the dorsal. The spinous dorsal is equal in length to the soft dorsal, and the spines are considerably lower than the longest rays. The membrane of the anal fin is deeply incised, and the posterior rays of both the anal and soft dorsal reach to, or beyond, the base of the caudal. The pectoral fin reaches to opposite the front of the anal. The caudal is broadly rounded and very slightly angulated at its outer rays.

When the pools containing fishes of this species were poisoned with chloride of lime they immediately left the water and proceeded over the land toward the next pool or the sea, progressing by a series of rapid hops made by curving the body and suddenly straightening it out, thus jumping from the caudal fin. They progressed over the sand at a rather surprising rate of speed.

Family PLEURONECTIDÆ.

224. Syacium micrurum Ranzani.

A single specimen taken at Natal.

225. Citharichthys spilopterus Günther.

A few specimens taken in the harbor at Natal and one at Pará. They differ from each other conspicuously in depth of color.

Family SOLEIDÆ.

226. Achirus lineatus (Linnæus).

A few small specimens were taken on the sand beaches about Natal. The pectoral is longer than described in current descriptions (3 times in the head). It is composed of 5 rays, with the middle ray produced, or in one case the second ray from the top is produced, and its length varies from almost half as long as the head to a little more than half as long. In all of them the caudal is abruptly lighter and covered with round dark spots. The eyed side is profusely supplied with hair-like sensory papillæ, some of which are arranged in vertical lines.

227. Achirus achirus (Linnæus).

This species, which has hitherto been known principally from the description of Dr. Günther (*Solea gronovii* Günther, Cat. IV, p. 472), was found in abundance at Lake Papary, where the fishermen secured many specimens by the aid of cast-nets. Specimens were also taken in the market at

Pará. The only other Achirus having a rudimentary left pectoral is *A. inscriptus* Gosse, which has about 10 fewer dorsal rays, and has the body covered with a net-work of fine lines. Only a single small specimen from Porto Rico is at hand of the latter species for comparison, but there can be no question of the validity of these two species.

In *A. achirus* the head is contained from 3½ to 3⅘ times in the length, and the depth from 1½ to 1⅗ times. Counting from the upper part of the operculum above the lateral line there are from 72 to 76 transverse series of scales. The dorsal rays are not very variable in number, ranging from 61 to 63 in 14 specimens, the majority having 62. There are 3 pectoral rays on the eyed side, and one, with occasionally a second short one, on the blind side. The former is as long as the eye. The longest dorsal and anal rays at the beginning of the posterior third of the fin are contained 1¾ times in the head. The caudal shows a slight angle at the tips of the median rays, which form a fourth of the entire length, or a little less. The ventral of the colored side is connected with the anal, but there is a rather deep notch between. The scales are enlarged on the anterior part of the body above the eyes, the anterior parts of the head, body, and fin rays are thickly covered with hair-like tentacles on the blind side, and a few are around the mouth and eyes of the eyed side.

228. Apionichthys unicolor (Günther).

A couple of specimens taken at Pará. The color is brownish, mottled with darker elongate spots placed vertically. One of them is freckled with dark brown specks. One has 3 ventral rays on the blind side, rather than 2.

Family ANTENNARIIDÆ.

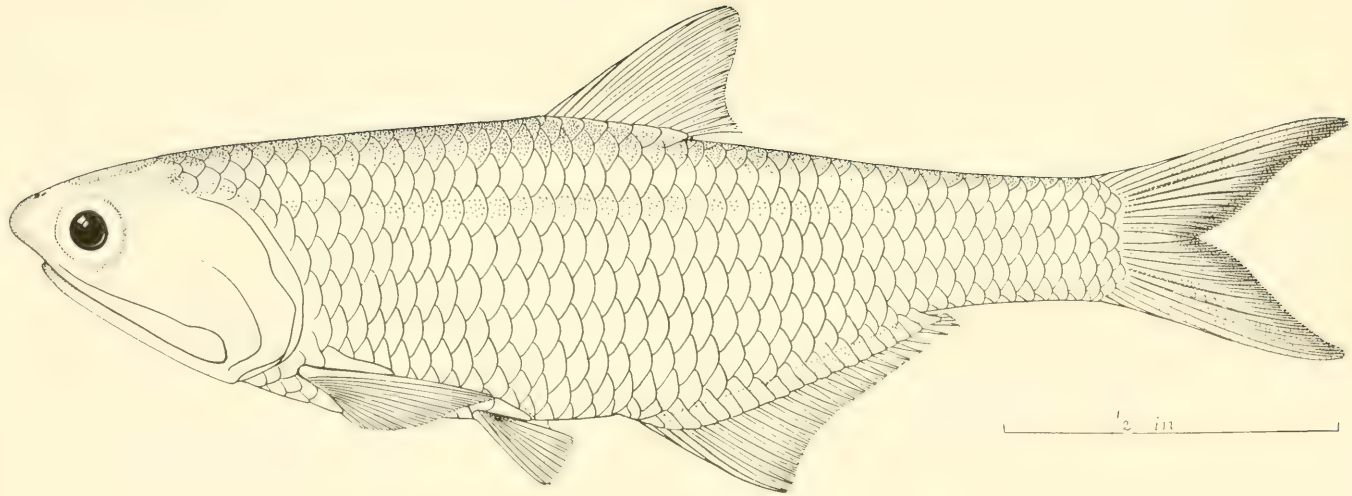
229. Pterophryne histrio (Linnæus).

