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THE PYGIDIIDÆ, A FAMILY OF SOUTH AMERICAN CATFISHES.[1]

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(PLATES XXXVI–LVI.)

INTRODUCTION.

The *Pygidiidæ* are a family of South American catfishes distinguished externally by the absence of an adipose fin and by the posterior position of the dorsal. Most of them are even more readily distinguished by the presence of spines or thorns on the opercle and interopercle, by twin barbels at the angle of the mouth, and by the absence of all mental barbels. Other characters of the catfishes may be present or absent, and by addition, subtraction, or modification of characters, various subfamilies have been formed. A description of the characteristic structures is given on pages 276–279. The basal habit of all the members of the family is that of burrowing. The opercular and interopercular spines are an adaptation to their habit of insinuation, which is at the root of the commensalism, parasitism, and worse, to which some highly specialized members of the family are addicted.

Nematogenys from central Chile, the only representative of the *Nematogenyinæ*, is probably more nearly like the ancestors of the *Pygidiidæ* than the other living representatives of the family. It recalls the *Siluridæ* by having a pungent pectoral spine, serrated on its posterior margin, by having but one barbel at the angle of the mouth (the remaining subfamilies having two), by having a pair of mental barbels,

[1] Contribution from the Zoölogical Laboratory of Indiana University, No. 164.

and by the absence of opercular and interopercular spines, which are present in the other subfamilies. Its dorsal is farther forward than in the other members of the family, again in this respect approaching the *Siluridæ*. It resembles the rest of the *Pygidiidæ* in lacking an adipose fin and in the case of some specimens by having a nasal barbel. I am not able to speak with certainty of its air-bladder.[2]

The principal subfamily is that of the *Pygidiinæ*. In addition to the main characteristics of the family, the members of the subfamily have a barbel on the anterior nostril, the gill-membranes are free from the isthmus, the teeth are in bands. The genera of the *Pygidiinæ* differ but little from each other. *Eremophilus*, found on the plains of Bogotá, has lost its ventrals; *Hatcheria*, living in the Andes of Argentina and Chile, has an elongate dorsal fin, *Scleronema* from the Uruguay has modified maxillaries and maxillary barbels. The main genus, *Pygidium*, with sixty-three species, is found everywhere in the mountains and sparingly in the lowlands. It attains the highest altitudes and flourishes in Lake Titicaca, where it is a food-fish of importance. The only food-fish at Bogotá is the closely related *Eremophilus*, "El Capitan." Seventy-one of the known species of the family belong to the subfamily *Pygidiinæ*.

[2] The genus *Pariolius* may be related to *Nematogenys*, but it is more likely to be related to *Phreatobius*, *Heptapterus*, ~~*Myoglanis*~~, *Leptorhamdia* (for *Leptoglanis* which is pre-occupied), etc. The only specimen recorded has been lost. → Miuroglanis

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I. PARIOLIUS* Cope.

Pariolius, Cope, Proc. Acad. Nat. Sci. Phila., 1871, p. 289.

Type.—*Pariolius armillatus* Cope.

Similar to *Pygidium;* no nasal barbel; a single barbel at the angle of the mouth; two pairs of mental barbels; no armature on the opercles; gill-openings wide; teeth brush-like; origin of the dorsal behind that of the ventrals; anus under dorsal; anal short.

Little can be said about the relationship of this genus until its skull and air-bladder are examined. It appears to be closely related to some members of the *Pimelodinæ*. There are no specimens available for examination. It is known only from the type of the species, and that has been lost.

Habitat.—Basin of Peruvian Amazons.

Pariolius armillatus Cope, *l. c.* (Ambyiacu); Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 50; Occasional Papers Cal. Acad. Sci., I, 1890, p. 324; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 398.

"Head flat rounded, eyes small, superior, covered by the skin. Head 4.5 times in length to basis of caudal fin. Depth at D. I. one-half length to basis pectoral fin; width of head two-thirds the same distance. Interorbital width 3.66 times in length of head. Maxillary and external mental barbels extending beyond basis of pectoral; inner mental barbel one-half the same. Radii D. 7; P. 8; V. 6; A. 11; caudal acuminate. Skin entirely smooth."

* I am not sure of the origin of this generic name. Is it from the proper name Parioli, or from παραιολίζω = *to trick*, hence a trickster or simulator, or from παρά = *with*, and ἀιόλος = *speckled*?

Nearest the *Pygidiinæ* are the *Pareiodontinæ*, which lack a nasal barbel. The teeth are very peculiar and in a single series (See Fig. 21) and the gill-membranes are attached. But one species is known. The *Nematogenyinæ*, *Pygidiinæ*, and *Pareiodontinæ* are free-living, and have a terminal or subterminal mouth and pointed or incisor teeth.

The *Stegophilinæ*, *Vandelliinæ*, and *Tridentinæ* differ widely from the members of the above-mentioned subfamilies in structure and habit. They are all small or minute; the mouth is inferior; the head flat below; the lower barbel at the angle of the mouth is minute. The jaws are weak, the teeth absent or slender. The gill-opening, in all but *Acanthopoma*, is greatly restricted, which, put in terms of habit, means that the mouth is suctorial. Some of them are parasites, or commensals.

The *Tridentinæ* differ in having the anal fin much longer than the others. Nothing is known of their habits and they are so small (the largest known specimen is but 27 mm. long) that it is a wonder that any of them have arrived in the bottles of the naturalist.

In the *Vandelliinæ* the teeth are reduced to a minimum, and the rami of the lower jaw do not meet in the middle. The differences between the genera are minute, but well marked. The habits of these fishes, as well as those of the next subfamily, are discussed below.

The *Stegophilinæ* have a very large number of minute teeth in definite series in both jaws. The rami of the lower jaw meet in the middle. The genus *Acanthopoma* stands out in that its gill-membranes, while united, are free from the isthmus. The genus, *Henonemus*, is well marked by the small number of opercular spines. *Ochmacanthus* has numerous accessory caudal rays above and below, which make the tail look like that of a tadpole. The remaining genera, *Stegophilus*, *Homodiætus*, and *Pseudostegophilus*, might well be united. They differ from each other largely in the position of the ventrals, the shape of the caudal, and in the number of accessory rays.

Habits.

The habits, as well as the distribution, of various members of the *Pygidiidæ* have been derived from the general tendency of the catfishes to get under banks, under logs, out of the way, and out of sight. This general tendency has been modified into the specialized, insinuating habit of the *Pygidiidæ*, for which the opercular spines and the eel-like body are adaptations.

On the plains of Bogotá the Indians secured the largest specimens of *Eremophilus* by thrusting their arms to the bottom of holes in the banks of streams. At Honda I found one species buried in the sand in the bottom of the stream. It

would dart from its hiding place as I raked my fingers through the sand, to dart into the sand again much like a lancelet or young lamprey, or to dodge under a rock. Mr. E. B. Williamson wrote me that he noticed another species clinging to the vertical sides of a waterfall. It looked like a water-weed, but he found by watching closely that every little while the supposed weed would move up the wall a short distance, and by using his butterfly-net he secured specimens. It is this habit assisted by the opercular spines that accounts for the fact that the species of the genus *Pygidium* are found in every mountain-stream.

The habit of insinuating themselves into crevices is undoubtedly also the starting point of the habit of resorting to the gill-cavities and probably other organs of larger fishes. There is a widely distributed belief among the Indians of the Amazon Valley, that fishes called "Candirú" enter the urethræ of bathers. Some travelers who have had this habit reported to them have simply dismissed the matter as absurd. Others have made attempts to identify the fish with results that have not always been fortunate. The native name, Candirú, is applied to some fishes (*Cetopsis* of the *Cetopsidæ*) at least a foot long, and at least two inches thick, as well as to minute slender fishes, species of *Vandellia,* which might enter the urethra without violating the law that the greater cannot enter the less. The habit has been attributed to the large *Cetopsis,* to *Pareiodon,* more moderate in size and yet too large, and to some species of *Vandellia* and to *Acanthopoma.* It is, of course, possible that the young of the larger Candirús have the urinophilous habit. It is also possible that the Indians consider the small Candirús (species of *Vandellia*) as the young of the larger Candirús, members of the genus *Cetopsis,* which according to the classification adopted, belong to a different family. The habit is also physically possible for the species of *Tridens,* of *Miuroglanis,* of *Paravandellia, Stegophilus, Branchioica,* and for some of the minute species or young of *Pygidium.* However, these have not been indicated as being Candirús. As far as I am able to find, the first notice of the peculiar habit is given by Spix (*Selecta Genera et Species Piscium,* 1829, p. viii), who says of *Cetopsis:*

De alio pisce hominibus infesto nonnulla afferre debeo, quem Brasilienses Candirú, Hispani in provincia Maynas degentes Canero nuncupant. Singulari enim instinctu incitatur in ostia excretoria corporis humani intrandi, quae quum igitur in iis, qui in flumine lavant, attingit, summa cum violentia irrepit, ibeque carnem morsu appetens, dolores, imo vitæ periculum affert, Urinæ odore hi pisciculi valde alliciuntur, quam ob causam accolæ intraturi flumen amazonum, cujus sinus hac peste abundant, præputium ligula constringunt, et a mingendo abstinent. Pertinet hic piscis ad Cetopseos, quod depinximus, genus; at nescio, an descriptarum specierum (*C. candirú* et *C. cæcutiens*) individua juniora, an tertiæ cujusdam speciei minoris individua crudeli hoc instinctu a natura sint donata.

I am indebted to Professor Selatie E. Stout for the following translation:

I should briefly mention another fish which is dangerous to man. The Brazilians call it CANDIRÚ; the Spaniards in Maynas[3] call it CANERO. It is impelled by a curious instinct to enter the excretory openings of the human body. Whenever it comes in contact with these openings of persons bathing in the stream, it violently forces its way in, and having entered, it causes constant pain, and even danger of life, by biting the flesh. These fishes are greatly attracted by the odor of urine. For this reason, those who dwell along the Amazon, when about to enter the stream, whose bays abound with this pest, tie a cord tightly around the prepuce and refrain from urinating. This fish belongs to *Cetopsis*, a genus which I have already described. But I do not know whether it is the younger individuals of the two species which I have described (*C. candirú* and *C. cæcutiens*), or whether a third species of smaller fishes has been given this cruel instinct by nature.

The habit here described by Spix in reality belongs to fishes of which he did not secure specimens.

In 1808, Domingo Vandelli, professor of natural history at Lisbon, sent Lacépède three small fishes, which he placed with the *Loricariidæ*. They were described by Valenciennes (Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 1846, p. 386, pl. 547) as *Vandellia cirrhosa*, and placed in their *Esoces*. Nothing was said of the habits, and even the habitat of the specimens was unknown. The identification of *Vandellia* with the urinophilous habit came later.

Castelnau in his *Animaux d'Amérique du Sud, Poissons*, 1855, says of his *Trichomycterus pusillus* = *Pareiodon microps* Kner:

Cette espèce est, de la part des pêcheurs de l'Araguay, l'objet d'un préjugé des plus singuliers, ils prétendent qu'il est très dangereux d'uriner en rivière: car, disent ils, ce petit animal s'élance hors de l'eau et pénètre dans l'urèthre en remontant le long de la colonne liquide.

As this species reaches a length of at least six inches and a corresponding thickness, Castelnau was probably mistaken in the species acting in this remarkable manner.

It seems that Paul Marcoy (*Voyage à travers l'Amérique du Sud*, Vol. II, p. 145–147) gives an account with a figure of a Candirú. I have not seen this book, but Lütken says: "Etude de Candirú signeret med den Rejsendes Initialer, er en fuldstandig Umulighed, hvad den saa skal forstille"(*Vidensk. Meddel. Naturh. Foren. Kjöbenhavn*, 1891, p. 60).

Lange "In the Amazon Jungle," p. 214, says:

In fact, throughout the Amazon this little worm-like creature, called the kandiroo, is so omnipresent that a bath-house of a particular construction is necessary. The kandiroo is usually

[3] Probably Mainá, an Igarapé tributary to the Amazon, near the Rio Negro; or a province of Peru with Moyobamba for its capital.

three to four inches long and one-sixteenth in thickness. It belongs to the lampreys, and its particular group is the Myxinos or slime-fish. Its body is coated with a peculiar mucus. It is dangerous to human beings, because when they are taking a bath in the river it will approach and with a swift, powerful movement penetrate one of the natural openings of the body, whence it can be removed only by a difficult and dangerous operation.

A small but hard and pointed dorsal fin acts as a barb and prevents the fish from being drawn back. While I was in Remate de Males the local doctor was called upon to remove a kandiroo from the urethra of a man. The man subsequently died from the hemorrhage following the operation.

The Candirú does not belong to the lampreys and its particular group is not Myxinos. The lampreys are not found in the Amazon Valley. Its dorsal fin is neither hard nor pointed, and hence cannot act as a barb to prevent the fish from being withdrawn. The retrorse spines on the interopercle and opercle are the obstacles which would prevent it from being withdrawn.

The question naturally arises: Is Lange more trustworthy in his account of the habit than in his account of the structure and relationship of the Candirú?

The only known specimen of *Acanthopoma annectens*, another Candirú, seems to have been collected by Gustav Wallis. In an article, "Mittheilung von C. Müller über die Reise von Gustav Wallis" in *Die Natur*, Zeitung von P. Ule u. K. Müller, XIX, No. 23, p. 180, mention is made of the habits of presumably this species, though it may have been drawn from the general report given the traveler concerning the Candirú. Lütken quotes:

In diesen noch so wenig bekannten Gewässern, namentlich im Huallága, beobachtete der Reisende (G. W.) einen Fisch, den ich der Aufmerksamkeit der Wissenschaft ganz besonders empfehlen will. Man nennt ihn dort den Candiru und fürchtet ihn mit Recht ebensosehr für das Gebiet des Wassers, wie man für das des Landes die Moskitos und Ameisen fürchtet. An sich selbst ist es nur ein kleines, kaum .75 Spannen langes Ding von welsartigem Körperbau, mit breitem, abgerundetem Kopfe, auf dem die beiden Augen ziemlich dicht neben einander liegen, während die beiden Brustflossen flügelartig dicht unter ihm sich ausbreiten und der übrige Körpertheil keilförmig zulauft. Den Rücken ziert eine dunklere Färbung mit undeutlich verlaufenden Flecken, so dass das Geschöpfchen an sich selbst kaum irgendwie durch eine hervorragende Eigenthümlichkeit ausgezeichnet ist. Eine umso schrecklichere Plage ist es für den Badenden, eine Art Blutegel nämlich, der mit unglaublicher Schwimmfertigkeit jenem zu Leibe geht, ihm überall schröpfkopfähnliche Wunden beibringt und, wenn es ihm gelungen, sich dadurch an dem Körper festzusetzen, in der Wunde ein Nadelbündel ausspreizt, an dem er wie an Widerhaken sich derart festklammert, dass er nur durch eine schmerzhafte Operation aus dem Körper entfernt werden kann. Diese Unart des Fisches ist umso grösser und gefährlicher als er am liebsten die geheimsten Körpertheile aussucht; man erzählt sich Fälle, die bei der Operation mit dem Tode endeten. Ich werde dafür Sorge tragen, dass dieser seltsame Fisch, den ich in Spiritus vor mir habe, in die rechten wissenschaftlichen Hände gelangt und seinen wissenschaftlichen Namen empfängt, den er noch nicht hat.

Boulenger (*Proc. Zoöl. Soc. London*, 1897, p. 901) says of *Vandèllia cirrhosa*, the urinophilous Candirú, *par excellence:*

The "Candyrú," as the fish is called, is much dreaded by the natives of the Jurua district, who, in order to protect themselves, rarely enter the river without covering their genitalia by means of a sheath formed of a small coconut-shell, with a minute perforation to let out urine, maintained in a sort of bag of palm-fibers suspended from a belt of the same material. The fish is attracted by the urine, and when once it has made its way into the urethra, cannot be pulled out again, owing to the spines which arm its opercles. The only means of preventing it from reaching the bladder, where it causes inflammation and ultimately death, is to instantly amputate the penis; and at Tres Unidos, Dr. Bach had actually examined a man and three boys with amputated penis as a result of this dreadful accident. Dr. Bach was therefore satisfied that the account given of this extraordinary habit of the "Candyrú" is perfectly trustworthy. Mr. Boulenger further showed a photograph, taken by Dr. Bach, of two nude Indians wearing the protective purse.

It is to be noted here that this evidence is only circumstantial. Dr. Bach did not himself operate or help to operate to remove the Candirú and a much simpler operation than amputation would be sufficient to remove it.

The literature on the evil repute of members of the *Pygidiidæ* has been reviewed by Pellegrin. In *Bulletin Société Philomathique de Paris* (10), I, 1909, pp. 101–104 [5–8 of the reprint], he says:

Le Dr. C. Jobert qui accomplit au Brésil, en 1877, un voyage où il rassembla des matériaux ichthyologiques considérables, a consacré à la question du Candiru un mémoire des plus documentés, où il n'admet pas sans réserve les déclarations du praticien américain cité par G. A. Boulenger. 'Le Dr. Bach,' écrit-il, 'n'a pas vu le petit Poisson in situ; la chose est regrettable et, cette fois encore, nous ne sortons pas du cercle de la légende.'

Toutefois, le Dr. Jobert rapporte les dires d'un médecin très estimé de Belem (Pará), le Dr. Castro, qui lui affirma avoir extrait de l'urèthre d'une négresse un petit Candiru qui y avait pénétré pendant la miction, alors qu'elle se baignait en rivière.

Mais ce qui fait le grand intérêt de l'article du Dr. Jobert, ce sont les renseignements qu'il a pu lui-même recueillir sur place au Brésil au sujet des Candirus.

Les Paraenses en distingueraient deux espèces, l'une petite, qui s'introduirait dans l'urèthre des baigneurs, l'autre de plus grande taille, 'trop grande pour tenter ces mêmes opérations, mais redoutable par les blessures qu'elle fait sur n'importe quelle partie du corps. On donne à cette dernière le nom de *Candiru de Cavallo* et les indigènes prétendent qu'elle attaque les chevaux pendant la baignade.' Au sujet de celle-ci il rapporte en outre les faits suivants:

'Un jour, à un mille environ en aval de Para, je voulus me baigner sans souci des Candirus qu'on m'assurait être très abondants en cet endroit. Je n'étais pas dans l'eau depuis cinq minutes que je ressentis dans le région lombaire, au ventre, sur le côtés de la poitrine, comme de légers coups de griffes qui se succédaient rapidement. Voyant l'eau se teinter de rouge autour de moi, je me hâtai de regagner le rivage et je constatai que, dans le région ou j'avais éprouvé la sensation

de ces coups de griffe, le sang s'échappait de blessures en scarifications parallèles, qui eussent pu être attribuées à un instrument, tant elles étaient régulières; elles constituaient des groupes de 5 à 6 lignes, longues d'un centimètre au plus et très rapprochées; je n'ai pas cherché à apprécier a profondeur, mais ces blessures très étroites saignaient abondamment.'

Les Poissons qui ont attaqué ainsi le Dr. Jobert appartiennent suivant moi, incontestablement au genre Vandellie, peut-être même à l'espèce *Vandellia Wieneri*. Si l'on se reporte à la description donnée plus haut de la bouche et de l'appareil operculaire, on s'expliquera ainsi facilement le fonctionnement de ces divers organes; on comprendra aisément que la demi-couronne de dents en crochet placée en avant de la bouche, dents *susceptibles d'un certain degré d'érection et au nombre de 5 à 6 principales* produit ces *scarifications parallèles, régulière et en groupe de 5 à 6 lignes*. Les épines interoperculaires du dessous de la tête, aussi un peu érectiles, peuvent également, dans une certaine mesure, déchirer les téguments, mais elles doivent sourtout servir à la fixation. Quant aux épines opereulaires du dessus de la tête, elles me semblent plutôt, étant donnée la direction de leur pointe, destinées à faciliter la progression de l'animal et à empêcher tout recul lors-qu'il s'engage dans un conduit étroit, par example entre les lamelles branchiales des Platystomes.

Sans vouloir trancher la question de la pénétration des Vandellies dans l'urèthre, pour laquelle je ne puis apporter des documents nouveaux, il me parâit tout au moins démontré en rapprochant les détails anatomiques que j'ai pu constater sur les *Vandellia Wieneri*, des observations faites sur lui-même au Brésil par le Dr. Jobert, que les Candirus, véritables Poissons-sangsues, ne sont pas, ainsi que le pensait Günther, de simples commensaux des grands Siluridés sur lesquels ils vivent habituellement; leurs dents et leurs épines operculaires et interoperculaires permettent non seulement de se fixer sur les branchies de leur hôte, mais aussi de faire des blessures amenant un écoulement de sang abondant qu'une disposition spéciale leur permet d'ingurgiter. Enfin à l'état libre, comme la constaté le Dr. Jobert, les Vandellies ne craignent pas de s'attaquer à l'Homme, dont elles percent les téguments, ce qu'elles font aussi certainement sur certains Mammifères domestiques. Il y a lieu en terminant de noter que les dents volumineuses peu nombreuses, en forme de crochets acérés de la mâchoire supérieure, sont particulières au genre Vandellia, qu'elles sont absentes dans les genres voisins *Stegophilus* Reinhardt et *Acanthopoma* Lütken, où elles sont remplacées par une bande de très nombreuses petites dents acérées.[4]

Les Vandellies représentent donc, chez les Siluridés, le dernier terme de la spécialisation en vue d'un parasitisme des plus caractérisés.

That fishes found in the Amazon Valley and called Candirús are a nuisance is certain. Whether the widely prevalent belief that the Candirú is tropic to urine, and consequently has a tendency to enter the urethra, or whether the Candirú's tendency to burrow leads it accidentally to enter the urethra, are all matters that must for the present remain in debate. A very interesting subsidiary question is, whether, if Candirús are tropic to urine they do not also enter the

[4] While members of the *Stegophilini* have bands of minute teeth uniform in size in the upper jaw there are frequently a few elongate, slender teeth in the middle of the upper jaw, which are similar and correspond to those of *Vandellia*.

urethræ of aquatic mammals and of large fishes. Further study may demonstrate that some species of Candirús have become parasitic in the bladders of large fishes and aquatic mammals. These are all questions that may legitimately be taken up by future expeditions.

The first of the commensals or parasites of this family to be described is the *Stegophilus insidiosus* of Reinhardt. Reinhardt secured all of his specimens from the gills of the giant catfish of the Rio das Velhas, a tributary of the Rio San Francisco. Haseman secured one specimen of this fish from the sandy island opposite Januaria, near the mouth of the Rio San Francisco. The fish therefore may and does live in the open as well as in the gill-cavities of larger fishes.

The account of *Stegophilus insidiosus* Reinhardt, given by the author of the genus and species, which was published in 1858 (Cf. *Naturhistorisk Forenings Videnskabelige Meddelelser*, Copenhagen, 1858, reprint, pp. 1–19, Pl. II) possesses great interest. Professor Reinhardt having been repeatedly informed that a large species of catfish, belonging to the genus *Pseudoplatystomus* and known by the natives as *Sorubim*, protects its young by carrying them in its gills, determined, if possible, to verify the statement. An English translation of a portion of his narrative is here given:

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> It deeply interested me to ascertain with exactness the circumstances under which this peculiar method of protection takes place, and also to examine the young at the time when they make use of it. I therefore offered the fishermen in the vicinity of Lagoa Santa, where I was staying at the time, a good sum if they would bring me a Sorubim with some of its young in the gill-cavities. Finally on February 27, 1852, a fisherman brought me one, in the gills of which he said there should be a little "young one." On examination I indeed found there a young fish, hardly an inch long, which was already dead, although the Sorubim still showed faint signs of life. The little fish looked so unlike the big one that I was astonished, and upon finding out that the old fish was a male I was strengthened in my doubt as to their relationship. When the same fisherman two days later again brought a male Sorubim with a young one, which looked exactly like the first, but was about three times longer, it became clear to me that these two small fishes could in no wise be what it was claimed they were. On the other hand they recalled to me the picture I carried in my mind of a *Trichomycterus* which I had obtained one year previously from the Rio das Velhas under the name of *Cambeja*, or *Bagre molle*. I naturally concluded that the fisherman in order to get the reward offered, had brought me the young of this Cambeja and was passing them off as the young of the Sorubim. I complained to his face about this procedure, and, though I did not obtain any confession from him, I nevertheless had no doubt that I had been made the victim of a swindle. During the few weeks I still remained in Lagoa Santa before starting on my homeward journey to Europe, nothing happened to induce me to think otherwise.
>
> Upon my return home, as soon as I could get access to the literature, and could make a direct comparison between the supposed young of the Sorubim and the Cambeja, I at once saw that I had made a mistake in assuming that the former were the young of the latter. In short these

so-called young of the Sorubim were the little fishes which I have had the honor of exhibiting to the Society. The whole matter became more involved and enigmatical to me, because it appeared that the fisherman, if he had been really guilty of an intended fraud, had for this purpose made use of a fish which was so rare that I had never found it, although I had collected great quantities of the various small fishes in the waters around Lagoa Santa; in fact a fish which I was forced to conclude to be as difficult to obtain as the real young of the Sorubim. In 1854, when I again visited Brazil, the solution of the riddle was one of my especial aims. Soon after I arrived at Lagoa Santa in the latter part of November I indeed reached the solution much more quickly than I had expected, and in the following manner:

A person from the vicinity of Lagoa Santa, but not the same one, who almost three years before had brought me the first *Stegophilus*, came to the village on a Sunday in the middle of December to attend mass according to the custom of the country. He brought with him on this occasion a Sorubim, which before he went to church he sold to a Frenchman who had a shop in the town. When mass was over he returned to get his pay, and watched the shopkeeper cut the fish into pieces. He remarked that when the fish had been pulled out of the water there had been five young in its mouth, of which two had remained inside. The shopkeeper looked and actually found the remaining "young," and was kind enough, as he knew the matter would interest me, to immediately bring them to me and relate the circumstances.