A small specimen was taken in the harbor at Natal. In life it was olive green with the belly yellow, and large, round, yellow spots scattered over the sides, as well as some obscure black spots. Over these colors were sparsely scattered flakes of pure white.

Family OGCOCEPHALIDÆ.

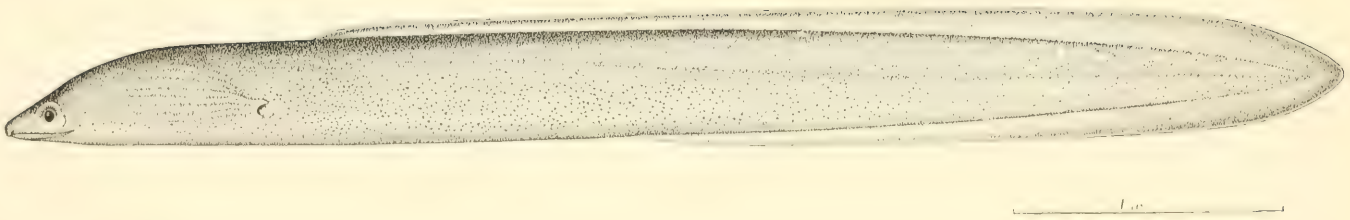
230. Ogcocephalus vespertilio (Linnæus).

A couple of specimens were examined in the Rocha Museum at Ceara.