At the very first glance at the so-called "young" I saw to my surprise that *again Stegophili had been brought me as the young of the Sorubim*. That deception should again be at the bottom of the matter appeared in the highest degree improbable. It could hardly be thought of, except upon the assumption that the person who had sold the last Sorubim was in collusion with the fisherman who during my previous stay, three years before, had brought me the first two *Stegophili*. How could it be explained that both had conceived the idea of passing off the very same fish as the young of the Sorubim, and that a fish, which has no particular resemblance to the latter? But, even if there had been collusion, would it not have been more likely that the first party concerned would have come directly to me with his "Sorubim young," instead of leaving it to be more or less of a chance whether or not they should fall into my hands? Even if a trick, prearranged to allay a possible suspicion, were thinkable, nevertheless it was hard to believe that under the existing conditions the parties involved would have taken the time and the trouble to deceive me, unless they had expected to reap advantage from their effort. If a trick had been planned in the present case it was entirely aimless, as no pay was either asked, or given, for these last "young Sorubim"; and neither the last person, nor any one else, came at a later date to offer me "Sorubim young." There was therefore left for me no other alternative than to conclude that I had been unjust in my suspicion in the case of the fisherman who on the occasion of my previous stay had brought me the first *Stegophili*. In other words, this little fish in reality passes into and abides in the gill-cavities of the Sorubim. Its presence there has through an easily explained misinterpretation on the part of the common people given rise in Minas to the story about the Sorubim's care for its young.

The second species, *Branchioica bertonii*, known to inhabit the gill-cavities of larger fishes, is recorded in the present volume. It really belongs to the *Vandelliinæ*. One specimen was sent me several years ago by Sñ. A. de W. Bertoni from Puerto

Bertoni, Paraguay. Later he sent me two more specimens, all three having been taken from the gills of a large characin, *Piaractus brachypomus*.

Ribeiro, of the National Museum of Rio de Janeiro, caught another very similar member of this subfamily, *Paravandellia*, among the water-weeds of the stream near San Luis de Caceres, in the Upper Paraguay basin.

With fishes as rare as these and as small as these, the question arises whether two species are really different, or whether the described differences are due to the fact that one worker uses a hand lens, and the other a binocular dissecting microscope with an arc spot-light. The results of the two instruments are comparable to the effects produced by an old-fashioned cannon and a modern forty-two centimeter howitzer. *Branchioica* and *Paravandellia* may prove to be synonymous.

Distribution (Plates XXXVI–XXXIX.)

In considering the distribution of the fresh-water fishes of South America I found, among other things (*Proc. U. S. Nat. Mus.*, XIV, 1891, p. 18) "that genera of many species usually have a wide distribution, and conversely, genera of wide distribution usually have many species." With one exception the number of species of any genus of the *Pygidiidæ* varies directly with the greatness of the area over which it is distributed. Some genera consist of but one species, and that restricted to but one, or a few neighboring localities. As far as known, *Eremophilus* is all but confined to the plateau of Bogotá, *Scleronema* to the center of the Uruguay basin, *Acanthopoma* to a part of the Huallaga basin, *Stegophilus* to the Upper San Francisco basin, *Paravandellia* to the Upper Paraguay basin, *Branchioica* to the Lower Paraguay basin. The genera with more than one species invariably have a wider distribution. *Homodiætus*, with two species, is limited to the lower and central La Plata basin, *Henonemus*, with four species, to the Amazon basin, *Hatcheria*, with six species, to the Andes of central and southern Argentina and Chile, and *Pygidium*, with sixty-three species, is found in all the mountain streams from the Tuyra in southern Panama to central Chile and central Argentina, in the mountain streams from Rio Grande do Sul to the Rio São Francisco, and sparingly in the lowlands of Guiana and Brazil. The only exception to the general rule is *Ochmacanthus*, with three species, ranging from Guiana to Paraguay.

The *Pygidiinæ* are mountain forms, and while they are found in lowlands near the mountains, we find the optimum in the plains of Bogotá and in Lake Titicaca. They are sometimes the last species to succumb in the struggle with adverse conditions found in high altitudes, and they range further south (to latitude 47° 30′), than any other tropical American fishes.

The *Stegophilinæ*, *Vandelliinæ* and *Tridentinæ* are essentially lowland forms, although some species reach considerable elevations.

Chronology.

The first species of the *Pygidiidæ* discovered was taken by Humboldt at Bogotá, and described in 1805 (*Recueil d'Observations de Zoölogie*, etc., pp. 17–19, pl. VI) as *Eremophilus mutisii*.

The habit of one of the species was next described by Spix in 1829, but attributed to a member of another family. See page 262.

The most prominent genus was first described by Meyen (Reise, I, p. 475, *Wiegm. Arch. Naturg.*, 1835, II, p. 269) as *Pygidium*. I have at diverse times defended the name, *Pygidium*, as against the name *Trichomycterus* and its variations.

The various generic names and their present equivalents are given in the following table:

Name Proposed.	Proposed in	Present Equivalent.
Eremophilus Humboldt	1805	*Eremophilus* Humboldt.
Thrichomycterus Cuvier & Valenciennes	1805	*Eremophilus* Humboldt.
Trichomycterus Valenciennes	1833	*Pygidium* Meyen.
Vandellia Cuvier & Valenciennes	1846	*Vandellia* Cuvier & Valenciennes.
Thrychomycterus Cuvier & Valenciennes	1846	*Pygidium* Meyen.
Thrichomycterus Girard	1855	*Pygidium* Meyen.
Parciodon Kner	1855	*Parciodon* Kner.
Centrophorus Kner	1855	*Parciodon* Kner.
Stegophilus Reinhardt	1858	*Stegophilus* Reinhardt.
Astemomycterus Guichenot	1860	*Parciodon* Kner.
Pariodon Günther	1864	*Parciodon* Kner.
Trachypoma Giebel	1871	*Eremophilus* Humboldt.
Tridens Eigenmann & Eigenmann	1889	*Tridens* Eigenmann & Eigenmann.
Pseudostegophilus Eigenmann & Eigenmann	1889	*Pseudostegophilus* Eigenmann & Eigenmann
Miuroglanis Eigenmann & Eigenmann	1889	*Miuroglanis* Eigenmann & Eigenmann.
Acanthopoma Lütken	1891	*Acanthopoma* Lütken.
Homodiætus Eigenmann & Ward	1907	*Homodiætus* Eigenmann & Ward.
Henonemus Eigenmann & Ward	1907	*Henonemus* Eigenmann & Ward.
Hatcheria Eigenmann	1909	*Hatcheria* Eigenmann.
Oehmacanthus Eigenmann	1912	*Oehmacanthus* Eigenmann.
Gyrinurus Ribeiro	1912	*Ochmacanthus* Eigenmann.
Paravandellia Ribeiro	1912	*Paravandellia* Ribeiro.
Cobitoglanis Fowler	1914	*Henonemus* Eigenmann.
Urinophilus Eigenmann	1917	*Urinophilus* Eigenmann.
Branchioica Eigenmann	1917	*Branchioica* Eigenmann.

Location of the Types and Specimens in the Museums of the World.

The species are, for the most part, but little known. Over forty of the ninety-five recorded species are known only from the types, which are widely scattered. Ten or twelve of the types are in Vienna, two are in Berlin, eleven or twelve in Paris, eleven in London, one in Torino, Italy, two possibly in Munich, one in the University of Leipzig, two in Copenhagen, three presumably in Santiago, Chile, three in Buenos Aires, five in Rio de Janeiro, two in Córdoba, Argentina, one in the Field Museum, two in the Philadelphia Academy of Sciences, eight in the Museum of Comparative Zoölogy at Harvard, eight in Indiana University, twenty-four in the Carnegie Museum, one in Princeton University. The Carnegie Museum possesses forty-six species, Indiana University is next in line with thirty-two species, and the Museum of Comparative Zoölogy comes third with twenty species.

The distribution of the known specimens in the various museums of the world is given in the following table:

	Vienna Museum.	Berlin Museum.	Paris Museum.	British Museum.	Santiago.	Buenos Aires.	Rio de Janeiro.	Univ. of Michigan.	Field Museum.	Acad. Nat. Sc. Phila.	U. S. National Museum.	Museum Comp. Zoölogy.	Indiana University.	Carnegie Museum.
1. *Nematogenys inermis.*			type									+		
2. *Scleronema operculatum*														type
3. *Hatcheria patagoniensis*[5]													+	+
4. *Hatcheria maculata*			type		?							+		
5. " *titcombi*											+		type	
6. " *areolatum*			type	+		+						+		
7. " *burmeisteri.*				+		type								
8. " *macræi*												type		+
9. *Pygidium marmoratum*					type?									
10. *Pygidium palleum*					type?									
11. " *tigrinum*					type?									
12. " *tenue*[6]														
13. " *corduvensis*[6]				+										
14. " *spegazzinii.*						type								
15. " *borellii*[7]				type		+								
16. " *eichorniarum*							type							+

[5] Type in Princeton University.

[6] Types in Córdoba, Argentina?

[7] Types in Mus. Univ. Torino, Italy?

	Vienna Museum.	Berlin Museum.	Paris Museum.	British Museum.	Santiago.	Buenos Aires.	Rio de Janeiro.	Univ. of Michigan.	Field Museum.	Acad. Nat. Sc. Phila.	U. S. National Museum.	Museum Comp. Zoölogy.	Indiana University.	Carnegie Museum.
17. *Pygidium riojanum*						type								
18. " *heterodontum*													type	
19. *Pygidium fuscum*		type												
20. " *eigenmanni*												type		
21. " *vittatum*				type										
22. " *dispar*		type										+		
23. " *punctulatum*			type									+	+	
24. *Pygidium taczanowskii*	type	+												
25. " *rivulatum*			type	+						+		+	+	
26. " *pocyanum*										type				
27. " *fassli*	type													
28. " *barbouri*												type	+	+
29. " *oroyæ*											+	type	+	+
30. " *quechuorum*	type													
31. " *laticeps*[8]	type?												+	+
32. " *stellatum*													+	type
33. " *chapmani*													+	type
34. " *tænium*[8]	type?												+	+
35. " *caliense*													+	type
36. " *latidens*													type	
37. " *metæ*													type	
38. " *stramineum*													+	type
39. " *unicolor*				type										
40. " *kneri*	type												+	
41. " *meridæ*				type									+	
42. " *bogotense*								+					+	type
43. *Pygidium nigromaculatum*				type				+					+	+
44. *Pygidium banneaui*													+	type
45. " *spilosoma*				type										+
46. " *dorsostriatum*													+	type
47. *Pygidium venulosum*	type													
48. " *latistriatum*														type
49. *Pygidium striatum*									type		+		+	+
50. " *regani*													type	
51. " *retropinne*				type										
52. " *guianense*														type
53. " *conradi*													+	type
54. " *gracilior*														type
55. " *amazonicum*	type													
56. *Pygidium hasemani*													+	type
57. " *nigricans*			type											
58. " *iheringi*													type	+
59. " *zonatum*														type
60. " *proöps*							type							+
61. " *paolence*														type
62. " *reinhardti*														type
63. " *davisi*														type

[8] Types possibly in Munich.

	Vienna Museum	Berlin Museum	Paris Museum	British Museum	Santiago	Buenos Aires	Rio de Janeiro	Univ. of Michigan	Field Museum	Acad. Nat. Sc. Phila.	U. S. National Museum	Museum Comp. Zoology	Indiana University	Carnegie Museum
64. *Pygidium immaculatum*												type		+
65. *Pygidium vermiculatum*														type
66. *Pygidium alternatum*													+	type
67. " *goeldii*				type										
68. " *brasiliense*				?			+					+		+
69. " *itatiayæ*							type							
70. " *triguttatum*														type
71. " *punctatissimum*			type											
72. *Pygidium minutum*				type										
73. " *santæ-ritæ*														type
74. *Eremophilus mutisii*			type										+	+
75. *Pareiodon microps*	type		+				+			+				
76. *Pseudostegophilus nemurus*				type								+		+
77. *Homodiætus anisitsi*													type	
78. " *maculatus*	type													+
79. *Henonemus macrops*	type													
80. " *punctatus*				type									+	+
81. " *taxistigma*										type				
82. *Henonemus intermedius*												type		
83. *Stegophilus insidiosus*[9]														+
84. *Acanthopoma annectens*[10]														
85. *Ochmacanthus batrachostoma*							type							+
86. *Ochmacanthus reinhardti*	type													+
87. *Ochmacanthus flabelliferus*													+	type
88. *Vandellia cirrhosa*			type	+			+					+		
89. " *plazai*			type				+					+		+
90. " *wieneri*			type											
91. " *hasemani*														type
92. " *sanguinca*														type
93. *Paravandellia oxyptera*							type							
94. *Branchioica bertonii*													type	+
95. *Tridens melanops*												type	+	
96. " *brevis*												type		
97. *Miuroglanis platycephalus*												type		

[9] Types in Copenhagen.

[10] Types in the collection of Professor Leuckhart.

Sources of the Material Examined.

In 1890 Mrs. Eigenmann and myself published a revision of the *Pygidiidæ* as part of the general monograph on the Nematognathi of South America (Occasional Papers California Academy of Sciences, Vol. I, 1890, pp. 316–347). Our account was based on the material in the Museum of Comparative Zoölogy, which was collected during the Nathaniel Thayer Expedition to Brazil, 1865–1866, during the U. S. Naval Astronomical Expedition to the Southern Hemisphere, across the Andes from Lima, 1849–1852, during the Hassler Expedition at Santiago, Chile, and Callao, Peru, and during Alexander Agassiz's Expedition of 1875 to Lake Titicaca. I have freely drawn on this monograph, which describes some species, which have not been duplicated.

From time to time Mr. J. D. Anisits and Sr. A de W. Bertoni have sent collections to Indiana University from Paraguay, containing, among other things, the types of *Homodiætus* and *Branchioica*. Similarly collections were sent from São Paulo by Messrs. Hermann and Rudolph von Ihering.

The collections made by the late J. B. Hatcher for Princeton University were received and reported upon by me in Vol. III of the Reports of the Princeton University Expedition to Patagonia.*

Miss Lola Vance made a small but valuable collection, containing specimens of *Pygidium oroyæ*, near Tarma, Peru.

The Yale-National Geographic Society Expedition to Peru collected a few specimens in the Urubamba Valley, which are being reported upon in the Bulletin of the Museum of Comparative Zoölogy.

I collected several species in British Guiana, which were described in the Memoirs of the Carnegie Museum, V, 1912.

Mr. Thomas Barbour collected *Pygidium barbouri* in the Beni River in Bolivia.

Several specimens, some of them new, were purchased for the collection of Indiana University from W. F. H. Rosenberg, London.

By far the greater and most valuable collections were secured in Ecuador and Colombia, and in Brazil, Uruguay, Paraguay and the Argentine.

The collections from Colombia were made by several field-parties. I collected between Bogotá and Buenaventura and at Istmina. Mr. Arthur W. Henn collected between Buenaventura and Istmina. Mr. Henn also collected in the upper valley of the Patia and southward in the Andes of Ecuador. Mr. Manuel Gonzales collected in Colombia along the routes from Bogotá west to Honda, north to Mogotes, and east to Barrigona, securing a wealth of material. Messrs. A. S. Pearse, M. A. Carriker, Jr., and Alexander Grant Ruthven collected in the Sierra

Nevada de Santa Marta for the University of Michigan, and Mr. E. B. Williamson secured specimens for me in the Sierra Nevada, and in other places in Colombia.

Mr. J. D. Haseman, who collected for the Carnegie Museum, secured many species, especially between the Rio São Francisco and Buenos Aires, as well as in the upper Paraguay basin and in the Amazon.

At one time or another I have examined all of the seventy-one species preserved in American Museums, fifty-eight species in the Indiana University Museum and the Carnegie Museum being under my immediate charge. Nine of the eighteen known genera and forty-three of the ninety-five known species were described by me during the course of my study.

I have attempted to collect what is known of the members of the family. I hope the result will help the next one who undertakes the study of the group and stimulate the collection of additional specimens and facts of the commensal or parasitic members of the family.

The Zoölogical Position of the Pygidiidæ.

Phylum **PISCES** Artedi.

Class TELEOSTOMI Bonaparte.

Superorder **OSTARIOPHYSI** Sagemehl.

Order **PLECTOSPONDYLI** Cope.

Family: Pygidiidæ Eigenmann & Eigenmann.

Subfamilies:

Nematogenyinæ Günther.
Pygidiinæ Eigenmann & Eigenmann.
Pareiodontinæ Eigenmann.
Stegophilinæ Günther.
Vandelliinæ Eigenmann.
Trident inæ Eigenmann.

Synonymy.

= *Siluroidei Trichomycteriformes* Bleeker, Nederl. Tijdschr. Dierk., I, 1863, p. 112.
> *Siluridæ Opisthopteræ* Günther, Cat. Fish. Brit. Mus., V, 1864, p. 4 and p. 271.
< *Siluridæ Branchicolæ* Günther, *l. c.*, p. 4 and p. 276.
= *Trichomycteridæ* Gill, Arrangement of Families of Fishes, 1872, p. 19.
< *Pygidiidæ* Eigenmann & Eigenmann, Am. Nat., July, 1888, p. 649; Occasional Papers California Academy Sciences, I, 1890, p. 316.
< *Pygidiidæ* Gill, Mem. Nat. Acad. Sci., VI, 1893, p. 132.

< *Trichomycteridæ* Regan, Ann. & Mag. Nat. Hist. (8), VIII, 1911, p. 57.
= *Trichomycteridæ* Ribeiro, Archivos do Museu Nacional, XVI, 1912, p. 219.

Limits of the family Pygidiidæ. (Plates XL and XLI.)

Günther, in his "Catalogue of the Fishes of the British Museum," V, 1864, pp. 271–277, arranges the then known members of the *Pygidiidæ* under three "Groups," belonging to two of his eight Subfamilies of the *Siluridæ*. His seventh Subfamily, the *Siluridæ Opisthopteræ*, consists of his Fifteenth Group, the *Nematogenyina* (*Heptapterus* and *Nematogenys*) and the Sixteenth Group, the *Trichomycterina* (*Trichomycterus* (= *Pygidium*), *Eremophilus*, *Pariodon*). His Eighth Subfamily, the *Siluridæ Branchicolæ*, consists of his Seventeenth Group, the Stegophilina (*Stegophilus* and *Vandellia*).

The genus *Heptapterus*[11] included in his Fifteenth Group, was shown by us in the *American Naturalist*, July, 1888, p. 648, to "have no real affinity with the *Pygidiidæ*."

We do not now feel justified in joining the *Cetopsinæ* to the family.

The *Pygidiidæ*, as here understood, are the *Pygidiinæ* (exclusive of *Pariolius* and the *Stegophilinæ* of the family, as described by Eigenmann & Eigenmann, in the *American Naturalist*, July, 1888, and Occasional Papers of the California Academy of Sciences, I, 1890. The species known at the time, thirty-six in number, belonging to eight genera, were reviewed in the last named paper. The *Cetopsinæ*, included in the papers mentioned, constitute a distinct family. Regan (*Ann. & Mag. Nat. Hist.* (8), VIII, 1911, p. 574) has united the *Pygidiinæ* and *Stegophilinæ* in his *Trichomycterinæ* of his *Trichomycteridæ* = *Pygidiidæ*. The family includes the South American Nematognaths without an adipose fin, with the dorsal over or behind the ventrals; posterior air-bladder obsolete; the anterior minute, in two lateral parts, enclosed in bony capsules with a complete osseous floor, united to the exoccipital and epiotic bones proximally and to the suprascapula distally; neural spine of the coalesced vertebræ very low, not as high as that of the vertebræ following them; parapophysis of the vertebræ following the capsule short; skull depressed, entirely closed in front, without an open space between the osseous roof of the mouth and the ethmoid; vomer and palatines weak, without teeth; clavicles wide, scoop-shaped, meeting below. The place of the adipose fin sometimes occupied in part by numerous accessory caudal rays; none of the fin-rays modified into spines; nares remote from each other, the anterior one frequently provided with a barbel; the maxillary ending in a short barbel; the lower lip usually ending in

[11] Related to *Heptapterus* is the genus *Phreatobius*, for an account of which see the Appendix to this paper.

another shorter barbel just beneath the maxillary barbel; this lower labial barbel is sometimes very minute and has been overlooked in describing some species of *Henonomus* and *Pseudostegophilus*, and in some species of other genera.

Mental barbels, characteristic of many Nematognaths, are lacking, except in *Nematogenys*. Thorn-like spines firmly attached to the opercle and the interopercle in all but *Nematogenys*. The opercles and interopercles to which the spines are attached are erectile, and by first erecting those on one side and then those of the other, the fishes are able to "elbow" their way forward in narrow openings, under rocks and up waterfalls. In some cases the spines are directed backward, but in *Vandellia* the opercular spines point obliquely upward and backward, the interopercular spines downward and backward.

All of the species secrete a copious mass of mucus, and the larger ones are as

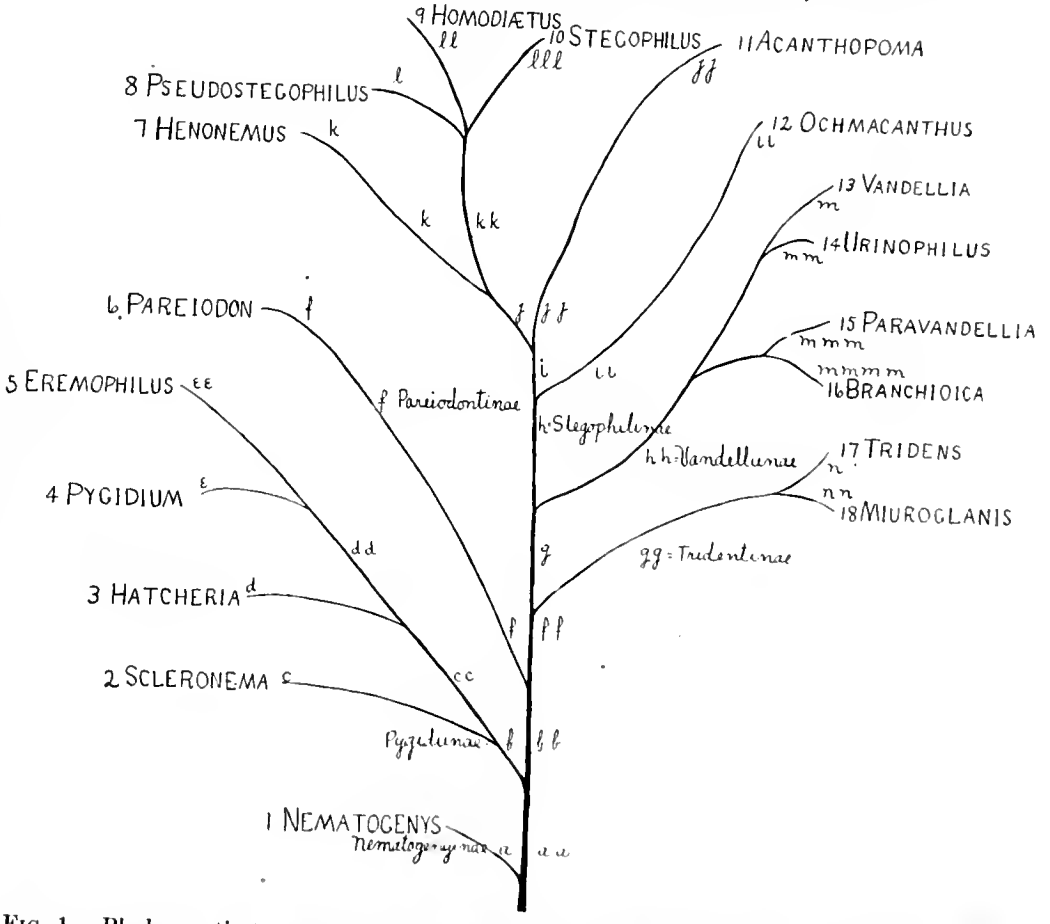


FIG. 1. Phylogenetic tree showing the relationship of the *Pygidiidæ*. The letters correspond to the letters in the key to the subfamilies and genera. The *Nematogenyinæ* are undoubtedly the most primitive of the family. The *Pygidiinæ* have the family characteristics fully developed. Beyond these we have the more highly specialized subfamilies, culminating in the parasitic *Stegophilinæ* and the urinophilous *Vandelliinæ*.

slippery as the proverbial eel, which they resemble in other respects. The pectoral gland is very large in the smaller species.

KEY TO THE SUBFAMILIES AND GENERA OF THE PYGIDIIDÆ.

a. One pair of mental barbels, no opercular or interopercular spines; one barbel at angle of mouth; a small nasal barbel; pectoral spine pungent; dorsal over ventrals. (*Nematogenyinæ.*)

I. **Nematogenys** Girard.

aa. No mental barbels; opercle and interopercle with spines; two barbels at angle of mouth; pectoral spine not pungent.

b. A nasal barbel; mandible with considerable antero-posterior extent, teeth along less than half its total length; teeth strong; anal short; no mental barbels; opercle and interopercle with spines; two barbels at angle of mouth; free-living species, some of them of economic importance. (*Pygidiinæ.*)

c. Opercle with a long dermal flap; maxillary bone longer than the attached barbel; teeth narrow incisors; pectoral without a filament; anal short...II. **Scleronema** Eigenmann.

cc. Opercle without a dermal flap; maxillary very small.

d. Dorsal long; caudal peduncle subterete; anal usually entirely under the dorsal; outer pectoral ray without a filament.....III. **Hatcheria** Eigenmann.

dd. Dorsal shorter; caudal peduncle compressed; anal partly or entirely behind the dorsal; outer ray of the pectoral prolonged or not.

e. Ventrals present.....IV. **Pygidium** Meyen.

ee. No ventral fins; otherwise like *Pygidium.* .....V. **Eremophilus** Humboldt.

bb. No nasal barbels.

f. Mouth subterminal, the teeth strong, in a single series; gill-membranes united with isthmus; anal short. (*Pareiodontinæ.*).....VI. **Pareiodon** Kner.

ff. Mouth inferior.

g. Anal short, of 7–11 rays, its origin usually behind, rarely under that of the dorsal; lower barbel at angle of mouth minute; eyes superior. Species small, some of them commensals or parasites.

h. Mouth wide, teeth very numerous, in several very regular series; rami of the lower jaw transverse, meeting, with teeth along its entire length; premaxillary large. (*Stegophilinæ.*)

i. Accessory caudal rays few, not conspicuous; caudal not fan-shaped nor excessively contracted at base; upper lip with fine, hair-like, movable teeth.

j. Gill-membrane confluent with the isthmus; gill-openings reduced to a narrow slit in front of the pectoral.

k. Opercle with two spines. VII. ..**Henonemus** Eigenmann & Ward.

kk. Opercle with four to twelve spines.

l. Caudal deeply forked, the upper lobe prolonged; eight or nine spines on the interopercle; color in bands; origin of ventrals equidistant from caudal and angle of mouth.

VIII. **Pseudostegophilus** Eigenmann & Eigenmann.

ll. Caudal emarginate or obliquely rounded, origin of ventrals nearly equidistant from snout and caudal; color, if present, in spots.....IX. **Homodiætus** Eigenmann & Ward.

lll. Caudal rounded; few accessory rays; origin of ventrals one-and-a-half to twice as far from snout as from caudal.

X. **Stegophilus** Reinhardt.

jj. Gill-membranes united, free from the isthmus.. XI. **Acanthopoma** Lütken.

ii. Accessory caudal rays very numerous, the tail like that of a tadpole; base of caudal very narrow; no hair-like teeth on the upper lip.

XII. **Ochmacanthus** Eigenmann.

hh. Mouth narrower, the rami of the lower teeth feeble, not transverse, not meeting in the middle; teeth few, slender, pointed. (*Vandelliinæ.*)

m. A few depressible teeth in a single series in the middle of the upper jaw; mandibles without teeth, or with a few excessively minute teeth on the ends of the rami; caudal rounded or emarginate

XIII. **Vandellia** Cuvier & Valenciennes.

XIV. **Urinophilus** Eigenmann.

mm. A band of depressible teeth in the middle of the upper jaw; a series of much smaller teeth laterad of the median band; no teeth on the mandible; caudal forked, the upper lobe longer..... XV. **Paravandellia** Ribeiro.

mmm. Two series of depressible teeth in the middle of the upper jaw; a single series of much smaller ones laterad of the median series and a claw-like tooth on the end of the maxillary[12] of the median series; two short series of teeth on the ends of the mandible; caudal subtruncate.

XVI. **Branchioica** Eigenmann.

gg. Anal long, with fifteen to twenty-five rays, its origin in front of that of the dorsal; eyes large, lateral; caudal rounded or emarginate. (*Tridentinæ.*)

n. Opercular and subopercular patches of spines distinct; head greatly depressed, the eyes infringing on both the upper and lower surfaces of the head; mouth inferior; a series of fine labial teeth and strong teeth in the jaws; gill-membranes united, forming a broad free fold across the isthmus; opercle long, slender, ending in a few thorns; interopercle with similar but smaller thorns.

XVII. **Tridens** Eigenmann & Eigenmann.

nn. Opercular and subopercular patches of spines confluent; head less depressed; mouth subinferior; several series of strong teeth in each jaw; gill-membrane broadly united with the isthmus, without a free margin.

XVIII. **Miuroglanis** Eigenmann & Eigenmann.

Genus I. Nematogenys[13] Girard.

Nematogenys Girard, Proc. Acad. Nat. Sci. Phila., 1854, p. 198.

Type.—Trichomycterus inermis Guichenot.

Origin of dorsal over or slightly in front of origin of ventrals, near middle of the body; nasal barbels small; a single maxillary barbel at angle of mouth; a shorter mental barbel below it; mouth wide, terminal; teeth in a broad band in each jaw; gill-membranes narrowly joined to the isthmus; first pectoral ray spinous, with

[12] Possibly the premaxillary. See under the genus.

[13] νῆμα, τό = thread, γένυς, ἡ = jaw. In allusion to the maxillary barbel.

serræ on its posterior margin; anal short; fontanel extending to the base of the occipital process, with a bridge over posterior margin of the eye; opercle and interopercle unarmed.

This genus resembles members of the *Pimelodinæ* more than the other species of the family, and is probably nearer the primitive stock of the family than the following more highly specialized genera, if it is not a member of the *Siluridæ*.

Habitat.—Chile.

1. **Nematogenys inermis** (Guichenot). (Plate XLII, figs. 1, 2.)

Native name "Bagre."

Trichomycterus inermis Guichenot, in Gay, Hist. Chil. Zoöl., II, 1848, p. 312; 1854, pl. IX, fig. 2 (Chile).

Nematogenys inermis Girard, Proc. Acad. Nat. Sci. Phila., 1854, p. 198; U. S. Nav. & Astron. Exped., 1855, p. 240, pl. XXXII (Rio Maypu near Santiago); Günther, Cat. Fish. Brit. Mus., V, 1864, p. 272; Philippi, Mb. Ak. Wiss., Berlin, 1866, p. 716; Eigenmann & Eigenmann, Proc. Cal. Acad. Nat. Sci., (2), II, 1889, p. 50 (Curico; Santiago); Occasional Papers Cal. Acad. Sci., I, 1890, p. 323 (Curico; Santiago); Proc. U. S. Nat. Mus., XIV, 1890, p. 36; Delfin, Catalogo de los Peces de Chile, 1901, p. 29 (Central Provinces of Chile); Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1909, p. 246, pl. XXXI, fig. 2; 1910, p. 398, pl. XXXII, fig. 2.

Nematogenys nigricans Philippi, Mb. Ak. Wiss., Berlin, 1866, p. 716.

Nematogenys pallidus Philippi, *l. c.*, p. 716.

Habitat.—Fresh-waters of central Chile.

Head 3.8–4.33; depth 6–7; D. 10; A. 11; P. I, 8; Br. 11–12; eye small, superior; interocular little less than snout; caudal peduncle about as deep as body; origin of dorsal one-fifth nearer snout than to base of middle caudal rays in specimens 120 mm. long, one-fifth nearer caudal than snout in specimens 260 mm. long; origin of anal much behind the last dorsal ray; fins all rounded; caudal with numerous accessory rays. Light brown, mottled with darker; a series of about five light areas along the lateral line; fins speckled.

Genus II. Sclieronema[14] Eigenmann. (Plate XXXVI.)

Scleronema Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 691.

Type.—*Scleronema operculatum* sp. nov.

Allied to *Pygidium*.

Ventrals nearer snout than to caudal; outer pectoral rays shortest, without a

[14] σκληρός = hard, νῆμα, τό = thread, in allusion to the hard base of the maxillary barbel.

filament; opercle with a long dermal flap; interopercular spines in a much more restricted area than in species of *Pygidium;* accessory rays of the caudal inconspicuous; maxillary barbel with a large osseous base (maxillary). Teeth very narrow incisors; mouth wide, terminal.

In other respects like *Pygidium.*

Habitat that of the single species.

1. **Scleronema operculatum** EIGENMANN. (Plate XLIV, fig. 1.)

Scleronema operculatum EIGENMANN, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 691.

7077, C. M., type, one, 79 mm.; 7539 a–e, C. M. paratypes, 65–80 mm. Cacequy, Uruguay basin. Feb. 1, 1909. Haseman.

Head 5.2–5.66; D. 12.5; A. 7.5 counting the rudimentary rays; P. 7; eye in anterior half of the head; interocular five times in the length of the head; width of mouth nearly half the length of the head.

Nasal barbel short, reaching just beyond posterior nares; maxillary barbel reaching about half-way to the tips of the opercular spines, the bony base much longer than the soft filament; a broad, free membrane above from near the anterior nares to the tip of the osseous base of the barbel, a narrower membrane along the outer edge of the base of the barbel; six spines in the main row of the interopercle; opercular flap reaching to or beyond base of the last pectoral ray; pectoral about as long as the head; origin of ventrals about equidistant from the snout and from the base of the middle caudal rays; ventrals reaching beyond the anus, not quite to the anal, equal to the portion of the head behind the nasal barbels; origin of anal under the posterior part of the dorsal, the distance from the base of its last ray to the caudal four times in the length; caudal narrow and long, equal to the length of the head, its margin slightly oblique, rounded; origin of dorsal over posterior half of ventrals, the distance from the first ray to the caudal 1.3 in its distance from the snout.

Middle of sides with a series of large spots, similar spots along the back.

Genus III. HATCHERIA[15] Eigenmann. (Plate XXXVI.)

Hatcheria EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1909, p. 248.

Type.—Hatcheria patagoniensis Eigenmann.

Origin of dorsal behind that of the ventral, which is near middle of the body; nasal barbels large; two barbels of nearly equal size at the angle of the mouth; no mental barbels; mouth terminal; teeth conic or narrow incisors, in a few series;

[15] In memory of J. B. Hatcher, leader of the Princeton University Expeditions to Patagonia.

gill-membrane free or very narrowly joined to the isthmus; first pectoral ray not continued as a filament; opercles and interopercles with numerous spines; dorsal

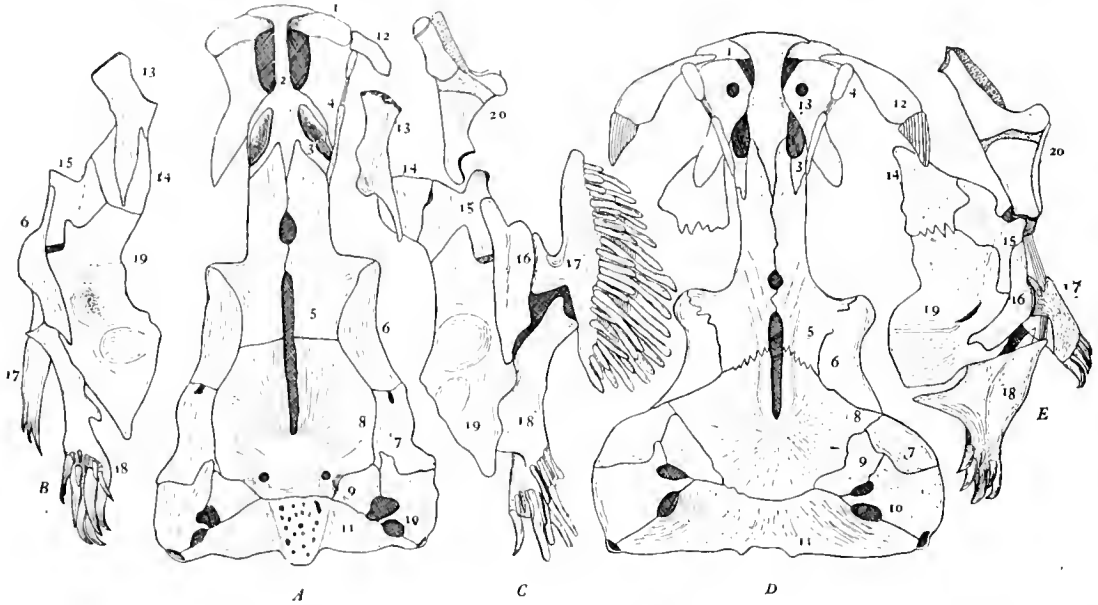


Fig. 2. *A-C. Hatcheria patagoniensis* Eigenmann. *A*. Skull from above. *B*. Opercular apparatus, etc., as seen from above when attached to the skull. *C*. The same spread out flat. *D-E. Sclerocnema operculatum* Eigenmann. *D*. Skull from above. *E*. Opercular apparatus spread out flat. 1, Premaxillary; 2, ethmoid; 3, lateral ethmoid; 4, nasal; 5, frontal; 6, sphenotic; 7, pterotic; 8, supra-occipital; 9, epiotic; 10, supraclavicle; 11, parapophysis of coalesced vertebræ; 12, maxillary; 13, palatine; 14, metapterygoid; 15, quadrate; 16, pre-opercle; 17, interopercle; 18, opercle; 19, hyomandibular; 20, mandible.

long, emarginate; caudal peduncle slender, the fin wider than the peduncle, with few accessory rays; origin and end of anal under the long dorsal, except in *H. areolata*.

Habitat.—In the mountain-streams of northern Argentina, central Chile, and southward. Replacing the species of the genus *Pygidium* east of the Andes in the south, and largely also west of the Andes. Its definite boundaries not known.

Key to the Species of Hatcheria.

a. Dorsal with fourteen to seventeen rays.

b. Origin of dorsal equidistant from tip of caudal and some part of the snout; D. 15; last ray of anal under the last ray of the dorsal or very little farther forward.

c. Distance between anal and caudal 4.5 in the length; origin of ventrals nearer the caudal than the snout; origin of anal nearer tip of caudal than head; origin of dorsal equidistant from tip of caudal and posterior nares.....1. **patagoniensis** Eigenmann.

cc. Distance between anal and caudal 3.75 in the length; origin of ventrals nearer snout than to caudal; origin of anal nearer the head than tip of caudal; origin of dorsal equidistant from tips of snout and caudal.....2. **maculata** (Cuvier & Valenciennes).

bb. Origin of dorsal equidistant from tip of caudal and occiput.

d. Last anal ray under the dorsal; D. 17.....3. **titcombi** Eigenmann.

dd. Last anal ray behind the last dorsal ray; D. 14....4. **areolata** (Cuvier & Valenciennes).

aa. Dorsal with twenty-one rays; anal entirely under the dorsal.

e. Ventrals nearer tip of caudal than snout.....5. **burmeisteri** (Berg).

ee. Ventrals nearer snout than tip of caudal.....6. **macraei** (Girard).

1. Hatcheria patagoniensis Eigenmann.

Hatcheria patagoniensis Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1909, p. 250 (Rio Blanco, at base of Andes, latitude 47° 30′, longitude 72° W.; the southernmost record of the family); *l. c.*, 1910, p. 399.

Habitat.—Eastern slope of the Andes between latitudes 47° 30′ and 31° 30′.

Mr. Haseman collected the following specimens:

7084, C. M., two, 66 and 82 mm. San Juan, Argentina. Feb. 25, 1909.

7085, C. M., six, 34–77 mm. San Juan, Argentina. Feb. 26, 1909.

11370 and 11371, I. U. M., four, paratypes, 94–120 mm. Rio Blanco; Hatcher.

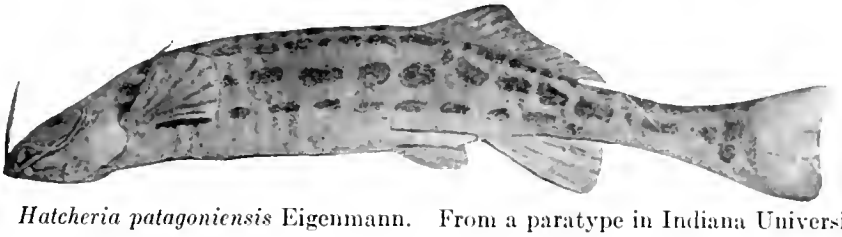


Fig. 3. *Hatcheria patagoniensis* Eigenmann. From a paratype in Indiana University.

Head 5; depth 8; D. (13) 15; A. 6. Elongate, slender; caudal peduncle slender, its depth nearly three times in the head, about four times in its length; upper maxillary barbel reaching pectoral, lower maxillary barbel reaching to margin of interopercle; a broad lobe of skin joining base of lower maxillary barbel to the lower lip; snout pointed, mouth narrow, its width 3.5 in head, equal to interorbital; nasal barbels reaching beyond eye; width of head but little less than its length; greatest width of body behind the pectorals, 1.6 in the length of the head. Gill-opening not extending forward to below eye; origin of dorsal equidistant from tip of caudal and posterior nares; base of dorsal equal to its distance from the caudal, its free surface emarginate, the anterior lobe rounded, the posterior pointed; beginning of last third of dorsal not much more than half as high as anterior lobe. Caudal moderate, emarginate, its lobes rounded, .8 of the length of the head. Anal broadly rounded, its last ray about under last ray of dorsal. Ventrals broad, their middle under origin of dorsal, 1.5 in head, equal to height of anal. Base of pectoral horizontal, closing edgewise to the body, its lower part folded when appressed, its first ray sickle-shaped, slightly prolonged. Dark yellowish, more or less regularly spotted with darker; dorsal, caudal, and pectorals irregularly blotched with black.

Some of the cotypes are more robust in body; in one the anal is blotched like the caudal; in some the spots form regular series along the sides, leaving lighter stripes between them.

2. **Hatcheria maculata** (Cuvier & Valenciennes). (Plate XLII, figs. 3–5.)

Trichomycterus maculatus Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 1846, p. 493 (San Iago); Guichenot, *in* Gay, Hist. Chile, II, 1848, p. 311 (Chile); Günther, Cat. Fishes Brit. Mus., V, 1864, p. 273; Philippi, Mb. Ak. Wiss. Berlin, 1866, p. 716 (Chile); Delfin, Catálogo, de los Peces de Chile, 1901, p. 30.

Thrichomycterus maculatus Girard, Proc. Acad. Nat. Sci. Phila., 1854, p. 199; U. S. Naval & Astron. Exped. 1855, p. 243 (Rio Mapocho).

Pygidium maculatum Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 51 (Rio Mapocho); Occasional Papers Cal. Acad. Sci., I, 1890, p. 329; Proc. U. S. Nat. Mus., XIV, 1890, p. 36.

Hatcheria maculata Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1909, p. 249, pl. XXXIII, figs. 1, 1*a* and 1*b*; 1910, p. 399.

Habitat.—Pacific slope of Chile.

Head 5.33; depth 7.5; D. 15; A. 9. Elongate, somewhat compressed; head as long as wide; caudal peduncle long and slender. Eye small, midway between tip of snout and end of opercle. Lips and lower surfaces of the head thickly covered with warts. Gill-openings not continued forward to below the eye, the membranes joined to the isthmus for a distance equal to one-third the width of the mouth. Pectorals rounded, the first ray not produced; origin of dorsal in front of the vent, but some distance behind the ventrals, equidistant from tip of snout and tip of caudal, its last ray over the last ray of the anal. Caudal long, truncate. Anal short and high, its height about equal to the length of the caudal, its distance from the base of the caudal 3.75 in the length. Origin of the ventrals equidistant from tip of snout and base of caudal, their tips reaching beyond the vent. Back and sides marbled with light and dark brown; fins pale, immaculate.

3. **Hatcheria titcombi** Eigenmann. (Plate XLIV, fig. 2.)

Hatcheria titcombi Eigenmann, Proc. Am. Philos. Soc., LVI, Jan. 1918, p. 692.

Pygidium areolatum Evermann & Kendall (*non* Cuvier & Valenciennes), Proc. U. S. Nat. Mus., XXXI, 1906, p. 86. (Rio Comajo, tributary of Lake Traful, tributary to Rio Limay.)

Habitat.—Eastern slope of the Andes in Argentina, Limay basin.

11110, I. U. M., one, 164 mm. Arroyo Comajo, J. W. Titcomb.

This specimen is one of those mentioned by Evermann and Kendall in the paper quoted above. It differs from *P. areolatum* as described by Cuvier and Valenciennes, whose specimen came from Chile, west of the Andes. The origin of the dorsal is farther back, and its last ray is beyond the last ray of the anal.

Head 6.33; depth 6.5; D. 17.5 (3 and 14.5); A. 9.5, counting the minute imbedded rays in each case; P. 9; front margin of the eye in the middle of the head; interocular a little over three times in the length of the head, eye three in the interocular. Teeth very narrow chisels; nasal barbel reaching to above first interopercular spines, maxillary barbel to middle of opercular spines. Pectoral rounded, its first ray not prolonged, nearly two-thirds the length of the head; origin of the ventrals equidistant from snout and last fifth of the middle caudal rays; first anal ray under the sixth dorsal ray, the last anal ray under the fourth from the last ray of the dorsal; distance between anal and caudal 4.75 times in the length; origin of dorsal equidistant from tip of caudal and middle of pectorals, its distance from the caudal two times in its distance from the snout.

Sides without distinct markings; faint traces of longitudinal lines.

This specimen differs from a specimen of *H. areolata* in the Harvard Museum, in which the last dorsal ray is over the fourth ray of the anal. In a specimen of *areolata* in the British Museum drawn by J. Green, the last dorsal ray is over the penultimate anal ray.

4. **Hatcheria areolata** (Cuvier & Valenciennes).

Native name "Bagre."

Trichomycterus areolatus Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 1846, p. 492 (coast of Chile); Guichenot, *in* Gay, Hist. Chile, II, 1848, p. 309; Günther, Cat. Fishes Brit. Mus., V, 1864, p. 274 (Chile); Philippi, Mb. Ak. Wiss. Berlin, 1866, p. 714; Delfin, Catálogo de los Peces de Chile, 1901, p. 30.

Pygidium areolatum Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 51 (Rio Mapocho, Chile); Occasional Papers Cal. Acad. Sci., I, 1890, p. 330; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; ? Berg, An. Mus. Nac. Buenos Aires, IV, 1895, p. 143 (Arroyo del Tala, Catamarca, Argentina).

Hatcheria areolata Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1909, p. 251, pl. XXXIV, fig. 2; 1910, p. 399.

Thrichomycterus maculatus Girard, *part;* U. S. Naval and Astron. Exped., 1855, p. 243 (Mapocho).

Habitat.—Pacific slope of Central Chile; ? Catamarca, Argentina.

It is doubftul whether the specimens mentioned by Berg, which had come from

east of the Andes, belong to H. *areolata,* the definitely known habitat of which is the western slope of Central Chile.

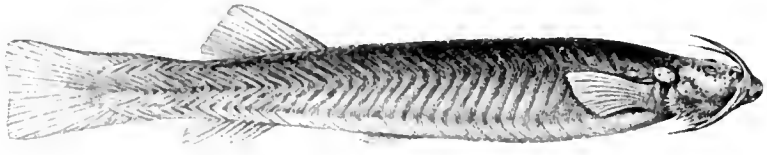


Fig. 4. *Hatcheria areolata* (C. & V.) after Eigenmann. From a specimen in the Mus. Comp. Zoöl., 103 mm. Mapocho, Chile.

Head 5.75; depth 8.5; D. 14; A. 8. Elongate, subterete. Lips and lower surfaces of the head thickly covered with small warts. Gill-openings continued forward to below the eye, the membranes free from the isthmus. Upper maxillary barbels reaching to the pectorals. Pectorals rounded, the first ray not prolonged; origin of dorsal slightly in front of the vent, equidistant from tip of caudal and occiput, its last ray over the fourth ray of the anal. Caudal very slightly emarginate. Distance of anal from the base of the caudal five times in the length. Origin of the ventrals equidistant from tip of snout and middle of caudal; tips of the ventrals not reaching the vent. Light brown, with purple longitudinal streaks.

5. **Hatcheria burmeisteri** (Berg.)

Pygidium burmeisteri Berg, An. Mus. Nac. de Buenos Aires, IV, 1895, p. 128, Lam. 2, fig. 1 (Rio Mendoza); Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Trichomycterus burmeisteri Boulenger, Ann. & Mag. Nat. Hist. (7), IX, 1902, p. 336 (Palmira, Rio Mendoza, 900 m.).