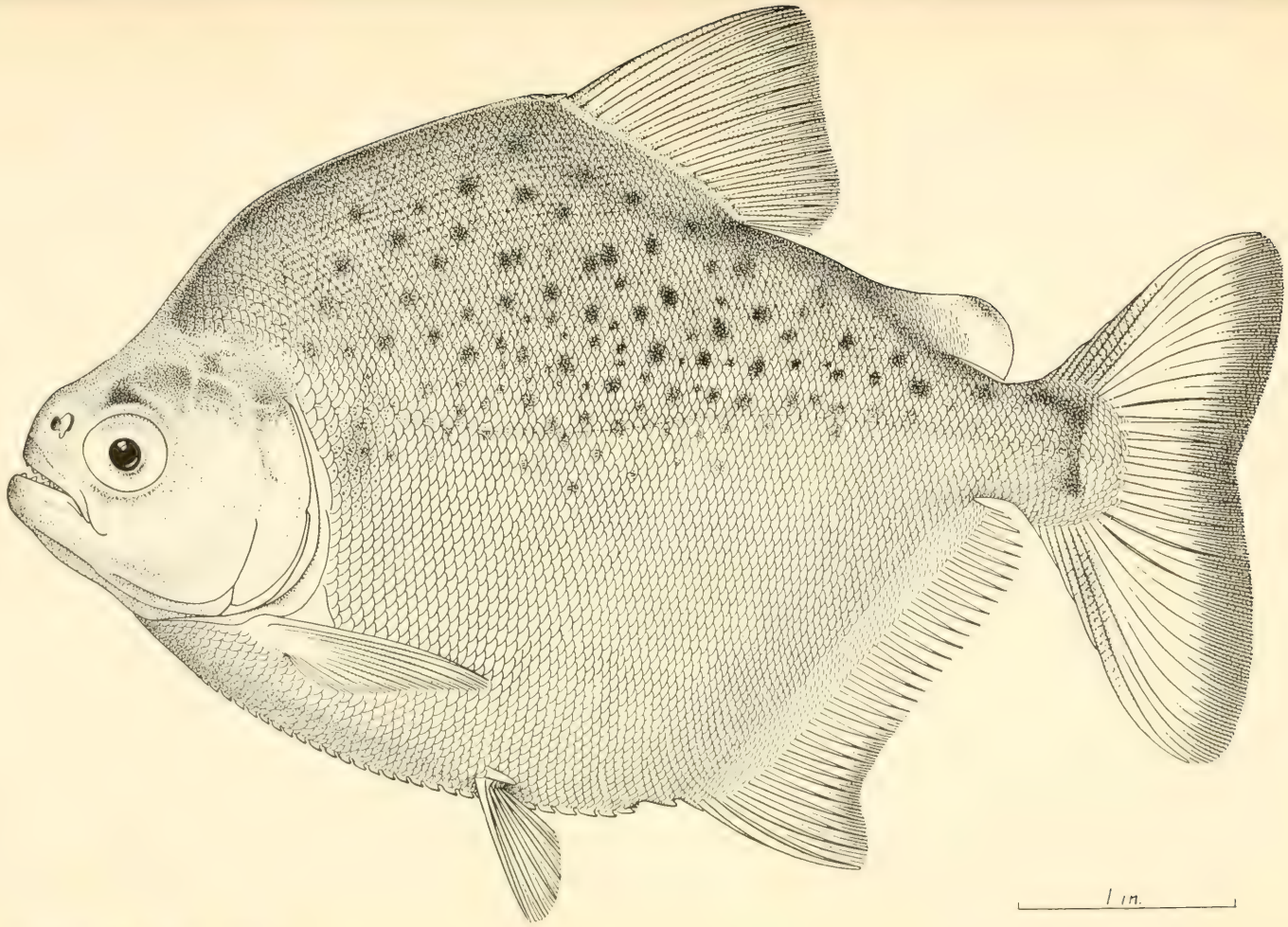
Anchovia pallida Starks. **Type.**

C. L. S. *Del.*



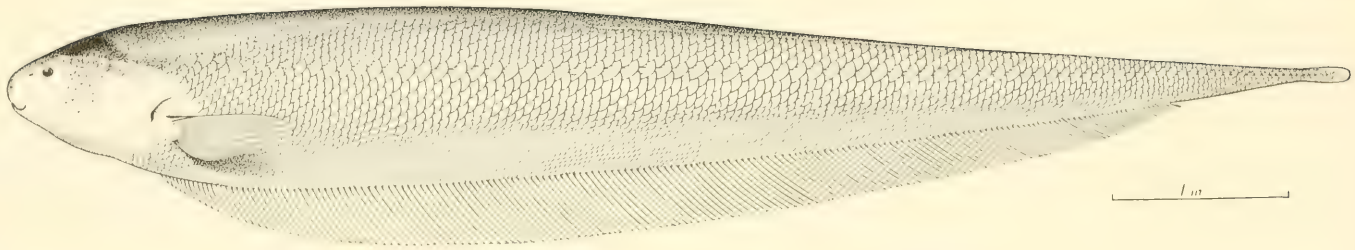
Rabula megalops Starks. **Type.**

C. L. S. *Del.*



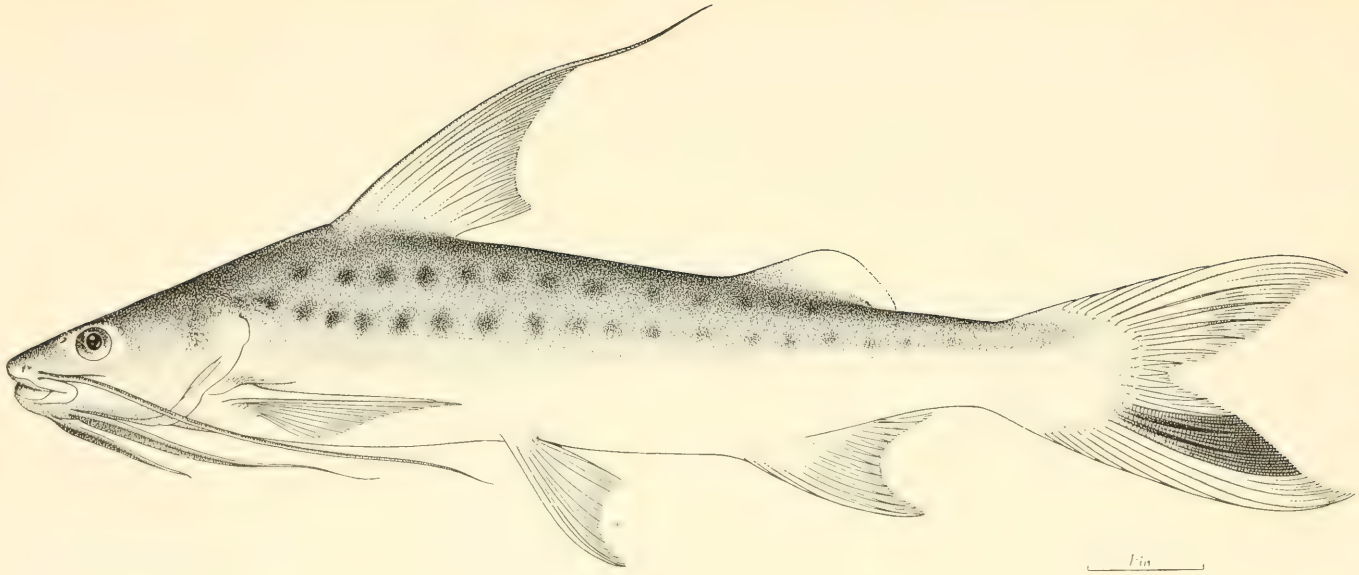
Pygopristis gibbosus Starks. Type.

C. L. S. *Del.*



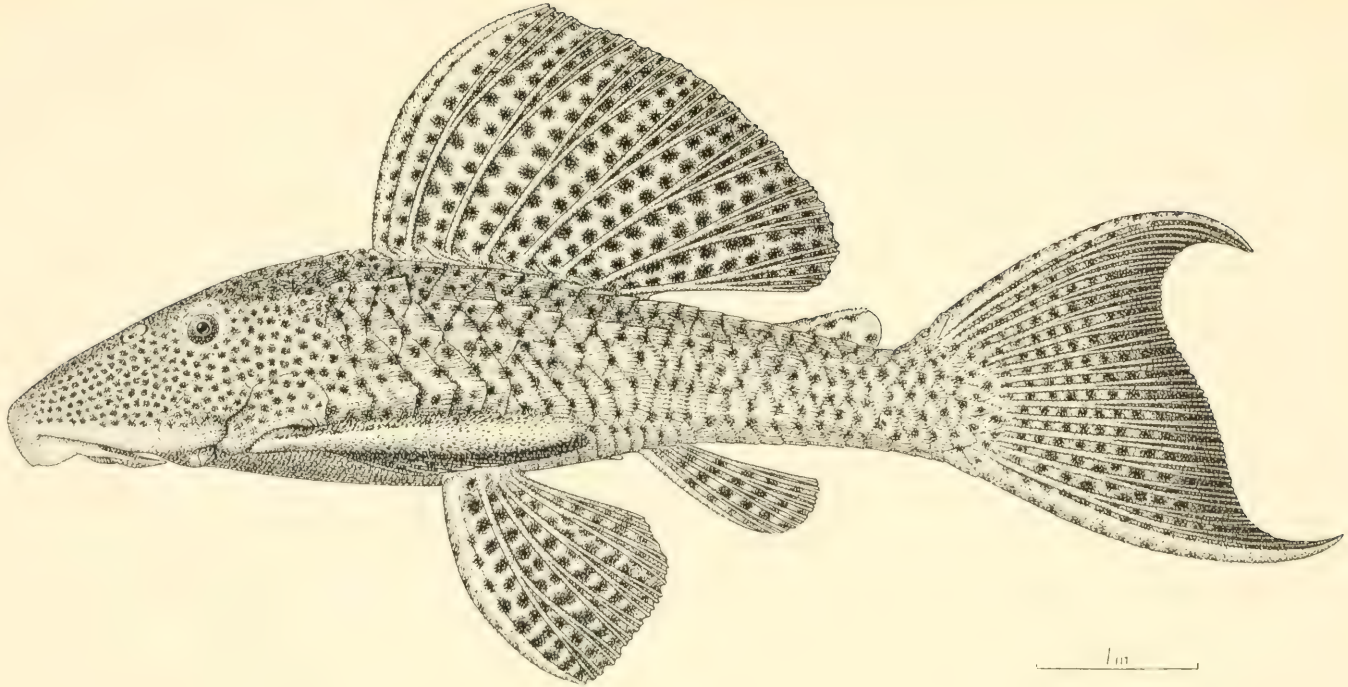
Sternarchella sima Starks. **Type.**

C. L. S. *Del.*



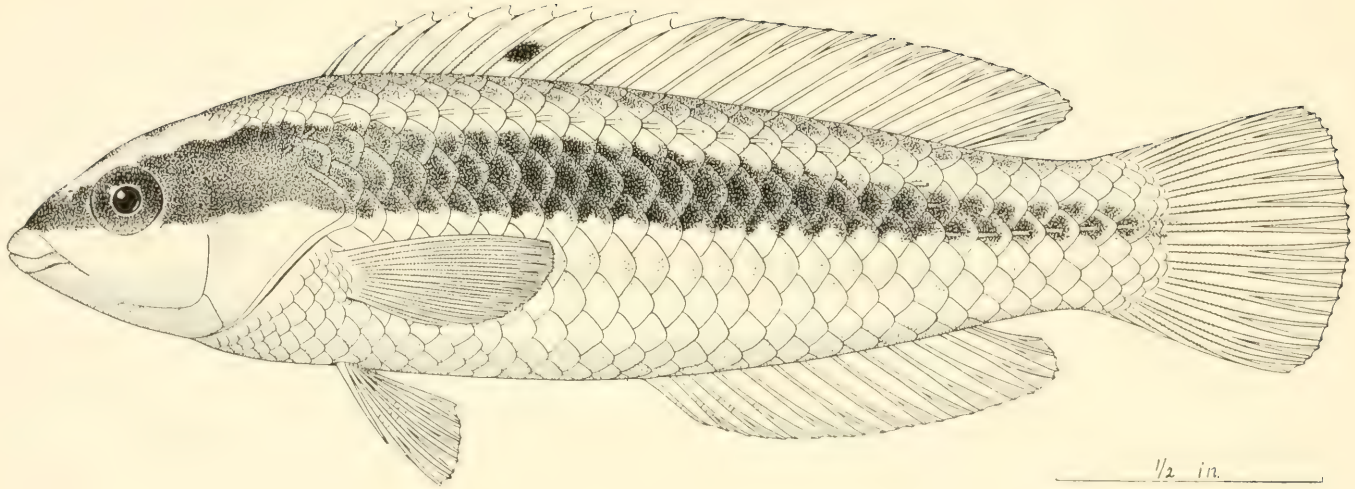
Platypogon cærulorostris Starks. **Type.**

C. L. S. *Del.*



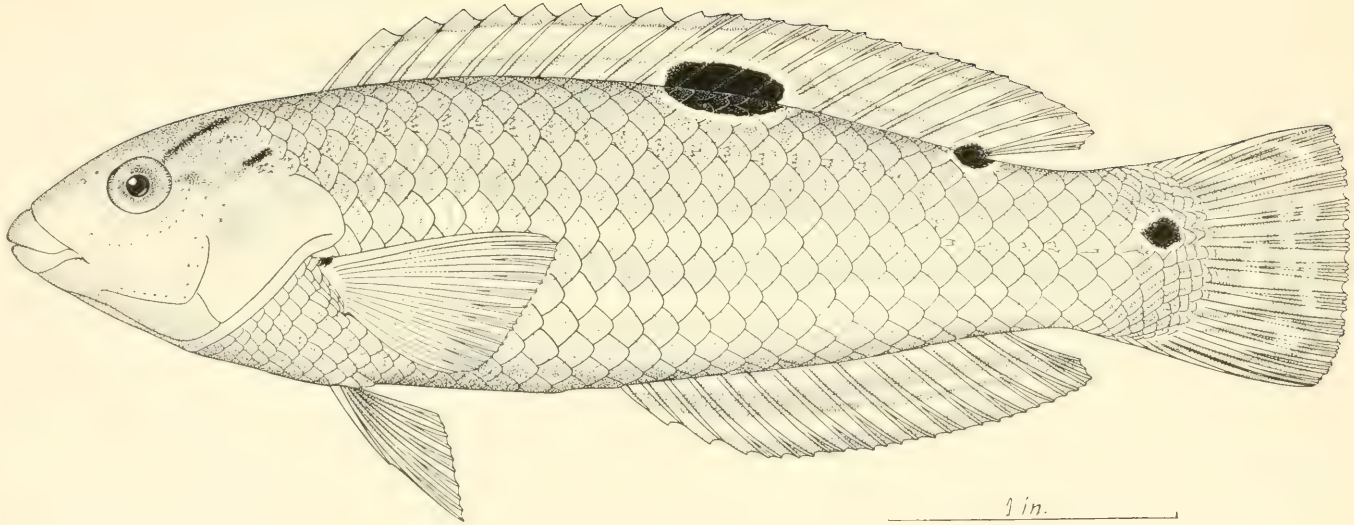
Plecostomus pusarum Starks. Type.