Habitat.—Province Mendoza, Argentina, elevation 900 meters.

Known from the type and the specimen recorded by Boulenger.

Reaches a length of at least 260 mm.

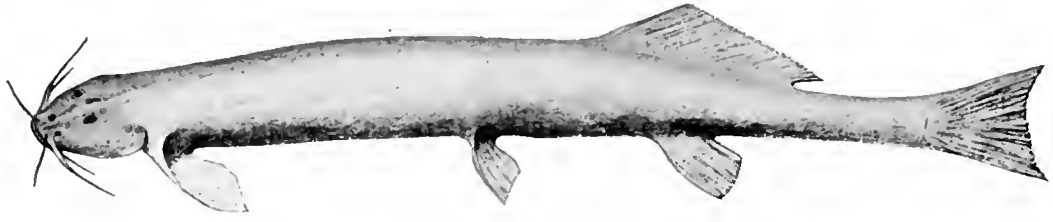


Fig. 5. *Hatcheria burmeisteri* Berg. After Berg.

Head 7.5 (9 in total); depth 9 (10); D. 21; A. 7; P.10; eye in the middle of the head; nasal barbel reaching to the eye, maxillary barbel scarcely to gill-opening; head much longer than broad, depressed; interopercular spines numerous; pectoral

ray scarcely produced, shorter than head; anal inserted under the eighth dorsal ray; caudal emarginate, the upper lobe slightly produced and pointed, the lower obtuse. Color uniform.

6. Hatcheria macræi (Girard.)

Thrichomycterus macræi GIRARD, U. S. Naval and Astron. Exped., 1855, p. 245 (Uspullata, 7,000 feet).

Pygidium macræi EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 51 (Uspullatuo*); Occasional Papers Cal. Acad. Sci., I, 1890, p. 328; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; DELFIN, Catálogo de los Peces de Chile, 1901, p. 29.

Hatcheria macræi EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1909, p. 248, plate XXXII, figs. 1, 1*a* and 1*b*; 1910, p. 399.

Habitat.—Eastern slope of the High Andes of central Chile.

7458*a–j*, C. M., 24–113 mm. San Juan, Argentina, Feb. 25, 1909, Haseman.

7549*a–f*, C. M., 37–70 mm. Rio Colorado, March 5 and 6, 1909, Haseman.

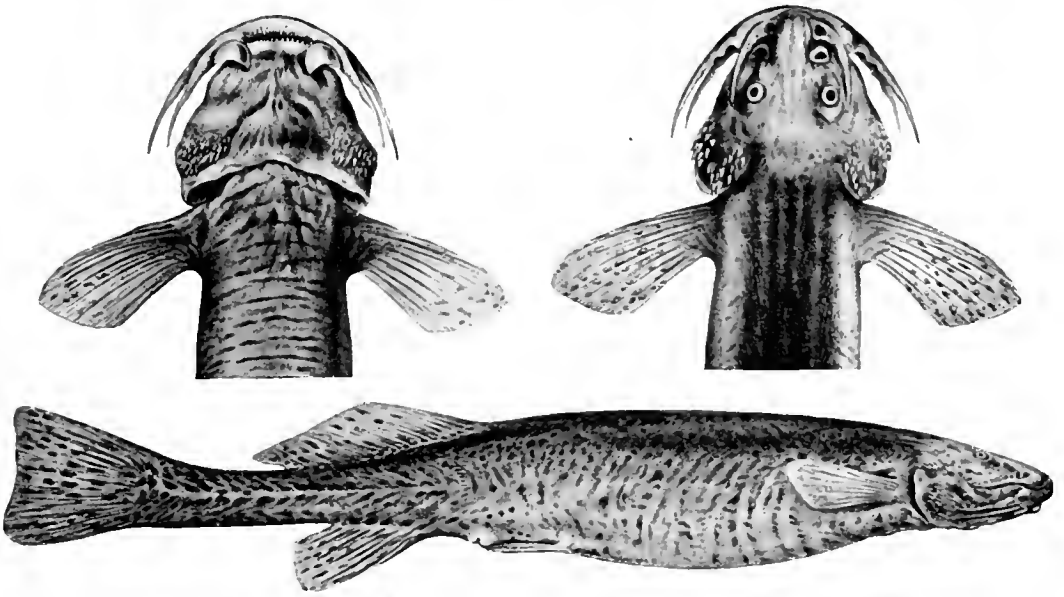


FIG. 6. *Hatcheria macraei* (Girard). After Eigenmann. From No. 8298, Mus. Comp. Zoöl., Uspullata, Chile.

Head 6.5; depth 7; D. 21 or 22, rarely 20 or 23; A. 10. Elongate, rather compressed, especially backward. Head nearly or quite as broad as long, snout rounded; eye small, midway between tip of snout and end of opercle; none of the barbels reaching the gill-opening. Gill-opening scarcely continued forward, joined to the isthmus for a distance equal to half the width of the mouth. Pectorals obliquely truncate, the first ray not produced in the type, or slightly produced in the speci-

* ? A misprint for *Uspullata*? "Uspullatuo" is not found in gazetteers or on maps. *Editor.*

mens collected by Haseman; origin of dorsal some distance behind ventrals, equidistant from occiput and tip of caudal in the type or from some portion of the snout and tip of caudal in the specimens collected by Haseman; fourth or fifth dorsal ray highest, then gradually decreasing in height to the last. Caudal emarginate, the upper lobe pointed, the lower rounded; anal inserted about under the ninth dorsal ray and terminating under about the seventeenth; ventrals inserted nearer tip of snout than to tips of middle caudal rays, reaching to the vent or slightly beyond.

Sides and back in the San Juan specimens profusely spotted, much less so in the specimens from the Rio Colorado.

Genus IV. Pygidium[16] Meyen.

Trichomycterus Valenciennes, in Humboldt, Rec. d'Obs. Zoöl. et Anat., II, 1833, p. 348 (*nigricans*); not *Thrichomycterus* Cuvier and Valenciennes, *in* Humboldt, of which it is a misspelling. Günther, Cat. Fishes Brit. Mus., V, 1864, p. 272.

Thrychomycterus Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 1846, p. 485 (misspelled).

Thrichomycterus non Cuvier & Valenciennes, Girard, Proc. Acad. Nat. Sci. Phila., VII, 1854, p. 198; Girard, U. S. Nav. Astron. Exped., II, 1855, p. 242 (misquoted).

Pygidium Meyen,[17] Reise, I, 1835, p. 474 (*fuscum*).

Type.—*Pygidium fuscum* Meyen.

Skin naked; head depressed, nearly or quite as broad as long, its length five or six times in the length from snout to caudal; body terete, the caudal peduncle compressed, deep; a nasal barbel as long as the head or shorter, on the posterior edge of the anterior nares; two barbels at the angle of the mouth, the upper, connected with the rudimentary maxillary, may reach to the tip of the

[16] πυγίδιον, τό = a thin rump = the tail much compressed.

[17] In "Archiv für Naturgeschichte von Dr. Ar. Fr. Aug. Wiegmann, Zweiter Band, Berlin, 1835 (Part. II), p. 269," the original description with addenda appears as follows:

"Eine neue Gattung der Siluriden, *Pygidium*, hat Meyen (Reise, I, p. 475), nach einem todten Fische aufgestellt, den er in einem kleinen Bache Peru's antraf.

"Char. gen. Corpus elongatum, caudam versus compressum. Cirri maxillares 4, nasales nulli. Pinnæ pectorales ut pinnæ abdominales duæ cum pinna anali circa anum positæ. Pinna adiposa parva. (Die einzige Art *P. fuscum* ist 5—6″ lang). Die Gattung bedarf einer genaueren Charakteristik; die gegebene ist dahin zu berichtigen, dass *cirri nasales* vorhanden sind, und die Rückenflosse Strahlen hat, also keine Fettflosse ist. Die Gattung steht demnach nicht *Malapterus*, sondern *Silurus* nahe, unterscheidet sich von diesem durch Zahnlosigkeit des Vomér, durch ein *operculum aculeato-serratum*, und durch die weit hinten stehende Rückenflosse. Das Exemplar ist im Berliner Museum."

pectoral, but is usually shorter; no mental barbels; eye small, in the middle of the head, or just in front of the middle, without a free orbital rim; interopercle with numerous spines in several series, those of the outer series largest (in the very young in a bunch as long as the opercular bunch, in the older in a much larger patch); opercle with a bunch of similar spines; gill-membranes narrowly united with the isthmus and usually with a narrow, free margin across it; mouth of moderate width, terminal, the jaws with two or more series of chisel-shaped or conic teeth; no teeth on lips or on the vomer; fins without spines, the pectoral short, the outer, simple ray usually prolonged into a filament extending distinctly beyond the rays; ventrals small, placed in the middle or considerably behind the middle of the body; anal short, usually in part below, more rarely behind, the dorsal; caudal short, broadly rounded, truncate or slightly emarginate, accessory rays variable, sometimes very conspicuous, sometimes much less so; origin of the dorsal between the vertical from the origin of the ventrals and anal, always nearer the base of the caudal than to the snout; the fin is low, rounded, short, with a variable number of rays up to twelve. Cuvier & Valenciennes state that the first ray of the dorsal of *P. nigricans* is prolonged in a filament. Is this a *lapsus digiti* for first ray of the pectoral? The dorsal and anal have from two to four minute accessory rays entirely hidden in the thick skin in front of the evident portion of these fins.

The color may be uniform, or there may be one or three longitudinal stripes or rows of spots, or large spots less regularly arranged, or numerous small spots which may be discrete, or which may coalesce into vermiculations. There are no distinct cross-bars. If the markings are longitudinally arranged, a series of spots may be replaced by a stripe or *vice versa* in different individuals of the same species.

Some of the species are of very small size, the maximum recorded size is 350 and 390 mm. in *P. rivulatum* and *P. taczanowskii* from Peru.

The eggs reach 2.5 mm. in diameter.

The species differ from each other largely in the shape of the teeth, the length of the barbels, the relative position of the dorsal, anal, and ventrals, and in the color.

Distribution.—The members of the genus *Pygidium* belong particularly to the mountains, where they live in all waters from small rills to large lakes like Titicaca. They are frequently found under rocks or buried in the muddy banks of streams. They extend from Panama southward to Chile and Patagonia, where they are replaced by the members of the allied genus *Hatcheria*. In favorable places they descend to the sea, as at Jequetepec and Callao, and they are among the last or are the very last to disappear in ascending the mountains, where they are associated

with a few other mountain forms like *Grundulus* at Bogotá, *Astroblepus* and *Bryconamericus* in the High Andes from Panama to Cuzco, and *Orestcas* in Lake Titicaca. The only fish found by Haseman in the headwaters of the Rio das Velhas was a member of this genus. Species of *Pygidium* were found in the most elevated places visited by Henn in Colombia and Ecuador. In Titicaca they are of considerable economic importance, and on the plains of Bogotá, the nearly related genus *Eremophilus* is of prime economic importance. They are found in Guiana and in the Amazon, but only as dwarfs. They also flourish in the mountain-streams of southeastern Brazil, but the species do not reach the size of those in Peru. Some of the species are found on both slopes of the Andes, but, unlike lowland species of other fishes, which if found on both sides of the Andes, usually have a very wide distribution, the species of the genus *Pygidium* all have rather limited ranges. Many of them are restricted to a single small river and no river has many species. In 1910 I said (Patagonia Report, p. 248), "There is no place on record harboring more than one species of this genus." This statement requires modification. While, so far as known, many basins contain but a single species, a number of other smaller rivers, the Iguapé for instance, contain several. Judging by its wide distribution, both horizontally and vertically, the genus is probably one of very long standing.

The species of the genus need a careful revision, but the descriptions usually omit mention of the character of the teeth, and no collection contains any great percentage of the total number of species described. Furthermore, judging from the fact that they are abundant in all the high mountain-rills and even in lowland rapids, and that from the stretch from Caracas along the eastern slope of the Andes to Peru we have only the types of the species *P. meridæ, kneri, metæ,* and *dorsostriatum,* the revision of the entire genus may be left in abeyance. The species are grouped according to the areas from which they have been reported.

CHILEAN SPECIES

The species from Chile where the members of the genus *Hatcheria* have in part replaced them, are *P. marmoratum* (Philippi), *P. palleum* (Philippi), and *P. tigrinum* (Philippi).[18]

1. **Pygidium marmoratum** (Philippi).

Trichomycterus marmoratus Philippi, Mb. Ak. Wiss. Berlin, 1866, p. 714; Eigenmann & Eigenmann, Occasional Papers Cal. Acad. Sci., I, 1890, p. 326; Delfin, Catálogo de los Peces de Chile, 1901, p. 31.

[18] In addition to the three species described by Philippi, *Pygidium nigricans* (Cuvier & Valenciennes) is recorded from Chile by Gay. This is probably an error.

Pygidium marmoratum EIGENMANN & EIGENMANN, Proc. U. S. Nat. Mus., XIV, 1891, p. 36; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Chile.

Blackish gray, marbled with many black spots, as in *punctatum;* fins dark. Depth 10.82; D. 10; A. 6.

2. **Pygidium palleum** (Philippi.)

Trichomycterus palleus PHILIPPI, Mb. Ak. Wiss. Berlin, 1866, p. 715; EIGENMANN & EIGENMANN, Occasional Papers Cal. Acad. Sci., I, 1891, p. 325; DELFIN, Catálogo de los Peces de Chile, 1901, p. 30.

Pygidium palleum EIGENMANN & EIGENMANN, Proc. U. S. Nat. Mus., XIV, 1891, p. 36; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Chile.

Light reddish; fins colorless; head 6.5 in total; D. 9–10; A. 6.

3. **Pygidium tigrinum** (Philippi).

Trichomycterus tigrinum PHILIPPI, Mb. Ak. Wiss. Berlin, 1866, p. 714; EIGENMANN & EIGENMANN, Occasional Papers Cal. Acad. Sci., I, 1890, p. 326; DELFIN, Catálogo de los Peces de Chile, 1901, p. 31.

Pygidium tigrinum EIGENMANN & EIGENMANN, Proc. U. S. Nat. Mus., XIV, 1891, p. 36; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Chile.

Light with reddish points; fins immaculate; head 6.5; depth 6.5 in total length; D. 9 or 10; A. 6.

Members of the genus *Pygidium* have been recorded from the mountains of Argentina, north of the latitude of Buenos Aires. South of this latitude species of *Hatcheria* take their place.

KEY TO THE SPECIES OF PYGIDIUM FROM ARGENTINA AND THE PARAGUAY BASIN

a. Teeth pointed (not examined in *tenue*).

b. Plain yellowish, eyes and barbels black; head triangular; operele and pre-opercle well armed; body much compressed; D. 6; A. 5.....4. **tenue** (Weyenbergh).

bb. Back spotted, sides with a band.

c. Pectoral ray prolonged; head as wide as long, 4.66–5 in the length; eye very small, a little in advance of middle of head, its diameter three in the interorbital; maxillary barbel reaching pectoral; depth of caudal peduncle half its length; origin of dorsal behind the ventrals, its distance from the caudal two and one-half in its distance from the snout; origin of

ventrals equidistant from snout and tip of caudal, or a little nearer the latter; caudal truncate, or slightly emarginate; olive above, more or less distinctly spotted with brown; a blackish band from opercle to the caudal; D. 8 or 9; A. 6....5. **corduvense** (Weyenbergh).

cc. Pectoral ray not prolonged; body and head tuberculate; head 6.5–7.5 in the length (with the caudal); eye a little in advance of the middle of the head; maxillary barbel broad and short; teeth minute, in many series; 6–8 spines in the main row of the interopercle; fins small; posterior part of dorsal over anal; caudal subtruncate or rounded; D. 3 + 8; A. 3 + 6.

6. **spegazzinii** Berg.

bbb. Back with spots; no lateral band; maxillary barbel reaching origin of the pectoral or farther; distance between origin of dorsal and caudal 2.5–3 in the distance between dorsal and snout; origin of ventrals equidistant from snout and tip of caudal.

d. Pectoral ray not prolonged; head 5.33–5.5; eye in middle of the head, 3 in interorbital; origin of anal under end of dorsal; caudal truncate; D. 10; A. 7. Spots of back large, round.

7. **borellii** (Boulenger).

dd. Pectoral ray much prolonged; head six times in the length; eye entirely in anterior half of the head; origin of anal nearly under origin of dorsal; caudal rounded; back, sides, dorsal and caudal densely spotted.....8. **eichorniarum** Ribeiro.

aa. Teeth in part, at least, incisors; head as long as broad; barbels short; first pectoral ray prolonged.

e. Head 8.5 in the length with caudal; eye in anterior half of head, 1.5 in the interorbital; dorsal obliquely truncate, its posterior third over the anal; caudal truncate; D. 2 + 9; A. 1 + 6; faint spots.....9. **riojanum** Berg.

ee. Head six times in the length without the caudal; eye in middle of the head; thirteen spines in the main row of the interopercle; caudal emarginate; D. 4 + 6.5; A. 2 + 5.5; nasal barbel extending to posterior margin of the eye.....10. **heterodontum** Eigenmann.

4. Pygidium tenue[19] (Weyenbergh). (See fig. 7, p. 293.)

Trichomycterus tenuis Weyenbergh, Act. Acad. Nac. Ciene. Exact., Córdoba, III, 1877, p. 12, pl. III (Sierra de Córdoba, near Cruz del Eje); Eigenmann & Eigenmann, Occasional Papers Cal. Acad. Sci., I, 1890, p. 326.

Pygidium tenue Eigenmann & Eigenmann, Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Rio Primero, Córdoba.

Yellow, eyes and barbels black; head triangular; opercle and pre-opercle well armed. Body much compressed; D. 6; A. 5.

5. Pygidium corduvense (Weyenbergh).

Trichomycterus corduvensis Weyenbergh, Act. Acad. Nac. Ciene. Exact. Córdoba, III, 1877, p. 11, pl. III (Rio Primero); Eigenmann & Eigenmann, Occasional

[19] Berg (An. Mus. Nac. Buenos Aires, IV 1895, p. 144) makes this a synonym of *Hatcheria areolata*. Boulenger (Boll. Mus. Zoöl. Anat. Comp. Univ. Torino, XII, 1897), contends that Weyenbergh is right in placing it near *P. dispar*.

Papers Cal. Acad. Sci., I, 1890, p. 326; BOULENGER, Boll. Mus. Zoöl. Anat. Comp. Univ. Torino, XII, 1897 (Caiza).

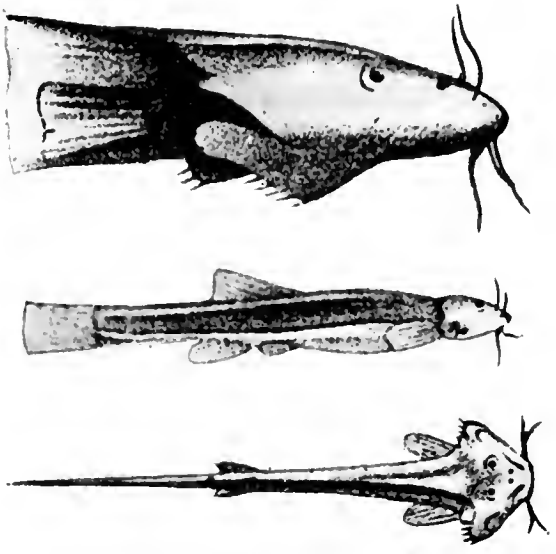


FIG. 7. *Pygidium tenue* (Weyenbergh). After Weyenbergh.

Pygidium corduvense EIGENMANN & EIGENMANN, Proc. U. S. Nat. Mus., XIV, 1891, p. 36; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

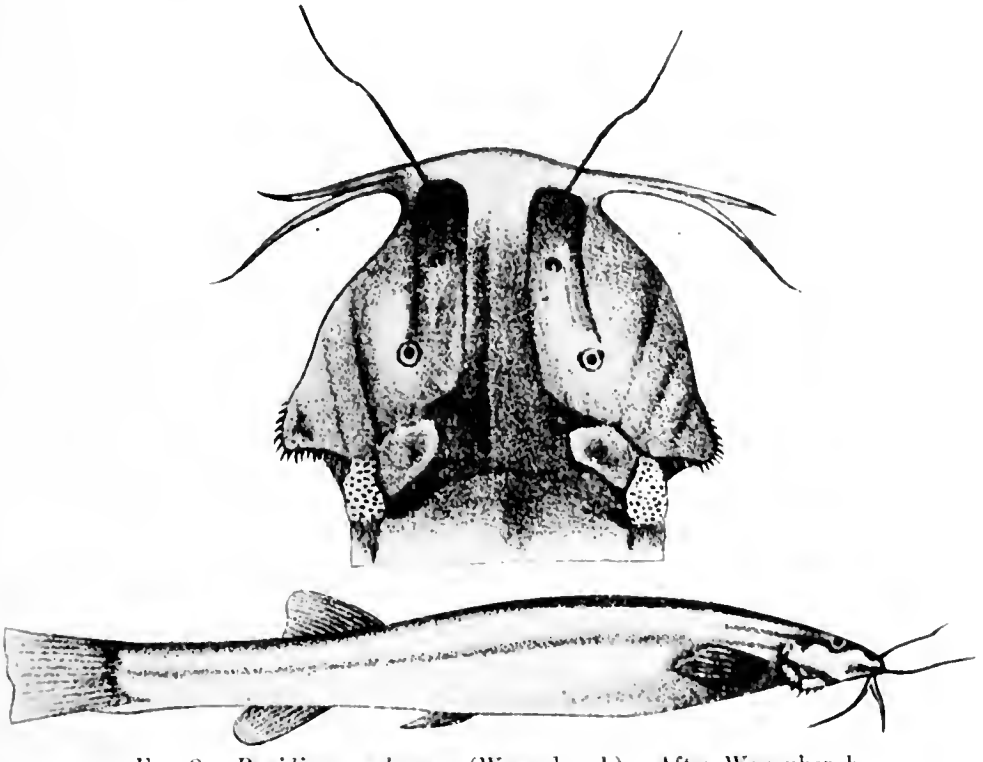


FIG. 8. *Pygidium corduvense* (Weyenbergh). After Weyenbergh.

Habitat.—Sierra de Córdoba, near Cruz del Eje, Argentina; Caiza, Bolivian Chaco.

The following is from Boulenger's description of specimens up to 62 mm. long:

"Head 4.66–5; D. 8–9; A. 6; eye three times in interorbital, a little nearer snout than to opercle; maxillary barbel reaching pectoral; caudal peduncle twice as long as high; distance between origin of dorsal and caudal two and one-half times in the distance between dorsal and snout; outer pectoral ray prolonged; origin of ventrals equidistant from snout and tip of caudal, or a little nearer the latter; caudal truncate, or slightly emarginate. A dark lateral band."

6. **Pygidium spegazzinii** Berg.

Pygidium spegazzinii Berg, An. Mus. Nac. Buenos Aires, V, 1897, p. 267; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Rio de Cachi, Province de Salta, northern Argentina, 2,500–2,800 m.

Known only from the types, 29 specimens, the largest of which is 95 mm., in the National Museum of Buenos Aires.

Head 6.5–7.5 in the length with the caudal; D. 11 (3 + 8); A. 9 (3 + 6); eye much nearer snout than to edge of opercle; nasal barbel extending beyond the eye, maxillary barbel short and broad; gill-membrane without free margin at the middle; teeth in many series; interopercular spines few, in three or four rows, the sixth to eighth in the lower row moderate in size; opercular spines also few and minute; body verrucose; pectoral obliquely rounded, its first ray not prolonged; anal inserted under posterior part of dorsal; caudal subtruncate or rounded.

7. **Pygidium borellii** (Boulenger).

Trichomycterus borellii Boulenger, Boll. Mus. Zoöl. Anat. Comp. Univ. Torino, XII, 1897 (Mission d'Aguairenda; Tala; Lesser); Ann. & Mag. Nat. Hist. (7), IX, 1902, p. 336 (Palmira, Rio Mendoza).

Pygidium borellii Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Pygidium schmidti Berg, An. Mus. Nac. Buenos Aires, V, 1897, p. 266 (Rio de Belen, Prov. Catamarca, Argentina); Eigenmann, *l. c.*, p. 399.

Habitat.—Mission d'Aguairenda, Bolivian Chaco; Tala and Lesser, Province Salta, northern Argentina; Rio de Belen, Province Catamarca, northern Argentina; Palmira.

Reaching a recorded length of 110 mm.

Head 5.35–5.5; D. 10; A. 7; eye very small, in middle of the head, three times in the interorbital; body compressed, caudal peduncle one and one-half times as

long as high; maxillary barbel reaching pectoral; origin of anal under end of dorsal; distance of origin of dorsal from caudal two and one-half to three in its distance from the snout; pectoral ray not prolonged; origin of ventrals equidistant from tips of snout and caudal; caudal truncate; sides and back with large dark spots.