C. L. S. *Del.*



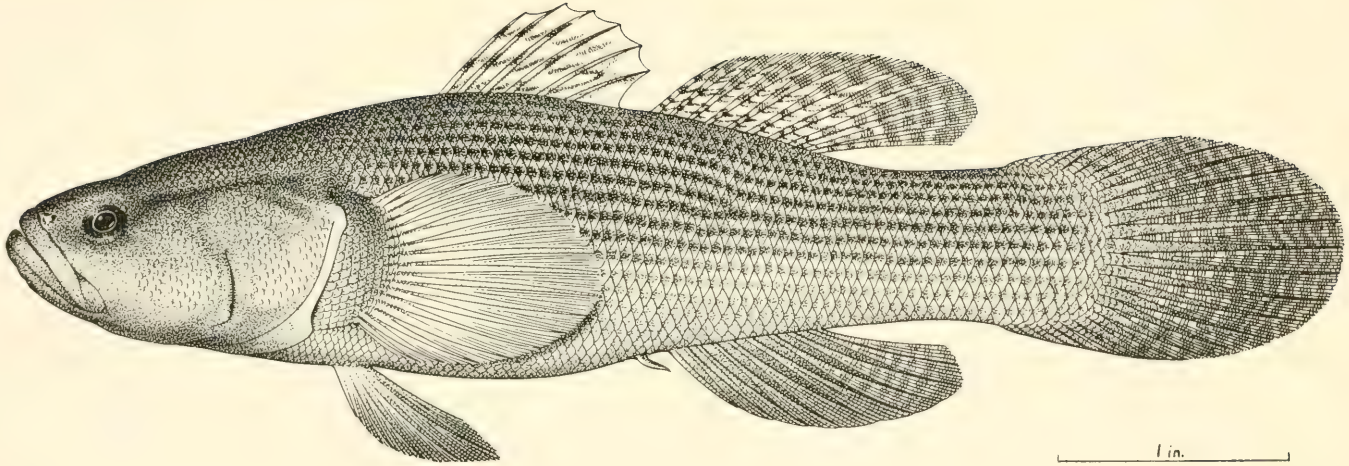
Halichæres penrosei Starks. Type.

C. L. S. *Del.*



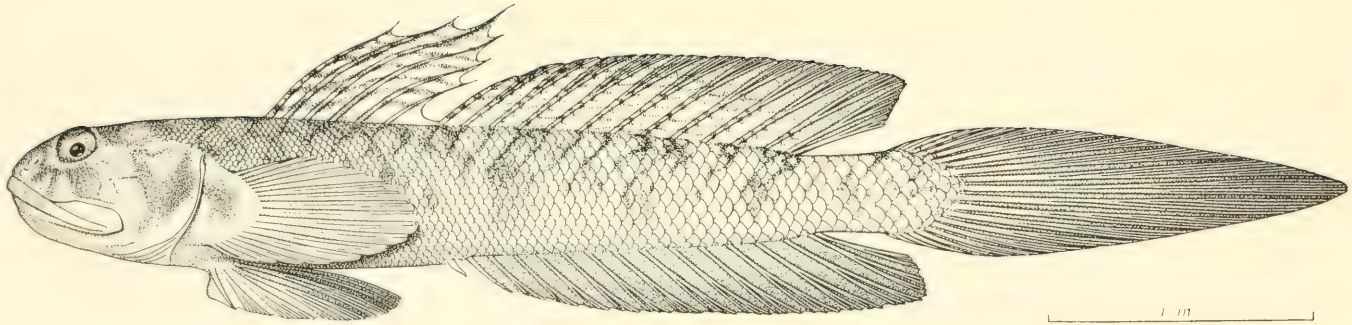
Halichœres irideus Starks. **Type.**

C. L. S. *Del.*



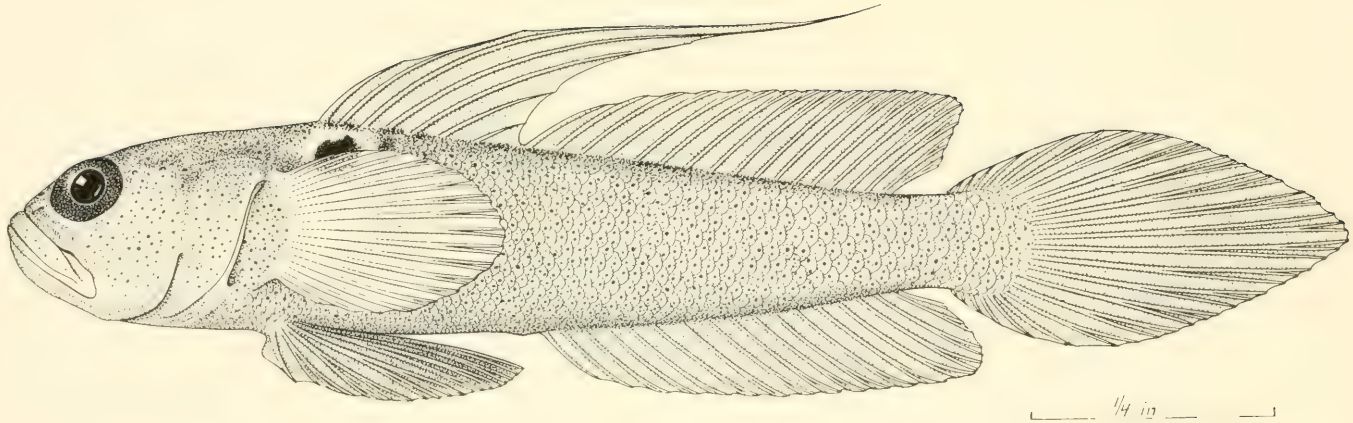
Eleotris carvalhonis Starks. Type.