8. **Pygidium eichorniarum** (Ribeiro). (Plate XLIV, fig. 3).

Trichomycterus eichorniarum Ribeiro, Comm. Linhas Telegraphicas Estrategicas Matto-Grosso ao Amazonas, Annexo, 5, 1912, p. 27 (Caceres).

Habitat.—Upper Paraguay.

Evidently allied to *P. riojanum*, *proöps*, and *meta*.

Known from the types, two specimens, the larger 44 mm., and

7556*a–c*, C. M., 24–30 mm. Caceres, May 27, 1909. Haseman.

7557*a* & *b*, C. M., 33–43 mm. Caceres, May 23, 1909. Haseman.

7558*a*, C. M., 42 mm. San Francisco, Rio Jaurú, Paraguay basin, June 10, 1909. Haseman.

7559*a*, C. M., 32 mm. Bastos, Rio Alegre, eight miles south of Villa de Matto-Grosso, June 26, 1909. Haseman.

7560*a–c*, C. M., 39–41 mm. San Antonio, Rio Guaporé, plantation of Maciél, July 31–Aug. 11, 1909. Haseman.

Head 5–5.75; D. 9–10; A. 8; P. 6; posterior margin of eye slightly in advance of the middle of the head; eye about 1.5–2 in the snout, 5.5–6.5 in the head, about equal to the interorbital; maxillary barbel reaching to axil or middle of pectoral; nasal barbel to the tip of the opercular spines or the axil of the pectoral; teeth conical, a very narrow band of but two or three irregular series; origin of ventrals equidistant from tip of snout and tip of caudal; origin of anal under, or but slightly behind, the first dorsal ray; distance from base of last anal ray to base of caudal about six times in the length; distance from origin of dorsal to base of caudal two and three-quarters in its distance from the snout; caudal rounded, accessory rays moderate; first pectoral ray much prolonged, with its filament nearly equal to the length of the head.

General color of *P. brasiliense*, back and sides profusely spotted; caudal rays with numerous spots, dorsal and anal less profusely spotted.

9. **Pygidium riojanum** Berg.

Pygidium riojanum Berg, Ann. Mus. Nac. Buenos Aires, V, 1897, p. 269; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Arroyo in the Cordillera de la Rioja, northern Argentina.

Known from the type, a specimen 85 mm. long, in the National Museum at Buenos Aires.

Head 8.5 in the length with the caudal; D. 9 (2 + 7); A. 7 (1 + 6); eye 1.5 in the snout, 1.5 in interorbital, 2.5 in posterior part of the head; nasal barbel scarcely extending beyond the eye; maxillary barbel scarcely to end of opercle; gill-membrane with scarcely a free margin; interopercular spines in two or three series, medium in size; teeth small, in irregular series, anterior ones larger, their tips broader; fins small; first pectoral ray prolonged; anal under last third of dorsal; caudal truncate.

10. **Pygidium heterodontum** Eigenmann. (Plate XLIV, fig. 4.)

Pygidium heterodontum Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 692.

13832, I. U. M., 83 mm., ♀, Rio Mendoza, Palmira, Argentina, 900 m. Purchased from Rosenberg.

Palmira is probably the southernmost locality on the eastern slope of the Andes from which species of this genus have been taken.

Head six times in length, as long as broad; D. 10.5 (4 + 6.5); A. 7.5 (2 + 5.5); P. 9; eye in middle of the head, interocular 3.5 in the head; teeth in three series in each jaw, those of the outer row narrow incisors, of the second row much smaller incisors and of the third row conic. Head much depressed, interopercular spines numerous, thirteen in the last row.

Nasal barbel extending to the posterior margin of the eye, maxillary barbel to the base of the opercular spines; first pectoral ray scarcely produced, equal to the portion of the head behind the posterior nares; origin of ventrals midway between opercle and caudal, reaching to the vent; origin of anal under posterior part of the dorsal, the distance between its last ray and the base of the middle caudal ray 4.4 in the length; depth of the caudal peduncle 2.5 in its length; caudal narrow, emarginate, a little more than five in the length; origin of dorsal midway between the tip of the caudal and the occiput, over the tip of the ventrals, its distance from the caudal 1.75 in its distance from the snout.

A faint lateral band and obscure spots or marblings.

The members of the genus *Pygidium* reach their largest size and greatest economic importance in Peru. The Carnegie Museum has no specimens from this region, except *P. oroyæ* Eigenmann & Eigenmann. To the key below should be added *P. fuscum* Meyen, the type of the genus.

Key to the Species of Pygidium from Peru and Western Bolivia.

a. Pectoral ray prolonged.

b. Dorsal entirely in front of the anal.

c. Caudal truncate or rounded.

d. Uniform brown, darkest on the back; head flat above; width of head less than its length; barbels scarcely extending beyond the eyes, which are in the middle of the head; a broad band of villiform teeth in each jaw; first pectoral ray but slightly prolonged; origin of dorsal equidistant from tip of caudal and nares, over posterior edge of base of ventrals; last ray of the dorsal over the origin of the anal; caudal rounded, distance between anal and caudal 4.5 in the length; ventrals nearer tip of snout than to tip of caudal; head 5; depth 5.66; D. 10; A. 9.....12. **eigenmanni** (Boulenger).

dd. Head and body with dark spots; a dark lateral stripe; head as broad as long; barbels equal to eight-tenths the length of the head; snout slightly shorter than the postorbital part of the head; outer pectoral ray as long as the head, longest branched ray three-quarters as long; origin of dorsal in advance of the vent, its distance from the base of the caudal one and one-half times in its distance from the snout; origin of anal slightly behind the last dorsal ray; caudal truncate; distance between anal and caudal 4.5 in the length; head 6.25; D. with six, A. with four branched rays.

13. **vittatum** (Regan).

cc. Caudal emarginate.

e. Back and sides profusely spotted; head longer than broad; barbels not quite reaching gill-openings; origin of ventrals equidistant between tip of snout and tip of caudal; head 5.2–5.66; D. 12; A. 9 or 10.

f. Sides, back, dorsal, and caudal with large spots; spots as large as, or larger than, the eye, smallest on the head; origin of dorsal equidistant from tip of caudal and anterior margin of eye; distance between anal and caudal five or six times in the length.....14. **dispar** Tschudi.

ff. Spots much smaller than the eye; origin of dorsal equidistant from tip of caudal and a point between occiput and anterior margin of the eye; distance between anal and caudal 6–6.5 in the length.....15. **punctulatum** (Cuvier & Valenciennes).

ee. Back and sides unspotted; maxillary barbel reaching past origin of pectoral; origin of dorsal varying with age; origin of ventrals a little nearer snout than to tip of caudal; distance between anal and caudal five times in the length; head 4.66–5.5; eye minute, in adult a little behind the middle of the head; teeth conic.[20]

16. **taczanowskii** (Steindachner).

bb. Dorsal in part over the anal.

g. Accessory caudal rays conspicuous; caudal rounded; outer row of teeth narrow incisors; maxillary barbel reaching edge of pre-opercle; origin of dorsal equidistant from tip of caudal and a point between occiput and posterior nares; distance between caudal and anal 4.4–4.5 in the length; head 4.5–5.5; D. 13; A. 11.

17. **rivulatum** (Cuvier & Valenciennes).

gg. As under *g*, but "differing in its large, dark blotches."....18. **poeyanum** (Cope).

ggg. Accessory caudal rays not evident; caudal emarginate; teeth conic; head 4.66; depth 7; D. 8; A. 6; eye in middle of the head; head longer than wide; nasal barbels reaching posterior margin of the eye; maxillary barbel to the gill-opening; distance between dorsal and caudal about 2 in its distance from the snout; distance between anal and caudal 5.5.

19. **barbouri** Eigenmann.

gggg. Accessory caudal rays not conspicuous, the caudal truncate; teeth conic; head 4.85; depth

[20] The male of *dispar* as figured by Tschudi agrees with this.

6; D. 9; A. 7; eye in middle of the head; head a little longer than wide; nasal barbels reaching lateral end of head, maxillary barbel a little beyond origin of pectoral.

20. **fassli** Steindachner.

aa. Pectoral ray not prolonged; end of dorsal about over the middle of the anal; caudal rounded; head as long as wide; sides and back with irregular spots.

h. Eye moderate; origin of the dorsal over or in front of the vent, equidistant from eye and tip of caudal or nearer the latter; head 5.75–6; D. 12; A. 10.....21. **oroyæ** Eigenmann.

hh. Eyes very minute; origin of the dorsal in front of the vent, nearer the eye than the tip of the caudal; head 5; D. 8; A. 6 or 7 not counting the hidden rays; a dark lateral line.

22. **quechuorum** Steindachner.

11. Pygidium fuscum Meyen.

Pygidium fuscum Meyen, Reise, I, 1835, p. 475; Wiegmann's Arch., 1835, II, p. 269; Eigenmann & Eigenmann, Occasional Papers Cal. Acad. Sci., I, 1890, p. 325; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Peru.

Very little is known about this species. It was imperfectly described by Meyen. Fortunately the type which was found dead in some stream in Peru, is in the Berlin Museum (*fide* Tschudi, Fauna Peruana, Ichthyologie, 1845, p. 21). Tschudi tells us that *fuscum* is specifically distinct from his own species *dispar*. This and the original description is all we know about the species.

12. Pygidium eigenmanni (Boulenger).

Pygidium knerii Eigenmann & Eigenmann (*non* Steindachner), Occasional Papers Cal. Acad. Sci., I, 1890, p. 335 (Cumbaca).

Trichomycterus eigenmanni Boulenger, Boll. Mus. Zoöl. Anat. Comp. Univ. Torino, XIII, Dec. 2, 1898, substituted for *P. knerii* Eigenmann & Eigenmann, *non* Steindachner.

Pygidium eigenmanni Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Cumbaca. Location on map not known.

Boulenger based his *eigenmanni* on the description of *P. knerii* Eigenmann & Eigenmann, which, according to Boulenger, was based on a specimen distinct from *knerii*. The species is known from the description of a specimen 110 mm. long from Cumbaca, collected by the Thayer Expedition and now at Cambridge, Mass.

Head 5; depth 5.66; D. 10; A. 9. Elongate, compressed; head greatly depressed, flat above, the eyes entirely superior; width of the head less than its length. Barbels scarcely extending beyond the eyes, which are equidistant from tip of snout and end of opercle. A broad band of villiform teeth in each jaw. Pectoral rounded,

the first ray slightly prolonged. Origin of dorsal above posterior edge of base of ventrals, equidistant from tip of caudal and nares, the last ray over origin of anal. Caudal rounded, its distance from the anal 4.5 in the length. Ventrals nearer tip of snout than tip of caudal. Uniform brown, darkest on the back.

13. **Pygidium vittatum** (Regan).

Trichomycterus vittatus REGAN, Ann. & Mag. Nat. Hist. (7), XII, 1903, p. 623 (Collected by Oekenden).

Pygidium vittatum EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Marcapata Valley, eastern Peru.

Known from the types, 78 mm. long, in the British Museum.

Head 6.25; D. 6 (branched); A. 4 (branched); head as broad as long; diameter of eye 2.33 times in the interocular width, which is 3.5 in the length of the head. Snout slightly shorter than the postorbital part of head. Barbels equal to eight-tenths the length of head. Dorsal originating in advance of the anal opening, the the distance from its point of origin to the caudal one and one-half times in the distance from the former to the tip of the snout. Anal originating slightly behind the vertical from the last dorsal ray, the distance from the base of its last ray to the caudal four and one-half times in the total length. Longest branched ray of pectoral three-fourths the length of the simple outer ray, which is as long as the head. Ventrals extending six-tenths of the distance from their base to the origin of the anal. Caudal truncate. Head and body with dark spots; a dark longitudinal stripe along the middle of the side.

14. **Pygidium dispar** Tschudi. (Plate XLV, fig. 5.)

Pygidium dispar TSCHUDI (*partim*), Faun. Peruana, Ichthyol., 1845, p. 22, pl. 3, upper figure. (Eastern slope of the Peruvian Andes at an altitude of 14,000 ft.); EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 52 (Callao); Occasional Papers Cal. Acad. Sci., I, 1890, p. 335 (Callao); Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Pellegrin, Bull. Soc. Zoöl., Paris, XXIX, 1904, p. 91; STARKS, Proc. U. S. Nat. Mus., XXX, 1906, p. 770 (Eteri, Peru); Poissons des Lacs des Haut Plateaux de l'Amer. Sud, 1907, p. 17 (Lake Titicaca); EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—High Andes of eastern and western Peru, down to Callao and Eteri.

The *P. dispar* recorded by Ribeiro from the Rio Iporanga of southeastern Brazil is a different species. Tschudi says the species is abundant in the highland

between the two chains of the Cordilleras, but on the eastern slope only. It is quite possible that Tschudi had two species and that the unspotted male he figured is the *taczanowskii* of Steindachner. The specimens recorded by Pellegrin are probably *P. rivulatum*.

Head 5.2; D. 12; A. 9. Elongate, compressed, the depth everywhere less than the length of the head. Head longer than wide by more than a diameter of the eye. Eye moderate, four times in the interocular, equidistant from tip of snout and end of opercle. None of the barbels reaching quite to the gill-opening. Gill-openings continued forward to below the eye. Pectorals obliquely rounded, the first ray produced in a filament. Origin of dorsal equidistant from tip of caudal and anterior margin of the eye, the whole fin in front of the anal and behind the ventral fins. Caudal emarginate. Distance of anal from base of caudal six times in the length. Origin of ventrals midway between tip of snout and tip of caudal.

Reddish brown; sides, back, dorsal and caudal fins with large dark spots, those on the head smallest; lower surface plain.

15. **Pygidium punctulatum** (Cuvier & Valenciennes). (Plate XLV, fig. 4.)

Trichomycterus punctulatus Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 1846, p. 488 (Lima); Lütken, Velhas Flodens Fiske, 1875, p. 137 (Callao).

Pygidium dispar punctulatum Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 52 (Rio Remac, near Lima); Occasional Papers Cal. Acad. Sci., I, 1890, p. 336 (Rio Remac, largest 180 mm.); Proc. U. S. Nat. Mus., XIV, 1890, p. 36.

Pygidium punctulatum Starks, Proc. U. S. Nat. Mus., XXX, 1906, p. 771 (Callao); Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Trichomycterus punctatus Cuvier & Valenciennes, *l. c.*, pl. 552.

Habitat.— Rio Remac, Peru.

4234, I. U. M., one, 145 mm., a female with empty ovary. Callao.

From the Harvard collections.

Head 5.33–5.66; D. 12; A. 10.

Teeth conic, in about five series in the middle of the jaws.

Origin of dorsal equidistant from tip of caudal and somewhere between occiput and anterior margin of eye; distance of anal from base of caudal 6–6.5 in the length.

16. **Pygidium taczanowskii** (Steindachner). (Plate XLVI, figs. 5–8.)

?Pygidium dispar Tschudi (in part), Fauna Peruana Ichthyol., p. 22, pl. 3 (lower figure).

Trichomycterus taczanowskii Steindachner, Flussf. Südam., IV, 1882, p. 22, pl. IV, figs. 1–1*b* (Rio de Huambo; Rio de Tortora).

Pygidium taczanowskii EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 52; Occasional Papers Cal. Acad. Sci., I, 1890, p. 338; Proc. U. S. Nat. Mus., XIV, p. 37; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—North and central Peru, between the Andes.

Head in specimens 110–113 mm. 5–5.5; in a specimen 390 mm. 4.75; D. 9–10; A. 7; P. 9; width of head 1.2 in its length, snout 2–2.33; interorbital 3–3.33, nasal barbels 1–1.25 in the head, in small specimens, 1.4 in larger specimens, maxillary barbels 1.21–1.25, lower barbels 1.6–2; width of mouth two times in the length of the head; anterior margin of eye slightly in front of the middle of the head in smaller individuals, in the middle in the larger; teeth brush-like; opercular and interopercular spines numerous, in several series, mostly concealed; origin of dorsal variable, moving back with age, in a specimen 110 mm. its origin much nearer gill-opening than to caudal; in specimens 390 mm. 1.22 nearer middle caudal rays than tip of opercle; origin of ventrals in specimens up to 210 mm. almost directly under the origin of the dorsal, in a specimen 390 mm. half the length of the head farther forward; the origin of the anal in front of the end of the dorsal in small specimens, under it in the specimen 390 mm. long; first pectoral ray prolonged, its length 1–1.37 in the length of the head. Without spots, bands, or stripes.

17. **Pygidium rivulatum** (Cuvier & Valenciennes). (Plate XLV, figs. 2, 3.)

Trichomycterus rivulatus CUVIER & VALENCIENNES, Hist. Nat. Poiss., XVIII, 1846, p. 495 (Guasacona); GÜNTHER, Cat. Fishes Brit. Mus., V, 1864; COPE, Proc. Amer. Philos. Soc., XVII, 1877, p. 46 (Lake Titicaca); PELLEGRIN, Bull. Soc. Zoöl. Paris, XXIX, 1904, p. 91; POISSONS des Lacs des Hauts Plateaux, de l'Am. Sud., 1907, p. 17 (Rio de Pazña, lac Poopo).

Pygidium rivulatum EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 51 (Cuzco; Moho and Puno, Lake Titicaca); Occasional Papers Cal. Acad. Sci., I, 1890, p. 330, Proc. U. S. N. Mus., XIV, 1891, p. 36; STARKS, Proc. U. S. N. Mus., XXX, 1907, p. 771 (Lake Titicaca); EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

?*Trichomycterus incæ* CUVIER & VALENCIENNES, *l. c.*, 496 (Rio Guatanai at Cuzco).

Trichomycterus gracilis CUVIER & VALENCIENNES, *l. c.*, 497 (Rio Azangaro near Guasacona; Rio Guatanai near Cuzco; Rio Pontezualo near Coroico; Lake Compucila near Cuzco); COPE, Proc. Amer. Philos. Soc. XVII, 681, 1877 (Tinta).

Trichomycterus barbatula CUVIER & VALENCIENNES, *l. c.*, 498 (Guasacona; Rio Pontezualo near Coroico).

Trichomycterus pentlandi Castelnau, Anim. Nouv. Am. Sud., 49, pl. XXIV, fig. 1, 1855 (Lake communicating with the Ucayale).

Trichomycterus pictus Castelnau, Anim. Nouv. Am. Sud., 59, pl. XXIV, fig. 2, 1855 (Lake Titicaca).

Trichomycterus dispar Günther (*partim*), Cat. Fishes Brit. Mus., V, 273, 1864 (Lake Titicaca; Rio de Pontezualo; Andes de la Paz; Guasacona; Rio de Azangaro); Garman, Bull. Mus. Comp. Zoöl. III, 275, 1875 (Lake Titicaca). ?Pellegrin, Bull. Soc. Zoöl. Paris, XXIX, 1904, p. 91; Poissons des Lacs des Hauts Plateaux de l'Am. des Sud., 1907, p. 7 (Lake Titicaca).

Trichomycterus pardus Cope, Proc. Acad. Nat. Sci., Phila., 1874, p. 132.

Habitat.—High Andes of Peru, about Cuzco, Titicacà, Jequetepeque, etc.

13833, I. U. M., one, 93 mm. Tirapata, eastern Peru. 13000 ft. From Rosenberg.

13750, I. U. M., one, 145 mm. Ollantaytambo. E. Heller.

Teeth in about five series in the middle of the jaws, those of the outer series narrow incisors, those of the innermost row conic.

Head 4.5–5.5; depth 3.75–6.5; D. 13; A. 11. Tail compressed, head depressed, about as wide as long; eye equidistant from tip of snout and end of opercle. Nasal barbels reaching to the posterior margin of the eye, longer in the young. Upper maxillary barbel about to edge of pre-opercle. Mouth wide, more than one-third the length of the head. Pectoral rounded, the first ray prolonged in a short filament, except in the very young. Origin of dorsal equidistant from tip of caudal and a point between occiput and posterior nares, its posterior portion always over the anterior half of the anal. Accessory rays of the caudal very numerous, their division from the true caudal rays marked. Caudal always rounded, its distance from the anal 4.5–4.4 in the length. Color of largest specimens dark reddish brown, sides with fine white or silvery spots and vermiculations. Specimens from 100–200 mm. greatly variable, grayish or dark brown, with darker markings; sometimes the ground color predominating, sometimes only forming reticulations between the dark markings; young with an interrupted dark band along the sides.

18. **Pygidium poeyanum** (Cope).

Trichomycterus rivulatus Cope (*non* Cuvier & Valenciennes), Proc. Acad. Nat. Sci. Phila., 1874, p. 132 (Arequipa).

Trichomycterus poeyanus Cope, Proc. Am. Philos. Soc., 1877, p. 47.

Pygidium poeyanum Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 50; Occasional Papers Cal. Acad. Sci., I, 1890, p. 326; Proc. U. S. Nat. Mus.,

XIV, 1891, p. 36; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399; FOWLER, Proc. Acad. Nat. Sci. Phila., 1915, p. 229 (note on type).

Habitat.—Arequipa.

This species named by Cope without any sort of description is said by Fowler to be "close to *rivulatum*, differing in its large dark blotches."

19. **Pygidium barbouri** Eigenmann.

Pygidium barbouri EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400; Ann. Carnegie Mus., VII, 1911, p. 214, pl. XXXII.

Habitat.—Beni River, eastern Bolivia.

12566 I. U. M., 37 mm. and 2465*a–b*, C. M., two, cotypes. Rio Beni, tropical eastern Bolivia. Obtained by Mr. Thomas Barbour at La Paz, Bolivia, from the Beni River.

This species has conical teeth.

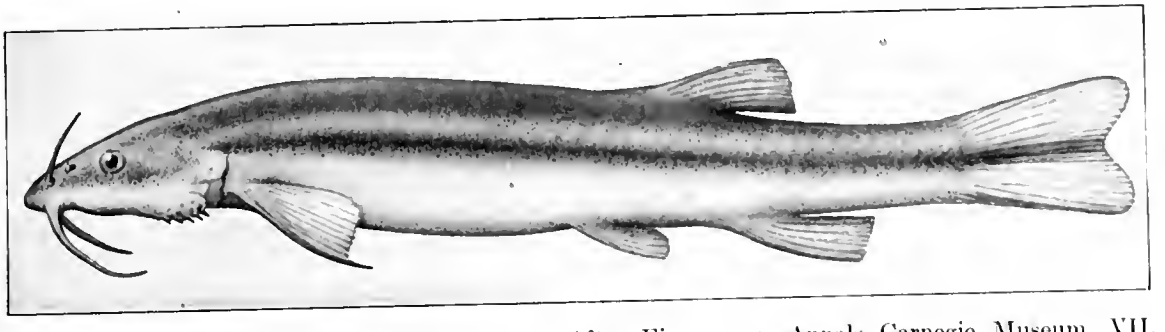


FIG. 9. *Pygidium barbouri* Eigenmann. After Eigenmann, Annals Carnegie Museum, VII, pl. XXXII.

Head 4.66; depth 7; D. 8; A. 6; eye 3 in snout, 7 in head, 2.5 in space between the eyes. Width of head equals its length behind the posterior nares, the body tapering to the caudal; nasal barbels reaching to posterior margin of the eye, the longer maxillary barbel scarcely to the gill-opening when laid straight back. Teeth minute, in bands. First pectoral ray prolonged, not as long as the head; dorsal subtruncate, none of its rays prolonged; distance of origin of dorsal from caudal 2.6 in the length; origin of anal from base of middle caudal rays 3.75 in the length; caudal emarginate; accessory rays not evident; ventrals not reaching the short, scarcely rounded anal. A dark median band from the gill-opening to the tip of the middle caudal rays, a light stripe above it; the back chocolate.

20. **Pygidium fassli** Steindachner.

Pygidium fassli STEINDACHNER, Anz. K. Akad. Wiss. Wien, 1915, No. XVII, p. 200 (Rio Songo, Province North Yungas, Bolivia).

Head 8.77; depth 6; D. 9; A. 7; P. 9; teeth pointed, in several irregular series; head a little longer than broad; eye in middle of head; nasal barbels reaching about to lateral end of head, maxillary barbels a little beyond origin of pectoral. First pectoral ray moderately elongate; caudal truncate; origin of anal behind the vertical from the middle of the dorsal, half a head nearer to base of middle caudal rays than to the lateral margin of the head; snout rounded. Body velvety with minute tubercles. Upper part of head, back, and sides light chocolate with darker spots in tolerably regular rows; a dark lateral band, the spots above it larger than the others, those of the uppermost rows sometimes confluent. Fins unspotted.

21. Pygidium oroyæ Eigenmann & Eigenmann.

Pygidium oroyæ Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 51; Occasional Papers Cal. Acad. Sci., I, 1890, p. 334 (Pochachara, Oroyo River); Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399; Evermann & Radcliffe, Bull. 95, U. S. Nat. Mus., 1917, p. 35, pl. IV, fig. 2 (Oroyo).

Habitat.— Rios Oroyo and Perené, central Peru.

5792, C. M., eighteen, 24–90 mm. Spring supplying water to Tarma, Peru. Lola Vance.