C. L. S. *Del.*



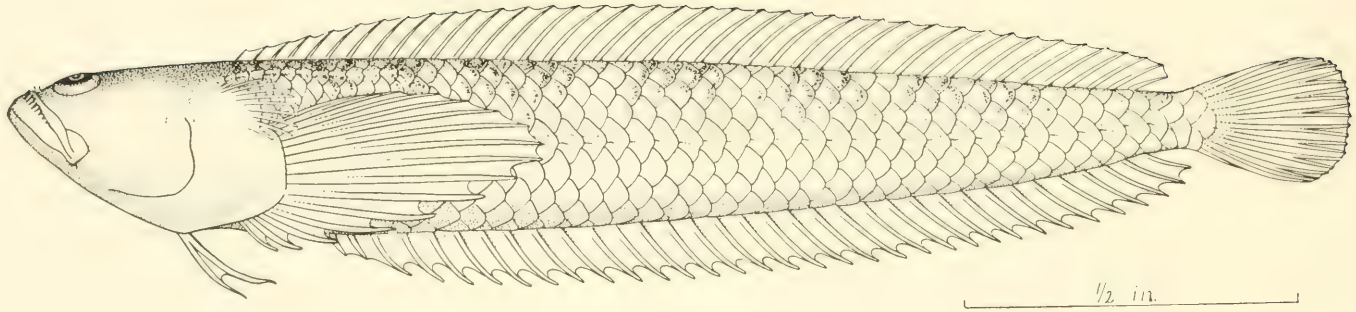
Gobionellus stomatus Starks. **Type.**

C. L. S. *Del.*



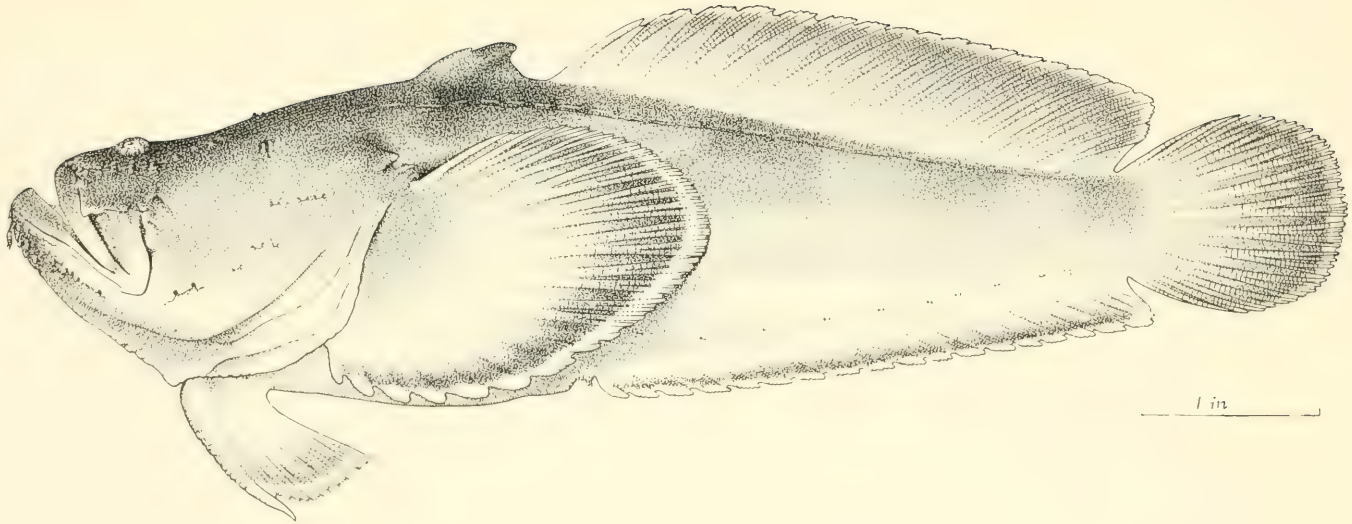
Microgobius omostigma Starks. **Type.**

C. L. S. *Del.*



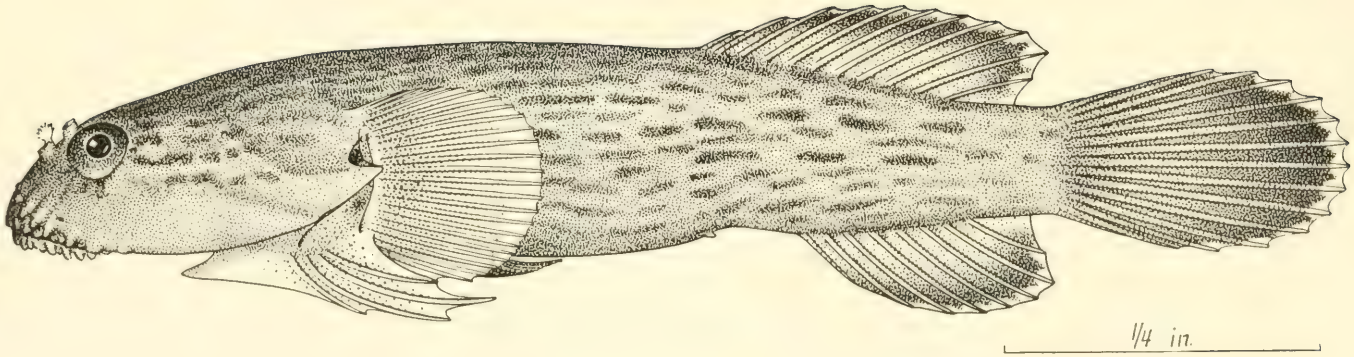
C. L. S. *Del.*