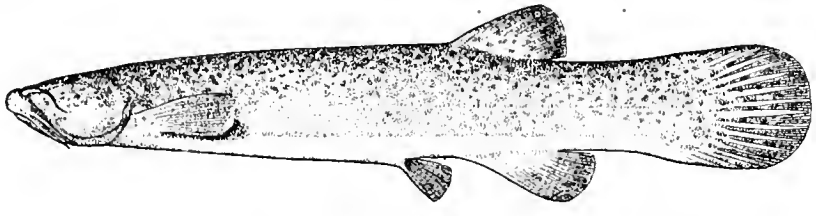


Fig. 10. *Pygidium* oroyæ Eigenmann & Eigenmann. After Evermann & Radcliffe.

Head 5.75–6; depth 5.75–8; D. 12; A. 10–11; P. 10. Head about as long as wide; none of the barbels reaching the gill-opening; teeth all pointed; gill-membrane narrowly joined to the isthmus, with a narrow, free margin. Pectoral shorter than head, fan-shaped, the first ray not prolonged. Dorsal inserted over or slightly behind the vent, its last ray over or behind the middle of the anal, its origin equidistant from anterior margin of eye or occiput and tip of caudal, its distance from the base of the caudal 1.5 in its distance from the snout. Caudal broadly rounded, its distance from the anal 4–4.75 in the length. Ventrals extending to or beyond the anus, their origin about midway between tip of snout and tip of caudal or nearer the former. Chocolate brown; sides, back and unpaired fins with irregular groups of dark points; traces of a dark lateral line in the young.

22. **Pygidium quechuorum** Steindachner.

Pygidium quechuorum STEINDACHNER, Anz. Ak. Wiss. Wien, 1900, p. 207 (Arequipa) Denksch. Ak. Wiss. Wien, LXXII, 1902, p. 137 (49 of separate), pl. IV, fig. 3–3*a* (Rio Chile, Arequipa); EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Rio Chile at Arequipa, Peru.

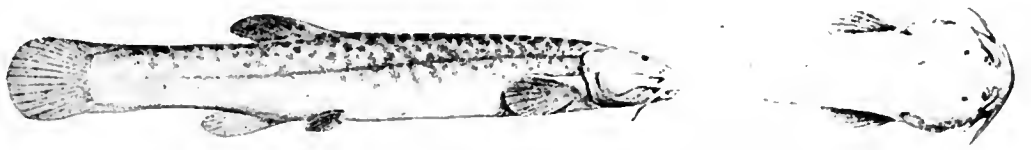


FIG. 11. *Pygidium quechuorum* Steindachner. After Steindachner.

Known from the types, five specimens, 51–64 mm. long, in the Vienna Museum.

Head about 5; depth 5.66–5.75 in total length; eyes very minute; interorbital 3 in the head, snout 3; width of head equals length of head or only very little less; first pectoral ray not prolonged, the fin 1.5 in the head; maxillary barbel to some part of the interorbital spines; origin of ventrals almost exactly in the middle; origin of dorsal about equidistant from base of caudal and pectoral; origin of anal behind the dorsal; caudal rounded or subtruncate; upper parts marbled; a narrow, diffuse lateral band, which is sometimes faintly interrupted.

KEY TO THE SPECIES OF PYGIDIUM FROM VENEZUELA, COLOMBIA, PANAMA, AND ECUADOR.

a. Teeth incisors, apparently conic in the very young.

b. Last dorsal ray over the last anal ray; distance between last anal ray and base of middle caudal ray about 2.28 in its distance from the snout; distance between last anal ray and base of middle caudal rays five and one-half in the length; obscure spots about as large as the eye evenly distributed over back and sides, no lateral band.....23. **laticeps** (Kner)

bb. Last dorsal ray over the anal.

c. Sides with a lateral band or nearly confluent series of spots.

d. Maxillary barbel extending beyond base of last pectoral ray; origin of ventrals equidistant between caudal and some part of the opercular spines; distance between anal and caudal four and one-half to four and three-fourths in the length; distance between origin of dorsal and base of caudal about two in its distance from the snout; a narrow lateral band, a variable number of small spots.....24. **stellatum** Eigenmann.

dd. Maxillary barbel extending little beyond origin of the pectoral or shorter; a dark band or series of spots below and another above the median band.

e. Origin of ventrals equidistant from caudal and middle of pectoral; distance between anal and caudal five in the length; distance between origin of dorsal and caudal a little more than two in its distance from the snout....25. **chapmani** Eigenmann.

ee. Origin of ventrals nearer head than caudal; distance between anal and caudal five to five and one-half in the length; distance between origin of dorsal and caudal one and four-fifths to two in its distance from the snout..26. **tænium** (Kner).

cc. Sides with numerous spots, those along the middle line not forming a band; origin of ventrals equidistant from caudal and base or middle of the pectorals; distance between the anal and caudal four and three-tenths to five in the length; distance between origin of the dorsal and the caudal one and three-fourths to one and four-fifths in its distance from the snout.....27. **caliense** Eigenmann.

ccc. Sides plain; maxillary barbel extending beyond the axil; origin of ventrals equidistant from caudal and pre-opercle; distance between anal and caudal five and one-half in the length; distance between origin of dorsal and caudal two in its distance from the snout; origin of anal a little in advance of the middle of the dorsal. See also *kneri*.

28. **latidens** Eigenmann.

aa. Teeth sharp-pointed, conical or recurved conical.[21]

f. Origin of ventrals nearer to caudal than to tip of pectoral filament, the distance between the ventrals and caudal two in the distance from the snout; distance between origin of dorsal and caudal two and two-fifths in its distance from the snout. Sides densely covered with small spots with only vermiculating light lines between them.....29. **metæ** Eigenmann.

ff. Origin of ventrals nearer to tip of pectoral filament than to caudal, usually much further forward.

g. Sides plain.

h. Origin of dorsal nearly over origin of the ventrals, nearer the eye than the tip of the caudal; distance between origin of dorsal and caudal 1.5 or less in its distance from the snout, head 4.5–5.33 in the length.....30. **stramineum** Eigenmann.

hh. Origin of dorsal above or a little in advance of the vent, its distance from the caudal 1.8 in its distance from the snout; head six times in the length; caudal subtruncate; barbels as long as head.....31. **unicolor** Regan.

hhh. As under *h*, caudal emarginate, barbels reaching considerably beyond origin of pectoral.....32. **kneri** (Steindachner).

hhhh. Origin of dorsal distinctly behind the origin of the ventrals, much nearer the tip of the caudal than the eye.....**striatum**, No. 41, which see.

gg. Sides irregularly spotted, more rarely a lateral band, the spots along the middle of the sides rarely in a distinct series; caudal rounded.

i. Maxillary barbels very slender, reaching to the middle of the pectoral rays; eye entirely in the anterior half of the head; origin of dorsal equidistant from tip of caudal and opercle; sides and back with moderate-sized dark spots.....33. **meridæ** Regan.

ii. Maxillary barbels not reaching to the middle of the pectoral; eye in middle of the head.

j. Origin of dorsal, on an average, slightly nearer to the caudal than to the eye; dorsal inclusive of the rudimentary rays most frequently 12.5; head a little longer than wide; distance between dorsal and caudal 1.5–1.7 in its distance from the snout; sides and back with numerous large spots, rarely in rows, the spots largest in the larger specimens.....34. **bogotense** Eigenmann.

jj. Origin of dorsal nearly equidistant from tip of caudal and snout; D. 11.5 or 12.5; head as wide as long; distance between dorsal and caudal 1.4–1.52 in its distance from the snout; sides and back in the largest with numerous irregularly arranged spots about the size of the eye, the spots larger and less numerous in the young. Sometimes nearly plain, sometimes with a lateral stripe.

35. **nigromaculatum** (Boulenger).

ggg. Sides with distinct longitudinal bands or rows of spots; caudal emarginate, truncate, or truncate-rounded.

[21] Not examined in *unicolor*, *kneri*, and *retropinne*.

k. Caudal emarginate; origin of dorsal equidistant from tip of caudal and opercle or pre-opercle, its distance from the caudal 1.5–1.8 in its distance from the snout; head five in the length; sides and back with numerous dark spots, those along the middle of the sides forming a distinct row, sometimes confluent along the anterior half of the body. 36. **banneaui** Eigenmann.

kk. Caudal truncate or rounded.

l. Dorsal, anal, and caudal truncate; origin of dorsal equidistant from tip of caudal and pre-opercle, its distance from the base of the middle caudal rays 1.6 in its distance from the snout; sides with a faint broad band, oversown like the back with spots about the size of the eye.....37. **spilosoma** Regan.

ll. Dorsal and anal rounded.

m. Lateral band above the middle; maxillary barbels extending to the axil.

n. Caudal truncate-rounded; origin of dorsal equidistant from tip of caudal and eye or nasal barbel, its distance from the caudal about 1.4 in its distance from the snout; the lateral band or row of spots above the middle, from the upper part of the gill-opening to above the middle of the caudal. 38. **dorsostriatum** Eigenmann.

nn. Barbels very short, about reaching the eye; origin of dorsal equidistant from tip of caudal and opercle, a faint lateral band, sides reticulated, first pectoral ray not prolonged.....39. **venulosum** Steindachner.

mm. Lateral band, if present, in the middle of the sides.

o. Origin of dorsal equidistant from tip of caudal and nasal barbel, its distance from the base of the middle caudal rays about 1.4 in its distance from the snout; a lateral band increasing in width to the caudal; middorsal area dark, a dark stripe between the lateral stripe and the dorsal stripe in front of the dorsal. 40. **latistriatum** Eigenmann.

oo. Origin of dorsal equidistant from tip of caudal and a point between the middle of the pectoral and the pre-opercle, its distance from the middle caudal rays 1.8–2 in its distance from the snout.

p. Maxillary barbel reaching a little beyond the axil or shorter; color very variable, plain, or with one to three lateral stripes; origin of the dorsal typically equidistant from tip of caudal and middle of pectoral rays.....41. **striatum** Meek & Hildebrand.

pp. Maxillary barbel reaching to near the end of the lower pectoral ray, longer than the head; origin of dorsal equidistant from tip of caudal and opercular spines.....42. **regani** Eigenmann.

ooo. Distance between origin of dorsal and caudal 2.2–2.4 in its distance from the snout; head as broad as long; eye in the middle of the head; distance between base of last anal ray and the caudal 5.4 in the length. An indistinct darker stripe along the middle of the side and traces of some darker spots.....43. **retropinne** (Regan).

23. **Pygidium laticeps** (Kner).

Trichomycterus laticeps Kner, Sb. Acad. Wiss. München, 1863, p. 228; Kner & Steindachner, Abhandl. K. Bayer. Akad. Wiss., II. Cl., Vol. X, Part I, 1864,

p. 54 (western slope of Andes of Ecuador); Günther, Cat. Fishes Brit. Mus., V, 1864, p. 274.

Pygidium laticeps Eigenmann & Eigenmann, Proc. Cal. Acad. Sci., II, 1889, p. 51; Occasional Papers Cal. Acad. Sci., I, 1890, p. 334; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Western slope of the Andes of Ecuador.

13811, I. U. M., one, 79 mm. Below Paramba, Prov. Imbabura, Ecuador. 2600 feet. Henn.

13812, I. U. M., 7094*a–d*, C. M., seventy-one, largest 89 mm. Mindo. Henn. Head 5–5.2; D. 10.5; A. 8.5; P. 7.

G. 12. *Pygidium laticeps* (Kner & Steindachner). After Kner & Steindachner.

The barbels in the specimens average a little longer than in the specimens of *P. tænium* from Llanos. Distance between last anal ray and base of middle caudal ray about 5.5 in the length; distance between origin of dorsal and base of middle caudal rays on an average 2.28 in its distance from the snout; *the last dorsal ray over the last anal ray*, the two fins coterminous.

Teeth: Incisors in two series in each jaw.

Dark brown, with obscure spots, about the size of the eye, evenly distributed over the sides and back. No trace of a lateral band in any of the specimens.

In the very small the last anal ray is a little back of the vertical from the last dorsal ray, and the color is uniform.

24. **Pygidium stellatum** Eigenmann. (Plate XLVII, fig. 1.)

7097, C. M., type, 78 mm. Quebrada Sarjento. Gonzales.

7098*a–c*, C. M.; 13814, I. U. M., paratypes, 65–85 mm. Quebrada Sarjento. Gonzales.

7096*a–c*, C. M.; 13815, I. U. M., five, 45–86 mm. Quebrada Guamal. Gonzales.

7099*a–b*, C. M.; 13816, I. U. M., five, 37–55 mm. Quebrada Guadual. Gonzales.

7100*a–i*, C. M.; 13817, I. U. M., seventeen, largest 50 mm. Rio Guaduas. Gonzales.

13807, I. U. M., three, 31–50 mm. Quebrada Cristalina, 28 kilom. above Puerto Berrio, 1000 ft. E. B. Williamson.

Head 5.5–6; D. 10.5; A. 7.5; P. 7; eye in middle of the head, or very slightly in

front of the middle; interocular three times in the head; teeth broad incisors, in two series.

Nasal barbels extending to the tip of the opercular spines or a little further, maxillary barbels usually beyond base of last pectoral rays; pectoral narrow, the filament longer than the head; origin of ventrals equidistant from base of middle caudal rays and some part of the opercular spines, the tips of the ventrals reaching vent; origin of anal under anterior half of the dorsal, the distance between the base of the last anal ray and the base of the middle caudal rays 4.5–5 in the length; caudal rounded, 5 to 6.5 in the length; origin of dorsal about equidistant from tip of caudal and opercle, its distance from the base of the middle caudal rays about two times in its distance from the snout.

A narrow, dark lateral stripe, a variable number of dark spots, smaller than the eye, above the band and below it on the tail.

The specimens from Cristalina have the lateral band very broad, the maxillary barbels reaching to the middle of the pectoral.

25. **Pygidium chapmani** Eigenmann. (Plate XLVII, figs. 2, 3.)

Pygidium chapmani EIGENMANN, Indiana University Studies, No. 16, dated Sept., issued Dec. 23, 1912, p. 18. (Boquia.)

4817, C. M., type, 106 mm.; paratypes, 4818*a–i*, C. M.; 12678, I. U. M., Boquia. Eigenmann.

7091*a–b*, C. M.; 13805, I. U. M., 4, 78–118 mm. Rio Dagua at Caldas. Eigenmann

Habitat.—Upper Cauca Valley.

Head 5–5.75; D. 10.5; A. 7–8.5; P. 7; interocular 3.5 in the head; eye in middle of the head; width of head equal to its length in the young, narrower in the adult. Teeth in 75 mm. specimens long and very narrow chisels, in smaller specimens less distinctly chisel-shaped, in 65 mm. specimens long and smaller, conical.

Nasal barbels extending to base or near tip of opercular spines; maxillary barbel just beyond origin of pectorals.

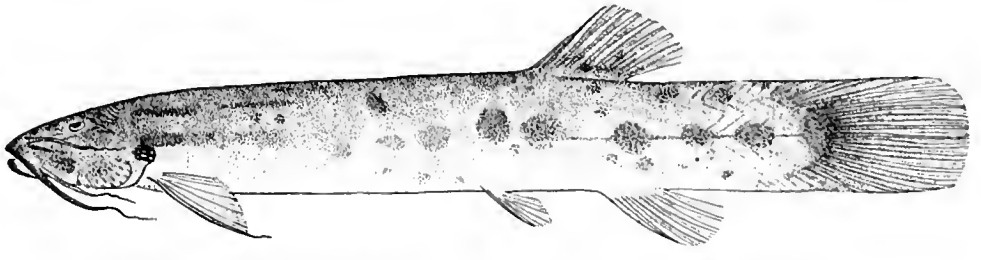


FIG. 13. *Pygidium chapmani* Eigenmann. Type, 106 mm., C. M. No. 4817. Boquia.

Pectoral narrow, the outer ray about equal to the head in length; origin of the ventrals about equidistant from base of caudal and middle of pectorals, the tips at or slightly beyond anus; origin of anal below middle or posterior part of the dorsal, the distance between the base of its last ray and the middle caudal rays five and one-third in the length; caudal distinctly rounded, about six and one-half in the length; origin of dorsal over tip or middle of the ventrals, its distance from the base of the middle caudal rays about two in its distance from the snout.

Smallest specimens with a black lateral band, a series of spots above and below it in the older, the band breaking up into a series of spots in specimens over sixty millimeters long. The oldest specimens dark with obscure darker spots and mottlings.

26. **Pygidium tænium** (Kner).

Trichomycterus tænia Kner, Sb. Akad. Wiss. München, 1863, p. 228; Kner & Steindachner, Abhandl. k. Bayer. Akad. Wiss., II. Cl., vol. X, part I, 1864, p. 52 (western slope of Andes of Ecuador); Günther, Cat. Fishes Brit. Mus., V, 1864, p. 274.

Pygidium tænia Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 51; Occasional Papers Cal. Acad. Sci., I, 1890, p. 334; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Western slope of the Andes of Ecuador and southern Colombia.

13813 I. U. M., 7095*a–d*, C. M., forty-two, 31–111 mm. Los Llanos, southern Colombia. March 8, 1913. Arthur Henn.

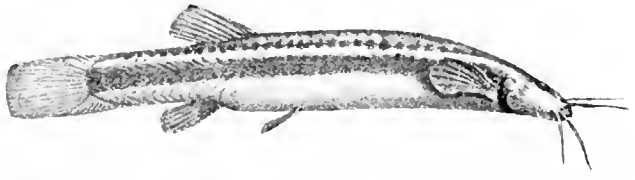


Fig. 14. *Pygidium tænium* (Kner). After Kner & Steindachner.

Head 5.2–5.6; D. 9.5 or 10.5; A. 8.5; P. 7; eye in the middle of the head, interorbital three in the length of the head.

Nasal barbel reaching to the opercular spines, the maxillary barbels to the pectoral; outer pectoral ray with its filament a little shorter than the head, the rays about equal to the head without the snout; ventrals reaching the vent, their origin equidistant between base of middle caudal rays and opercular spines; origin of anal under anterior half of the dorsal, the distance between the base of its last ray and the middle caudal rays about five in the length; caudal rounded, five and five-

tenths to six and five-tenths in the length; origin of dorsal over tips of ventrals, its distance from the base of the middle caudal rays one and eight-tenths to two in its distance from the snout.

Teeth in the largest specimen narrow chisels, three rows in the premaxillary and the middle of the mandible. In the young the teeth are more nearly conical.

Color variable; a dark band from the opercle to the middle caudal rays, sometimes in part, or as a whole, replaced by a series of large spots; an irregular series of irregular spots half way between the lateral band and the ventrals and anal, this series more rarely replaced by a band; a band or a series of spots between the lateral band and the mid-dorsal line; a mid-dorsal band; small spots sometimes interspersed among the larger ones.

27. **Pygidium caliense** Eigenmann.[22]

Pygidium caliense EIGENMANN, Indiana University Studies, No. 16, p. 18, dated Sept., 1912, issued Dec., 1912.

4819, C. M., type, 53 mm. Cali. C. H. Eigenmann.

Head 4.88–5.75; D. 10.5 or 11.5; A. 9.5 or 10.5; P. 7; eye about in middle of the head interocular 3.5–4 in the length of the head.

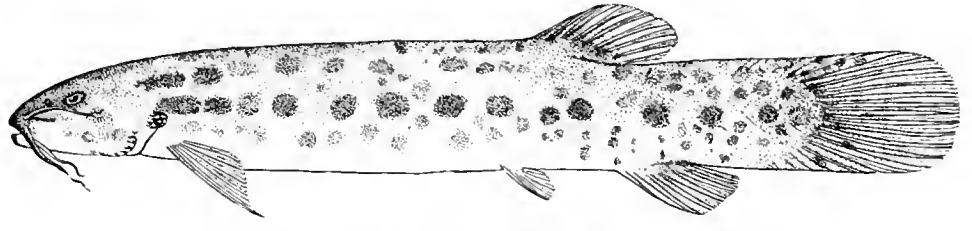


FIG. 15. *Pygidium caliense* Eigenmann. Type, 4819, Carn. Mus., 53 mm. Cali.

Nasal barbels extending to base or end of opercular spines, very little shorter in the type; maxillary barbel extending to the end of the opercular spines or beyond the origin of the pectorals; pectoral rays about equal to the length of the eye and the post-orbital part of the head, the filament extending for more than half the length of the fin beyond the tip of the divided rays on one side in the largest specimen, nearly as long as the head, shorter in other specimens; origin of the ventrals equidistant from base of middle caudal rays and base or middle of the pectoral rays, reaching just beyond the vent; origin of the anal about under the middle of the dorsal, the distance between the base of its last ray and the base of the middle caudal ray four and one-third to five in the length; caudal rounded, five and one-half to six and one-half in the length; accessory rays large, numerous; origin of dorsal

[22] The head in the figure is a little too short.

over middle of the ventrals, its distance from the middle of the caudal one and three-fourths to one and eight-tenths in its distance from the snout.

Sides and back in the young with black spots, the middle ones of the sides larger and forming a more or less regular series in the young and half-grown; in the largest specimen the caudal peduncle and base of the caudal are profusely covered with spots smaller than the eye, the spots larger, less numerous and less conspicuous forwards.

Teeth round-tipped incisors in the largest, more pointed but distinct incisors in the middle-sized specimens; the teeth of the type narrow, pointed incisors.

28. **Pygidium latidens** Eigenmann. (Plate XLVII, fig. 4.)

Pygidium latidens Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 693.

13801, I. U. M., one, 53 mm. Small creek near the mouth of Rio Calima, north of Buenaventura. May 7, 1913. Henn.

Head 5.5; D. 9.5; A. 7.5; P. 7; posterior edge of eye in advance of the middle of the head; interocular 3.5 in the head.

Nasal barbel extending beyond the tips of the opercular spines; maxillary barbel extending beyond the axil, longer than the head; pectorals broad, as long as head without snout; pectoral filament equal to the distance from the snout to the axil; ventrals not nearly reaching anus, their origin equidistant from the base of the middle caudal rays and the interopercle; origin of anal about under middle of the dorsal, distance between base of the last ray and the middle caudal rays five and a half in the length; caudal rounded, about six in the length; accessory rays well developed; origin of dorsal over anus, its distance from the middle caudal rays two in its distance from the snout; gill-membrane free to below the anterior spine of the interopercle, without a free membrane across isthmus; both jaws with two series of thin, chisel-shaped teeth.

Color plain, without spots or stripes.

29. **Pygidium metæ** Eigenmann. (Plate XLVII, fig. 5.)

Pygidium metæ Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 694.

13770, I. U. M., one, 78 mm. Barrigona. March, 1914. Manuel Gonzales.

Head 6.3 in the length; D. 10.5; A. 9.5, counting the rudimentary rays; P. 6; width of head nearly equal to its length; eye entirely in the anterior half of the head, snout 2.75 in the head, interocular 3.5. Teeth conic.

Nasal barbels reaching to tip of opercular spines, maxillary barbel slightly beyond origin of pectorals; pectorals small, equal to the postorbital portion of the head, the first ray with its filament equal to the head, origin of ventrals much nearer

base of middle caudal rays than to tip of pectorals, their tips reaching the anal; origin of anal under fourth dorsal ray (second fully developed ray), the distance between the base of its last ray and the base of the middle caudal rays six times in the length; caudal rounded; origin of dorsal over tip of ventrals, its distance from the base of the middle caudal rays two and two-fifths times in its distance from the snout.

Sides and back densely covered with spots about the size of the eye.

30. **Pygidium stramineum** Eigenmann. (Plate XLIX, fig. 1.)

Pygidium stramineum EIGENMANN, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 694.

7101, C. M., type; 13818, I. U. M., paratype, 46 and 50 mm. Quebrada del Mango, Santander. Gonzales.

7089*a*, C. M., paratype, 35 mm. Quebrada del Maradat (?) Santander. Gonzales.

7090*a–c*, C. M., 13804, I. U. M., paratypes, seven, largest 45 mm. Quebrada da Densino, Santander. Gonzales.

7102*a–h*, C. M.; 13819, I. U. M., fifteen, largest 60 mm. Quebrada Deocamante, Santander. Gonzales.

7103*a–b*, C. M.; 13826, I. U. M., four, the largest 67 mm. Quebrada de Zuarta, Santander. Gonzales.

7104, C. M., one, 41 mm. Quebrada de La Honda, Santander. Gonzales.

Head 4.5–5.33; D. 10.5; A. 8.5–9.5; P. 9; posterior margin of eye in the middle of the head; interorbital three in the length of the head; teeth bristle-like, in about three series.

Nasal barbels reaching base of opercular spines or beyond origin of pectorals, maxillary barbels to tip of opercular spines or axil; pectoral filament about equal to the length of the head, the rays equal to the length of the head without the snout; origin of ventrals equidistant from the base of the middle caudal rays and a point between the axil and a little in front of the opercle (and the tips of the opercular spines in the type), tips of the ventrals slightly behind the vent; origin of the anal behind the vertical from the base of the last dorsal ray or under the posterior half of the dorsal, the distance between the base of the last anal ray and the middle caudal rays 4.5–5 in the length, accessory caudal rays very large and numerous; caudal rounded, six and a half times in the length; origin of dorsal over the origin of the ventrals, or but slightly behind this point, always nearer the eye than the tip of the caudal, sometimes equidistant from tip of snout and tip of caudal, its distance from the base of the middle caudal rays one and a half or less in its distance from the snout.