Dactyloscopus crossotus Starks. Type.



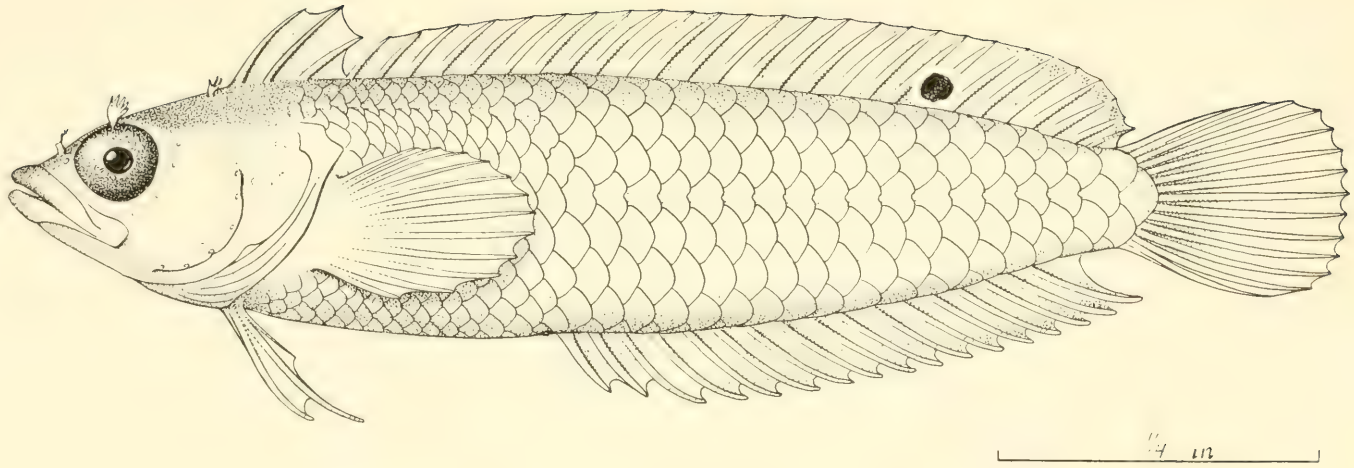
Thalassophryne branneri Starks. Type.

C. L. S. *Del.*



Gobiesox barbatulus Starks. Type.

C. L. S. *Del.*



Auchenopterus rubicundus Starks. **Type.**

C. L. S. *Del.*

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 00699 8223