Uniform straw-colored in alcohol.

31. **Pygidium unicolor** Regan.

Pygidium unicolor Regan, Ann. & Mag. Nat. Hist. (8), XII, Nov., 1913. (Condoto.)

Habitat.—San Juan basin.

The following is the original description of Regan:

"Depth of body 7 in length, length of head 6. Head as broad as long. Diameter of eye 12 in length of head or 3 in interocular width; eyes well in advance of middle of head, close behind nostrils. Barbels as long as head. Dorsal 8–9, with 5 or 6 branched rays, rounded; origin above or a little in advance of vent, $1\frac{1}{5}$ as far from end of snout as from base of caudal. Anal 7, with 4 branched rays; origin below last rays of dorsal. Pectoral filament $\frac{1}{5}$ to as long as head, branched rays $\frac{2}{3}$ length of head. Pelvics covering vent. Caudal subtruncate. Coloration uniform.

"Two specimens, 80 and 85 mm. in total length, from the Condoto (Spurrell)."

32. **Pygidium kneri** (Steindachner). (Plate XLVI, figs. 1, 2.)

Trichomycterus knerii Steindachner, Ichthyol. Beitr., XII, 1882, p. 21, pl. V, figs. 1–1*a*.

Habitat.—Canelos, Rio Bobonaza; Rio Zamora, eastern slope of Ecuador; Rio Meta, eastern Colombia.

13907, I. U. M., one, 155 mm. Barrigona, Rio Meta. Gonzales.

Head 5.7; depth 6.3; D. 10; A. 10 including the rudimentary rays; eye 9 in the head, interocular 3, snout 2.3; eye in middle of the head.

Nasal barbel extending a little beyond gill-opening, as long as the head; maxillary barbel reaching to near tip of the shortest pectoral ray; first pectoral ray with its filament a little longer than the head, the rays about equal to the part of the head behind the nasal barbels; origin of ventrals equidistant from base of middle caudal rays and the eye; origin of anal under last dorsal ray; caudal truncate when half expanded, slightly rounded or emarginate when fully expanded or compressed, its middle rays equal to the length of the head; dorsal rays coterminous when depressed; distance of origin of dorsal from base of middle caudal rays 1.6 in its distance from the snout; depth of caudal peduncle about 1.5 in its length, which is five in the length.

Slightly darker above, without spots or streaks.

Steindachner's description and figure give the following variation from the above.

"Head 5.25–5.66; depth 6.75–7.5; D. 9; A. 7; eye 5–6 in the head; snout 2.5; interocular 2.66–3.75; width of the head 1.33–1.4 in its length.

"Nasal barbels reaching to gill-opening, maxillary barbel considerably beyond origin of pectoral; upper pectoral ray prolonged; origin of the dorsal behind that of the ventrals, its last ray over or a little in advance of the first anal ray; caudal slightly emarginate in the figure, said to be "schwach convex" in the text. Chocolate brown, thickly peppered with somewhat darker, very small, irregular spots or points."

33. **Pygidium meridæ** Regan. (Plate XLIX, fig. 2.)

Pygidium meridæ Regan, Ann. & Mag. Nat. Hist. (7), XII, Dec., 1903, p. 624 (Merida and from Rio Albireggas above Merida, 3500 meters), Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, 399.

Habitat.—Cordillera of Merida, Venezuela.

13771, I. U. M., one, 99 mm. Merida. Purchased from Rosenberg.

Head 6 [–7]; D. 10.5 [6–7 branched rays]; A. 9.5 [4 or 5 branched rays]; P. 8; eye in front of the middle of the head; interocular contained three and one-third in the length of the head [3], snout two and one half times.

Nasal barbel reaching a little beyond the eye; maxillary barbel very slender, reaching about to middle of the pectorals, longer than the head [as long or nearly as long as the head]; outer pectoral ray equals length of maxillary barbel, the projecting filament being half as long as the rest of the fin [one and one-third times as long as head]; origin of ventrals equidistant from base of middle caudal rays and posterior portion of head, the ventrals reaching the vent; origin of anal below penultimate dorsal ray; distance between last anal ray and the middle caudal rays four and three-fourths in the length [four and two-thirds to five times]; caudal rounded [truncate], six and a half times in the length; origin of the dorsal on the vertical from a point just in front of the vent, over tip of ventrals; distance between origin of dorsal and base of middle caudal rays one and three-fourths times in its distance from the snout [one and two-thirds to one and four-fifths].

No lateral band; traces of dark spots.

The characters found by Regan are given in brackets.

34. **Pygidium bogotense** Eigenmann. (Plate XLIX, figs. 3, 4.)

Pygidium bogotense Eigenmann, Indiana University Studies, No. 16, p. 18, dated Sept., issued Dec. 23, 1912. (Madrid; Chapinero.)

Habitat.—Plains of Bogotá and northward.

4820, C. M., type; 4821, C. M.; and 12679 I. U. M., paratypes, two hundred thirty-nine, largest 80 mm. Puente de Supa, beyond Chapinero, north of Bogotá. Eigenmann.

4834, C. M.; 12680, I. U. M., paratypes, six. Madrid, plains of Bogotá. Eigenmann.

University of Michigan, 94 mm. Mountains, 4,000 ft., Guira River, Santa Marta. July 18, 1913. A. S. Pearse.

University of Michigan, 66 and 68 mm. Small stream, San Lorenzo, Santa Marta, 4,500 ft. July 8, 1913. A. S. Pearse.

7087*a–c*, C. M., 13802, I. U. M., five, largest 52 mm. Rio Piedras, Santander. Gonzales.

7457, C. M.; 13845, I. U. M., five, largest 55 mm. Quebrada da Charda. Santander.

7088, C. M., 13803, I. U. M., twenty-six, largest 80 mm. (Label illegible—"Puchada? de la Porguira? de Norte Zipa Quira?") Gonzales.

13806, I. U. M., 85 mm. Mill-stream, Cincinnati (twenty miles from Santa Marta), Colombia. Dec. 31, 1916, 4,500 feet. E. B. Williamson.

Head 5.25–6; D. 10.5 in two specimens, 11.5 in four, 12.5 in eight, 13.5 in two; A. 10.5; P. 8; center of the eye very little in front of the middle of the head; interocular about three in the length of the head; head but little longer than wide; teeth conical, in three or four irregular series.

Nasal barbel extending to tip or base of opercular spines; maxillary barbel extending to the base of the opercular spines or beyond the base of the pectoral; pectoral rays about as long as the head behind the nasal barbel, pectoral filament about as long as the head; origin of ventrals equidistant from base of middle caudal rays and tip or base of the opercular spines, tips of ventrals extending to or very slightly beyond the vent; origin of anal under one of the last three dorsal rays or just behind the vertical from the last one; distance between the base of the last anal ray and the middle of the caudal ray four and three-fifths to five in the length; caudal rounded, six to seven in the length; accessory caudal rays numerous and large; origin of dorsal over origin or posterior half of the ventrals, equidistant from tip of caudal and eye,[23] its distance from the base of the middle caudal rays one and five-tenths to one and seven-tenths in its distance from the snout.

[23] In this specimen the origin of the dorsal is over the origin of the ventrals. In the specimens from the plains about Bogotá examined in this regard, only one had the origin of the dorsal a little further forward, a number had it equidistant between the tip of the caudal and a point some distance behind the eye. In the specimens from the Santa Marta Mountains, the origin of the dorsal is a little further forward. These specimens approach *nigromaculatum*, to which they ought perhaps to be referred. It is certain that the largest specimens referred to *nigromaculatum* from Santa Marta belong to a species different from those found on the plains of Bogotá. It is possible that *P. bogotense* is also found in Santander and Santa Marta, but it is also possible that the halfgrown of *P. bogotense* are indistinguishable from the half-grown of *P. nigromaculatum*, and that the specimens from Santander and Santa Marta are really the latter species.

Sides and back with numerous irregular spots, larger in the larger specimens, sometimes referable to distinct series. The spots are smaller in the specimens from Santander.

35. **Pygidium nigromaculatum** (Boulenger). (Plate XLIX, fig. 5.)

Trichomycterus nigromaculatus BOULENGER, Ann. & Mag. Nat. Hist. (5), XIX, 1887, p. 349 (Andes of Colombia).

Pygidium nigromaculatum EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 52; Occasional Papers Cal. Acad. Sci., I, 1890, p. 336; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Andes of Colombia, especially Sierra de Santa Marta and Santander.

No. ? ———, University of Michigan, two, 138 and 165 mm. Small stream, San Lorenzo, Santa Marta Mountains (4,500 ft.). Sept. 9, 1912. M. A. Carriker.

No. ? ———, University of Michigan, two, 118 and 150 mm. Same place, Jan. 16, 1913. M. A. Carriker.

No. ? ———, University of Michigan, one, 73 mm. Same place, July 8, 1913. A. S. Pearse.

No. ? ———, University of Michigan, eight,[24] largest 55 mm. Same place, July 9, 1913. A. S. Pearse.

No. ? ———, one, 115 mm. Locality?

13837, I. U. M.; 7447*a–b*, C. M., four, largest 93 mm. Quebrada de la Raya, Santander. Gonzales.

7448*a–b*, C. M., two, the larger 45 mm. Quebrada Capitanejo, Santander. Gonzales.

7449*a–c*, C. M.; 13838, I. U. M., six, largest 68 mm. Quebrada de Cobarachior, Santander. Gonzales.

DESCRIPTION OF THE SPECIES FROM SAN LORENZO.

The characters given by Boulenger are in brackets.

Head 5.24–5.75 [6.5 in total]; D. 11.5 or 12.5; A. 9.5; P. 9; eye in middle of the head; interocular 3 in the length of the head; width of head equal to its length [longer than the distance between snout and a line connecting the tips of the two bunches of opercular spines]; teeth conical [pointed, recurved].

Nasal barbels extending to the tips of the opercular spines or to the base of the

[24] These specimens are so distorted that it is difficult to refer them to their proper place. The origin of the dorsal seems to be equidistant from the tip of the caudal and the front of the eye. There are traces of longitudinal bands.

last pectoral ray; maxillary barbels extending to the base of the last pectoral ray or a little beyond; pectoral broad, rounded, the filament equal or nearly equal to the length of the head; origin of the ventrals very little nearer base of middle caudal rays than eye, their tips reaching the vent or very little beyond it; origin of anal under the penultimate dorsal ray [anal entirely behind the dorsal], the distance between its last ray and the middle caudal ray four and one half to five in the length; caudal rounded, about six in the length; accessory caudal rays not conspicuous; origin of dorsal over the anterior two-thirds of the ventrals; origin of dorsal nearly equidistant from tip of snout and tip of caudal, its distance from the base of the middle caudal rays on an average 1.4 in its distance from the tip of the snout.

Sides and back in the largest with numerous irregularly arranged spots about the size of the eye, the spots larger and less numerous in the young, much as in *P. bogotense*.

In the specimens from La Raya, Santander, the dorsal and ventrals are a little farther back, the ventrals equidistant from base of middle caudal rays and tip of opercular spines, the distance between the dorsal and the middle caudal rays 1.52 in its distance from the snout. The anal is entirely behind the dorsal. The origin of the dorsal is equidistant from the eye and the tip of the caudal. Plain or but faintly spotted.

Specimens from Capitanejo resemble those from La Raya.

Some of the specimens from Cobarachior seem to be typical *bogotense*, while others approach the specimens from La Raya and *P. latistriatum* from Pinchote. *P. bogotense*, typical of the plains of Bogotá, grades into *P. nigromaculatum* of Santa Marta in Santander and Santa Marta.

36. **Pygidium banneaui** Eigenmann. (Plate XLVIII, fig. 1.)

Pygidium banneaui Eigenmann, Indiana University Studies, No. 16, dated Sept., issued Dec. 23, 1912, p. 19.

Habitat.—Streams near Honda, Colombia.

4815, C. M., type; 4816*a–z*, C. M., 12677, I. U. M., paratypes, eighty-nine specimens, the largest 44 mm. Bernal Creek, near Honda. Eigenmann.

7456*a–b*, C. M.; 13844, I. U. M., four, 35–41 mm. Guaduas? Gonzales.

These specimens might be considered the young of some of the other species if it were not for the fact that one specimen, 34 mm. long, contains eggs over a millimeter in diameter, which must be nearly mature.

Head 5.33–5.5; depth 5.5–7; D. 10.5 or 11.5; A. 7.5 or 8.5; P. 8; eyes slightly in advance of the middle of the head; interocular three and five-tenths in the length of the head; teeth conical.

Nasal barbels reaching to the tips of the opercular spines, maxillary barbel to near the middle of the pectoral; upper pectoral ray prolonged in a filament, as long as the head or a little longer; ventrals reaching the vent, their origin about equidistant from snout and tips of middle caudal rays; origin of the anal under the middle of the dorsal, the distance between the last ray and the middle caudal rays 4.5–5 in the length; caudal distinctly emarginate, about five in the length; origin of dorsal a little nearer tip of caudal than eye, the distance between the origin of the dorsal and the caudal 1.4–1.66 in its distance from the snout.

Specimens 18 mm. long have a black line from the nasal barbel to near the tip of the middle caudal rays, accented in places; in specimens 20 mm. long the line is accented more strongly, appearing to be breaking up into spots; there are also spots on the back; in older specimens the line becomes diffuse; with growth a distinct series of spots develops along the middle of the back in front of the dorsal, and another series between these and the lateral series; in the largest the sides and back are profusely spotted, the spots varying in size and arrangement.

In the specimens from Guaduas the barbels are a little shorter and the dorsal a trifle farther forward. The color markings are less profuse than in the type.

37. **Pygidium spilosoma** Regan. (Plate XLVIII, fig. 2.)

Pygidium spilosoma Regan, Ann. & Mag. Nat. Hist. (8), XII, Nov., 1913, p. 468. (Rio Sipi and Rio Tamana.)

This species from the Pacific drainage of central Colombia is known from three specimens 130–250 mm. long, described by Regan, and 7092, C. M., 97 mm. Cordova on the Rio Dagua. Eigenmann.

In the following description, Regan's data are given in brackets.

Head 6 [to 6.75]; depth 7 [to 8]; D. 11.5 [9, with 6 branched rays]; A. 9.5 [7, with 4 branched rays]; P. 8; eye very little in front of the middle of the head; interocular 3.5 in the length of the head [2.5–3]; head longer than wide, tapering forward, the space between the nasal barbels 6.5 in the length of the head. Teeth minute, conical.

Nasal barbels extending to the base of the opercular spines, the maxillary barbel to their tip [to basal part of pectoral]; pectoral rather narrow, the upper part truncate, the filament equal to the head; origin of the ventrals equidistant from base of middle caudal rays and the tip of the opercular spines, a little too far forward in the figure, origin of the anal under the middle of the dorsal [a little behind end of dorsal], the distance between the base of its last ray and the base of the middle caudal rays 5 in the length; caudal truncate, six and one-fourth in the length; dorsal obliquely truncate, origin of dorsal over posterior half of the ventrals, its distance from the base of the middle caudal rays 1.6 in its distance from the snout.

An obscure, dusky band along the middle of the sides; sides and back with obscure spots about the size of the eye.

38. **Pygidium dorsostriatum** Eigenmann. (Plate XLVIII, fig. 3.)

Pygidium dorsostriatum Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 695.

7093*a–b*, C. M.; 13810, I. U. M., four, 18–76 mm., the largest the type. Villavicencio. Manuel Gonzales.

Distinguished by the eccentric, dark, lateral band.

Head 5; D. 12.5 (of which 4 minute); A. 9.5; P. 9; center of eye very little in advance of middle of the head,[25] interocular three in the head. Teeth conic.

Nasal barbels extending to, or but slightly beyond, origin of pectoral; maxillary barbel to the axil, equal to the length of the head; pectoral filament equal to the length of the head, the longest ray equal to the length of the head behind the nasal filament; origin of ventrals equidistant from base of middle caudal rays and base or tip of the interopercular spines, ventrals nearly reaching the anal; origin of the anal under the last quarter of the dorsal, the distance between the base of its last ray and the base of the middle caudal rays about 4.5 in the length; caudal rounded, six and five-tenths to seven times in the length; the first rudimentary dorsal ray over the base of the ventrals, its distance from the base of the middle caudal ray equal to its distance from the tip of the opercular spine, 1.47 in its distance from the snout.

A dark band or row of spots from just above the gill-opening to the base of the upper caudal lobe; a few spots below the band in the front half of the body in the larger specimen.

This description is based on the two larger specimens, 68 and 77 mm. long. The two smaller specimens, 18 and 21 mm. long, are uniform in color.

39. **Pygidium venulosum** Steindachner.

Pygidium venulosum Steindachner, Anz. K. Akad. Wiss. Wien, 1915, No. XVII, p. 199 (Paramo de Cruz Verde, Eastern Cordilleras, Colombia, 3,000 M.)

Habitat.—Eastern Andes of Colombia.

I have not seen this species.

D. 10 or 11; A. 10; P. 8. Caudal peduncle greatly compressed. Caudal rounded; eye very small, a very little in front of middle of head. Barbels short, about reaching eye; origin of anal under middle of dorsal; origin of dorsal equidistant from tip of caudal and lateral margin of head; teeth pointed. First pectoral ray

[25] In the plate the eye is placed too far forward; the anterior margin should be where the posterior margin is.

not prolonged. Lateral band above middle of sides; back and sides with dark reticulations on a lighter background.

40. **Pygidium latistriatum** Eigenmann. (Plate XLVIII, fig. 4.)

Pygidium latistriatum EIGENMANN, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 696. 7450, C. M., type. 46 mm. Quebrada de Pinchote, Santander. Gonzales.

Head 8 mm., length to base of caudal 39 mm.; width of head 6 mm., interocular 2.5 mm.,eye a little in front of the middle; distance from snout to origin of dorsal 23 mm., to its last ray 27 mm.; distance between origin of dorsal and base of middle caudal rays 16 mm., distance from snout to origin of ventrals 22 mm., to origin of anal 28 mm.. distance between base of last anal ray and base of middle caudal rays 9 mm., maxillary barbel 9 mm., nasal barbel 7 mm., length of outer pectoral ray with its filament 8 and 9 mm., the divided rays 5 mm., D. 8.5; A. 6.5, not counting the imbedded rays in either case; upper caudal rays 8 mm.; lower caudal rays about 6.5 mm. Accessory caudal rays numerous.

A lateral band from above the opercle to the middle of the caudal, increasing in width backward; mid-dorsal line dark; a dark stripe in front of the dorsal between the lateral stripe and the mid-dorsal stripe.

It is possible that some of the specimens under *P. nigromaculatum* belong here.

41. **Pygidium striatum** Meek & Hildebrand.

Pygidium striatum MEEK & HILDEBRAND, Field Mus. Publ., No. 166, Zoöl., Ser. X, Dec., 1913, p. 78 (Rio Cana); Publ. 191, Zoöl., Ser. X, Dec., 1916, p. 266 (Rio Cana), Tuyra Basin, Panama.

Habitat.—Colombia from Santander to the Rio Dagua in west central Colombia and the Rio Tuyra in Panama.

I have been able to examine the types and the following specimens:

Catalog Numbers.	Number of Specimens.	Length in Mm.	Locality.	Collector.
7113*a–j*, C.M. 1382O I.U.M.	41	79 largest	Quebrada Sarjento	Gonzales.
7114*a–b*, C.M., 13821 I.U.M.	5	33–60	Quebrada Alban	Gonzales.
7115*a–b*, C.M., 13822 I.U.M.	4	41–61	Quebrada de la Ropera, Santander	Gonzales.
7105 C.M.,	2	35 and 71	Quebrada de la Hato, Santander	Gonzales.
7106*a–b*, C.M., 13823 I.U.M.	5	58 largest	Guadual	Gonzales.
7108*a–k*, C.M., 13824 I.U.M.	20	50 largest	Villeta	Gonzales.
7109*a–i*, C.M., 13825 I.U.M.	16	60 largest	San Gil, Santander	Gonzales.
7111*a–d*, C.M., 13828 I.U.M.	9	43 largest	Rio Guaduas	Gonzales.
?7112, C.M.	1	39	Quebrada Chamisal	Gonzales.
13829 I.U.M.	1	45	Caldas, Rio Dagua	Eigenmann.

Head 5–6; D. 10.5 or 11.5; A. 8.5 or 9.5; P.8; eye very little in advance of the

middle of the head, interocular 3.5 to 4 in the length of the head; the width of the head equal to its length behind the nasal barbels.

Nasal barbels about reaching the tip of the opercular spines, the maxillary barbels sometimes to the axil; first pectoral ray with its filament about equal to the length of the head, the rays equal to the length of the eye and postorbital portion of the head or a little longer ; origin of the ventrals equidistant from the base of the middle caudal rays and some point in the basal half of the pectorals, their tips reaching the vent in the young, falling short in the adult; origin of anal under the middle of the dorsal, the distance between the base of the last ray and the base of the middle caudal ray five to five and one-half in the length; caudal rounded, six in the length; origin of the dorsal over some point in the last half of the ventrals, equidistant between tip of caudal and middle of pectorals or a little farther forward, its distance from the base of the middle caudal rays 1.8–2.2 in the length.

Sides and back spotted, the spots usually confluent into a narrow median lateral band and into a narrow band above and below the median band. The very young with a narrow black lateral band without other markings.

The above description applies particularly to the types and some of the specimens between Honda and Facatativa, Nos. 7113, 7114, 7106, and some specimens from Santander, No. 7105.

From these typical specimens the following variations were noted. In the specimens from Villeta, No. 7108, also on the line between Honda and Facatativa, the caudal is truncate with rounded outer edges, the origin of the dorsal is equidistant between the tip of the caudal and the opercle or a little farther forward. Some of these specimens are more distinctly spotted than the typical *striatum*, approaching *P. bauneaui*.

In the specimens from Guaduas, also along the line between Honda and Facatativa, and in those from San Gil, No. 7109, the position of the dorsal agrees with its position in those from Villeta, *i. e.*, it is in front of the typical position. In these, the most conspicuous marking is a black lateral band in which the spots are not recognizable. In some of those from San Gil, the band above the median band is also prominent, but it can sometimes be seen that both it and the median band are made up of series of spots. A small specimen from Chamisal, No. 13831, is nearly like them. The origin of the dorsal is median between the tip of the caudal and the base of the opercular spines, the barbel extends nearly to the middle of the pectoral; a narrow black lateral stripe, otherwise plain light.

The specimens from La Ropera are more profusely covered with small spots, their longitudinal arrangement inconspicuous.

In the specimen from Caldas, No. 13829, the origin of the dorsal is equidistant from the tip of the caudal and the opercular spines. The spots along the middle of the sides are conspicuous, but not confluent.

To this species probably also belong the following specimens.

7451*a*, C. M., 13839, I. U. M., 3, largest 60 mm. Quebrada de la Pelada, Santander.

7452*a*, C. M., 13840, I. U. M., 2, larger 41 mm. Quebrada de la Callegona, Santander.

7453*a–b*, C. M., 13841, I. U. M., 3, largest 61 mm. Rio Mogotes, Santander.

7454*a–c*, C. M., 13842, I. U. M., 6, largest 63 mm. Quebrada de Horizonte, Santander.

7455*a–d*, C. M., 13843, I. U. M., 8, largest 67 mm. Quebrada de Suescum, Santander.

These are like the typical specimens of *striatum* described above, but lack all color markings, being uniformly pale.

Very close to *striatum* if not identical with it, is *P. regani*.

42. **Pygidium regani** EIGENMANN. (Plate XLVIII, fig. 5.)

Pygidium regani EIGENMANN, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 696.

? *Pygidium taenia* REGAN (*non* Kner & Steindachner), Ann. & Mag. Nat. Hist. (8), XII, 1913, p. 469 (Rio Sipi and Rio Tamana).

Habitat.—San Juan basin.

13772, I. U. M., one, 55 mm. Tado, Rio San Juan. Purchased from Rosenberg.

Head 6; D. 10.5; A. 8.5; P. 8; eye in middle of the head, interorbital four times in the length of the head.

Nasal barbel as long as the head, reaching beyond axil of pectoral; maxillary barbel reaching to near the end of the lower pectoral ray, considerably longer than the head; outer pectoral ray as long as the head; origin of ventrals equidistant from base of middle ray and tip of opercle, not quite reaching to the vent; origin of anal under posterior half of dorsal, the distance from the base of the last ray to the middle caudal ray contained five and one-half times in the length; caudal six times in the length; origin of dorsal equidistant from tip of caudal and opercular spines, over posterior third of the ventrals, its distance from the middle caudal ray one and four-fifths in its distance from the snout.

A dark streak from opercular spines to middle of caudal; faint spots above and below the lateral stripe.

TABLE OF MEASUREMENTS.

Length over all	55 mm.
Length to base of caudal	47 mm.
Length of head to tip of opercular spines	8 mm.
Distance of origin of dorsal from snout	30 mm.
Distance of origin of dorsal from middle caudal rays	17 mm.
Outer pectoral ray	8 mm.
Maxillary barbel	11 mm.
Nasal barbel	8 mm.
Length of eye	1 mm.
Length of snout	3.5 mm.
Interocular distance	2 mm.

This species is very similar to *striatum*, and may be a synonym of it.

43. **Pygidium retropinne** (Regan).

Trichomycterus retropinnis REGAN, Ann. & Mag. Nat. Hist. (7), XII, Dec., 1903, p. 624 (headwaters of Magdalena east of Papaganat, St. Augustine, Andes of Colombia, 5,000 ft.).

Habitat.—Headwaters of the Rio Magdalena.

"Length of head $5\frac{1}{2}$ times in the total length. Head as broad as long. Diameter of eye about 4 times in the interocular width, which is 3.33 times in the length of the head. Snout as long as the postorbital part of head. Barbels equal to about .8 the length of head. Dorsal with six branched rays, originating above or slightly behind the anal opening, the distance from its point of origin to the caudal 2.4 times in the distance from the former to the tip of the snout. Anal with 4 branched rays, originating below the anterior third of the dorsal, the distance from the base of its last ray to the caudal 5.4 times in the total length. Longest branched ray of the pectoral, .66 the length of the simple outer ray, which is equal to $\frac{5}{6}$ the length of head. Ventrals not quite reaching the anal opening. Caudal truncate-rounded. Brownish, with an indistinct darker stripe along the middle of the side and traces of some dark spots."

"Total length 80 mm."

"A third specimen, 30 mm. in total length, which I have purposely excluded from the above diagnosis, has a well-marked broad longitudinal stripe on each side. In it the longest branched ray of the pectoral is $\frac{5}{6}$ the length of the outer simple ray, and the distance from the origin of the dorsal to the caudal is 2.2 times in the distance from the former to the tip of the snout."

KEY TO THE SPECIES OF PYGIDIUM FROM THE AMAZON TO THE ESSEQUIBO.

From the vast lowland area of the Amazon, Orinoco, and Guiana but few species are known.

a. Origin of the dorsal in front of the vertical from the origin of the anal; maxillary barbel reaching tip

of opercle; snout about 2.5 in the head; nasal barbel reaching not quite to the tip of the maxillary barbel; head nearly as wide as long; eye just in front of middle of the head.

b. Head 6 in the length; the first pectoral ray with its filament equals the length of the head; sides and back with numerous spots, each larger than the eye, in about five series between the dorsal and anal; origin of dorsal equidistant from tip of caudal and eye....44. **guianense** Eigenmann.

bb. Head 5 in the length; first pectoral ray with its filament equals the length of the head without the opercle; uniform yellowish-brown above, lighter below, top of head marbled; origin of dorsal nearer tip of caudal than eye.....45. **conradi** Eigenmann.

aa. Origin of anal under origin of dorsal.

c. Head 6 in the length; maxillary barbel reaching tip of pectoral; upper parts obscurely spotted; origin of dorsal equidistant from tip of caudal and middle of pectoral; eye in anterior half of head.....46. **gracilior** Eigenmann.

cc. Head 7 in the length; maxillary barbel reaching middle of pectoral; eye entirely in anterior half of the head, nearly equal to the interocular and to the snout...47 **amazonicum** (Steindachner).

ccc. Head 5.5 in the length; maxillary barbel reaching tip of last interopercular spine; eye entirely in anterior half of the head, considerably less than the interorbital or the snout; opercular and interopercular bunch of spines alike.....48. **hasemani** Eigenmann.

44. **Pygidium guianense** Eigenmann. (Plate L, fig. 1.)

Pygidium guianense Eigenmann, Ann. Carnegie Mus., VI, 1909, p. 11; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400; Mem. Carnegie Mus., V, 1912, p. 212 (Aruataima Cataract above Holmia.)

Habitat.—Upper Potaro River, British Guiana.

1003, C. M., type, 77 mm. Aruataima Cataract. Eigenmann.

Head 6; depth equals head in length; D. 9; A. 7; eye 4 in snout, 9.5 in head; head nearly as broad as long; maxillary barbel reaching to tip of opercle; teeth in bands of about four irregular series; origin of anal under middle of dorsal; dorsal fulcra extending forward to near the dorsal; caudal rounded; first pectoral ray prolonged in a filament nearly as long as the rest of the ray; round dark spots everywhere, except on belly and lower surface of head; caudal dusky, the margin light.

45. **Pygidium conradi** Eigenmann. (Plate L, fig. 2.)

Pygidium conradi Eigenmann, Mem. Carnegie Mus., V, 1912, p. 212 (Amatuk and Waratuk Cataracts).

Habitat.—Lower Potaro River, British Guiana.

2212, C. M., 41 mm., type. Amatuk Cataract. Eigenmann.

11710, I. U. M., 34 mm., paratype. Waratuk Cataract. Eigenmann.

With the characters given in the key.

The teeth conic.

46. **Pygidium gracilior** Eigenmann. (Plate L, fig. 3.)

Pygidium gracilior Eigenmann, Mem. Carnegie Mus., V, 1912, p. 213 (Erukin).

Habitat.—Lower Potaro River, British Guiana.

1730, C. M., 27 mm., type. Erukin. Eigenmann.

Head 6; depth 9; D. 8; A. 6; eye about 2 in the snout; interorbital a little greater than snout, snout 3 in the head.

Slender, head as broad as long; maxillary barbel reaching tip of pectoral; nasal barbel to origin of pectoral; outer pectoral ray prolonged, about equal to the head in length. Origin of the anal under origin of dorsal; distance from origin of dorsal to origin of caudal 3.5 in the length; length of caudal 5 in the length.

All upper parts obscurely spotted.

47. **Pygidium amazonicum** (Steindachner). (Plate XLVI, figs. 3, 4.)

Trichomycterus amazonicus Steindachner, Flussf. Südam., IV, 1882, p. 29, pl. VI, figs. 4–4*a* (Cudajas).

Pygidium amazonicum Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 53; Occasional Papers Cal. Acad. Sci., I, 1890, p. 338; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Amazon, at Cudajas.

This species is known from the type, a specimen 60 mm. long.

Head a little over 6, equal to the depth; D. 8; A. 7; P. 6; eye entirely in front of the middle of the head; interorbital a little greater than the eye; width of head nearly equal to its length.

Head greatly depressed, caudal peduncle strongly compressed; nasal barbels reaching nearly to gill-opening; maxillary barbel to the end of the first third of the upper pectoral ray, lower barbel to the base of the pectoral; dorsal and anal opposite each other; ventrals very short, 2 in the head; caudal rounded; upper pectoral ray nearly equal to the head.

Chocolate brown, with faint darker spots on the caudal peduncle; rays of dorsal and caudal dotted with violet.

48. **Pygidium hasemani** Eigenmann. (Plate L, fig. 4.)

Pygidium hasemani Eigenmann, Ind. Univ. Studies, No. 20, March, 1914, p. 48.

5238 and 5239, C. M., type and paratypes, many, largest under 18 mm. Santarem. Haseman.

Habitat.—Amazon at Santarem to Bolivia.

76023, C. M., about 16 mm. San Joaquin. Sept. 4, 1909. Haseman.

Head 5.5; D. 7 or 8; P. 6. Eye in anterior half of the head, about five times in the length of the head, less than the snout, about two times in interorbital. Teeth conical, in a single series; maxillary barbel extending to the tips of the interopercular spines; axillary glands large; opercular and interopercular bunches of spines similar, separate from each other; gill-membranes united, free from the isthmus; pectoral very narrow, about equal to the head in length, the first ray prolonged; origin of dorsal over origin of anal, its distance from the base of the caudal two in its distance from the eye or occiput, equidistant from tip of caudal and middle of pectoral; origin of ventrals nearer snout than tip of caudal; caudal rounded, merging into the large accessory rays.

Translucent, with many chromatophores; dusky spots on the back from a short distance in front of the dorsal to the caudal; a dark bar across base of caudal; dark spots, similar to those of the back, from between ventrals and anal to the caudal; a series of minute spots along the middle of the sides; a small spot on opercle, another on the interopercle, a dark line forward from the eye; a minute spot on base of ventrals.

Species from Southeastern Brazil.

The mountain brooks of southeastern Brazil from Rio Grande do Sul to the Rio San Francisco harbor a number of species. One of these, *P. iheringi*, has broad incisors, a number are known to have pointed teeth, while the rest, *nigricans*, *minutum*, *goeldii*, *itatiayæ* and *punctatissimum*, I have not been able to examine. They have the following distribution:

P. minutum	Southern Rio Grande.
P. nigricans	Santa Catherina.
P. davisi	Rio Iguassú, southern São Paulo.
P. proöps	Ribeira, southern São Paulo and Rio Parahyba.
P. iheringi	Ribeira, Santos, and Sapina, São Paulo.
P. paolence	Northern São Paulo.
P. goeldii	Parahyba basin.
P. vermiculatum	Parahyba basin.
P. immaculatum	Parahyba basin; São Matheos; Goyaz.
P. braziliense	? Rio Grande do Sul, ? Rio Ribeira; Rio das Velhas; Rio Doce.
P. itatiayæ	Parahyba basin.
P. triguttatum	Parahyba basin.
P. reinhardti	Burmier, into Rio das Velhas.
P. alternatum	Rio Doce.
P. punctatissimum	Araguay.
P. santæ-ritæ	Rio Preto.

KEY TO THE SPECIES OF PYGIDIUM FOUND IN SOUTHEASTERN BRAZIL.

a. First dorsal ray prolonged in a filament; barbels scarcely reaching the edge of eye; back uniform blackish, lower parts light; D. 11; A. 10; P. 9.....49. **nigricans** (Cuvier & Valenciennes).

aa. First dorsal ray not prolonged; teeth incisors; origin of dorsal equidistant from tip of caudal and a point between the eyes and nasal barbels.

b. First pectoral ray not prolonged, or with only a trace of a projection; first anal ray behind the dorsal; sides and back with numerous spots.....50. **iheringi** Eigenmann.

bb. First pectoral ray usually prolonged; first anal ray under the dorsal; markings conspicuous.

51. **zonatum** Eigenmann.

aaa. First dorsal ray not prolonged; teeth conical.[26]

c. Origin of the dorsal nearer to the tip of the caudal than to the head, or sometimes equidistant between tip of caudal and occiput in *P. paolence*.

d. Origin of the anal under the second dorsal ray, last dorsal ray over middle of anal; origin of ventrals nearly equidistant from tip of caudal and snout; eye in anterior half of the head, near the posterior nares; head 5.5–6; D. 9; A. 7–9.....52. **proöps** (Ribeiro).

dd. Origin of the anal under the middle of the dorsal, last dorsal ray over third anal ray; origin of ventrals nearer to tip of caudal than to tip of the snout; eye just in front of the middle of the head; head six times in length.

e. D. 8.5; A. 6.5; many faint spots, a dark streak along the middle of the sides, another above it.....53. **paolence** Eigenmann.

ee. D. 9.5; A. 8.5; a broad lateral band with serrate edges; a series of spots below it and another above it.....54. **reinhardti** Eigenmann.

ddd. Dorsal opposite the space between ventrals and anal. (See No. 59 *goeldii*.)

cc. Origin of the dorsal equidistant between the tip of the caudal and some point near the eye.[27]

f. Pectoral ray without a filament; origin of ventral nearer snout than tip of caudal; origin of anal under posterior part of dorsal; color variable; D. 7; A. 5..55. **davisi** Haseman.

ff. First pectoral ray usually prolonged as a filament.

g. Color plain; anal behind the dorsal; origin of ventral nearer snout than tip of caudal; caudal very slightly emarginate; eye in the middle of the head; D. 11.5–13; A. 9.5–10.5.....56. **immaculatum** Eigenmann & Eigenmann.

gg. Variously marked.

h. Origin of the anal under posterior half of the dorsal.

i. *Origin of the dorsal over the origin of the ventrals;* origin of the ventrals nearer tip of caudal than eye; ventrals reaching anal; D. 8.5; A. 8.5; eye in middle of head; sides and back profusely covered with confluent spots, leaving the ground-color in irregular vermiculations. See also *punctatissimum*.

57. **vermiculatum** Eigenmann.

ii. Origin of the dorsal behind the origin of the ventrals.

j. Sides and back with large spots, sometimes alternating across the back; origin of ventrals equidistant from snout and middle of caudal; distance between origin of dorsal and caudal about 1.5 in distance of dorsal from the snout; caudal subtruncate; D. 10.5–11.5; A. 7.5 or 8.5.

58. **alternatum** Eigenmann.

[26] Not examined in *P. minutum, nigricans, goeldii*, and *punctatissimum*.

[27] Not examined in *P. goeldii*.

jj. With ill-defined spots; origin of ventrals equidistant from snout and tip of caudal; caudal rounded; distance between origin of dorsal and caudal twice in its distance from the snout; D. 10; A. 7.

59. **goeldii** (Boulenger).

jjj. With small spots and vermiculations; origin of ventrals equidistant from snout and tip of caudal; distance between origin of dorsal and caudal 1.66–1.75 in distance of dorsal from the snout; D. 10.5 or 11.5; A. 7.5 or 8.5.....60. **brasiliense** (Reinhardt).

jjjj. A dark lateral band, spots above and below it; origin of ventrals a little nearer snout than to tip of caudal; distance between origin of dorsal and caudal 1.8 in distance of dorsal from the snout; caudal truncate.

61. **itatiayæ** (Ribeiro).

hh. Origin of the anal behind the vertical from the last dorsal ray, the dorsal opposite the space between the ventral and anal, its origin equidistant from snout and tip of caudal, or nearer one or the other; origin of ventrals nearer the snout than to the tip of the caudal; interopercle with about seven spines in a bunch similar to that of the opercle; a series of dots along the middle of the sides, another along the back and another between the two.....62. **triguttatum** Eigenmann.

ccc. Origin of dorsal equidistant from tips of snout and caudal; pectorals without filaments; dorsal entirely in front of the anal.

k. Sides and back with minute dark specks and vermiculations between them; origin of dorsal over origin of ventrals.....63. **punctatissimum** (Castelnau).

kk. Pale brown above with three longitudinal series of squarish brown blotches; origin of dorsal over middle of ventrals; head 4.5 in the length.....64. **minutum** (Boulenger).

cccc. Origin of dorsal nearer snout than to tip of caudal.

l. Nasal barbels not quite reaching eye, maxillary barbel little beyond posterior margin of the eye; dorsal entirely in front of anal; sides with large blotches. Head four times in the length; a long patch of interopercular spines; pectoral ray not prolonged.

65. **santæ-ritæ** Eigenmann.

ll. Nasal barbels reaching beyond origin of eye; pectoral ray prolonged.

m. Interopercle with a long patch of spines; pectoral ray prolonged. (*See P. alternatum*, No. 56.)

mm. Interopercle with about seven thorns in a patch similar to that of the opercle; end of dorsal over anus; pectoral ray much prolonged. (See *P. triguttatum*, No. 60.)

49. **Pygidium nigricans** (Cuvier & Valenciennes.)

Trichomycterus nigricans Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 1846, p. 494; ? Gay, Hist. Chile, 1848, p. 311 (Chile); Günther, Cat. Fishes Brit. Mus., V, 1864, p. 274 (copied); Ribeiro, Fauna Braziliense, Peixes, IV (A), 1912, p. 220.

Pygidium nigricans Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 53; Occasional Papers Cal. Acad. Sci., I, 1890, p. 338; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Santa Catherina, Brazil.

Valenciennes's description of the only specimen known, 140 mm. long, is very brief, and I am afraid that it is in part misleading.

"D. 11; A. 10; P. 9; barbels short, scarcely reaching beyond the eyes; caudal peduncle short and deep; caudal small, truncate, 'le premiere rayon de la dorsal alongé en fil.'

"Back uniform blackish, lower parts light."

50. **Pygidium iheringi** Eigenmann. (Plate L, fig. 5.)

Pygidium iheringi Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 697.

Trichomycterus punctulatus (non Cuvier & Valenciennes) Ribeiro, Arkiv. för Zoölogie, IV, No. 19, 1908 (Iporanga).

Trichomycterus dispar (non Tschudy) Ribeiro, Kosmos, V, 1908, and Fauna Brasiliense, IV (A), 1912, p. 222 (Rio Iporanga, São Paulo).

Habitat.—São Paulo in coastal streams and the Paraná basin.

7071, C. M., two, 151–160 mm. Sapina, São Paulo. July 3, 1908. Haseman.

10785, I. U. M., four, 140–161 mm. Santos. Von Ihering, the largest the type.

Allied to *P. punctatissimum* from the Araguay.

Head 4.5–5 in the length; D. 11.5 or 12.5; A. 7.5 or 8.5 counting the two rudimentary rays in each case; P. 8; width of head equal to its length behind the nasal barbel; eye in middle of the head, interorbital 3.5–4 in the length of the head. Teeth incisors with slightly expanded tips, in bands of four or five series.

Nasal barbels reaching about to middle of eye, axillary barbel to above middle of operele; pectoral rounded, very little longer than snout and eye, the first ray not prolonged or with only a trace of a projection; distance between origin of ventrals and eye a little greater or less than that between origins of ventrals and middle caudal rays; the ventrals as long as the snout, not nearly reaching vent, nearly halfway to the anal; origin of anal on, or behind, the vertical from the base of the last dorsal ray; distance between bases of last anal ray and middle caudal rays five or a little over five in the length; caudal slightly rounded, seven to seven and a half in the length; dorsal low and long, the distance between its origin and the base of the middle caudal ray about one and a third in its distance from the snout, its first ray over posterior half of the ventrals.

Sides and back with numerous spots, smallest over pectorals, largest over dorsal, rarely coalescent.

51. **Pygidium zonatum** sp. nov. (Plate LI, fig. 1.)

7596, C. M., *a*, the type, 62 mm., *b* and *c*, paratypes, 50 and 55 mm. Agua Quente. Nov. 27, 1908. Haseman.

7595, C. M., paratype, 60 mm. Cubatão, seven miles west of Santos, São Paulo, Brazil. Aug. 1, 1908. Haseman.

In all but the teeth and color very similar to *P. davisi*.

Head 5; depth 6–6.5; D. 10; A. 7 or 8; P. 7 or 8; eye three times in the snout, seven to seven and one-half times in the head, two times in the interocular, exactly in the middle of the head or a little in front of it; posterior nares more than an orbital diameter from the eye; three rows of narrow incisors in each jaw. The teeth of the paratypes nearly conical.

Maxillary barbel reaching to near tip of last interopercular spine or to tip of opercular spines, the nasal barbel but little shorter; head pointed, but little longer than broad; gill-openings extending forward to below the anterior interopercular spines. First pectoral ray but slightly, if at all, prolonged, its length with the filament equal to the head without the opercular spines; origin of ventrals about equidistant from the snout and the middle of the caudal; origin of anal under penultimate, or fourth from last, dorsal ray; distance between bases of last anal ray and middle caudal rays four and one-half to five in the length; caudal truncate; origin of dorsal over last third of the ventrals, its distance from the base of the middle caudal rays 1.5–1.75 in its distance from the snout.

Color-markings coarse and conspicuous. In No. 7595 C. M., five obscure bars across the back in front of the dorsal, slightly emphasized at their lower ends on the middle of the sides; three similar bars behind the dorsal; a dark line from anterior to posterior nares. In the specimens from Agua Quente a dark lateral band broken toward the caudal in the smallest. Back and lower part of the sides with conspicuous spots.

52. **Pygidium proöps** (Ribeiro). (Plate LI, fig. 2.)

Tricomycterus proöps Ribeiro, Kosmos, V, 1908, fig. 4; Fauna Brasiliense, Peixes, IV (*A*), 1912, p. 221, pl. XL, fig. 1.

Habitat.—Ribeira de Iguapé, southern São Paulo, Brazil, and Rio Parahyba. Known from the types, and from

7593, C. M., one, 60 mm. Agua Quente, Ribeira Basin. Nov. 27, 1908. Haseman.

7598, C. M., one 32 mm. São João da Barra, Rio Parahyba. June 22, 1908. Haseman.

Head 5.5–6; depth 7; D. 9; A. 7–9; P. 7; posterior margin of eye slightly in advance of the middle of the head, diameter of eye two times in the snout, six and one-half in the head, over one and one-half in the interorbital; posterior nares close to the eye, their posterior margin on a line with the anterior margin of the eye;

teeth conical, in very narrow bands; nasal barbels reaching to the base, maxillary barbels to the tips of the opercular spines; first pectoral ray not prolonged, pectoral equal to the length of the head without the snout; origin of ventrals equidistant

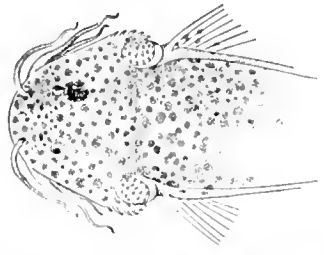


Fig. 16. *Pygidium proöps* (Ribeiro). No. 7593 C.M. ERRATA

from tip of snout and tip of caudal; origin of anal under second or third dorsal ray; distance between last ray of anal and base of caudal five and one-third times in the length; caudal rounded; distance between origin of dorsal and caudal two and one-half times in its distance from the snout.

Back, sides, dorsal and caudal densely spotted.

The above description is based on the specimen from Agua Quente and Ribeiro's account; the smaller specimen from the Parahyba has:

Head 5; depth 8; D. 10; A. 9; P. 5; first pectoral ray considerably prolonged; origin of ventrals equidistant from tip of caudal and pre-opercle. Sides and back finely marbled, a faint dusky, lateral line, and another above it. Its prolonged first pectoral ray and narrow pectoral, with but five rays indicate a distinct variety, which may be called *parahybæ*, var. nov.

53. **Pygidium paolence** Eigenmann. (Plate LI, fig. 3.)[28]

Pygidium paolence Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 698.

Very close to *Trichomycterus proöps* Ribeiro.

7081, C. M., type, 68 mm. Alto da Serra, Rio Tieté, São Paulo. July 25, 1909. Haseman.

7597, C. M., paratype, 61 mm. Rio Paranahyba bridge. Aug. 15, 1908. Haseman.

Head 5.33–6; D. 8.5; A. 6.5–8 not counting hidden rudiments, D. 10.5 and A. 8.5 with the rudiments; P. 6 or 7; head nearly as wide as long; eye in anterior half of the head, greater than its distance from the posterior nares; snout 2.33–2.5 in the length of the head, interocular 3–3.5; teeth conic; nasal barbel reaching base or tip of opercular spines, maxillary barbel reaching tip of opercular spines or a little farther; outer pectoral ray with its filament equal to head behind the posterior

[28] The head is too short in this drawing.

nares, the filament extending very little beyond the other rays; ventrals nearly reaching anal, their origin nearer caudal than to tip of pectorals; caudal rounded, six in the length; origin of anal under middle of dorsal, distance between the base of its last ray and the middle caudal ray 5.2 in the length; origin of dorsal equidistant from base of middle caudal rays and middle of pectorals, its last ray over the middle of the anal, the distance between the origin of the dorsal and the base of the middle caudal rays two in the distance between dorsal and snout in the type, 1.66 in the paratype.

With many faint spots about as large as the eye; in the type a dark streak along the middle of the sides, another along the side of the back, and a third along the edge of the belly.

This species is similar in appearance to *P. striatum*, from which it differs in the position of the ventrals, the pectoral filaments, etc.

7117*a–j*, C. M., ten, 25–30 mm. Mogy das Cruces, Rio Tieté, July 20, 1908.

These minute specimens came from near the type locality of *P. paoleuce* and are probably the young; the ventrals do not reach the vent; there is a series of minute spots along the sides, nearly confluent anteriorly; a series of larger spots above it on the sides of the back and a series along the middle of the back.

54. **Pygidium reinhardti** Eigenmann. (Plate LI, fig. 4.)

Pygidium reinhardti EIGENMANN, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 699.

7078, C. M., one, 65 mm. Burmier on the Rio Itabira, a tributary of the Rio das Velhas. May 14, 1908. Haseman.

Mr. Haseman notes that this is the only species he secured at the particular locality where the only specimen of the present species was collected.

Head 6.5; D. 9.5; A. 8.5, counting the minute rudimentary rays in both dorsal and anal; P. 6; eye in anterior half of head; interocular three times in the head. Teeth conic.

Nasal barbel nearly as long as the maxillary barbel, which reaches the edge of the gill-membrane. First pectoral ray with its filament equal to the length of the head, much longer than the divided rays; ventrals reaching beyond the vent, their origin very little nearer tip of pectorals than base of middle caudal rays; origin of anal under middle of dorsal; distance between the base of the last anal ray and the middle caudal rays five and a half in the length; caudal narrow, a little longer than the head, the accessory rays inconspicuous; origin of dorsal over middle of ventrals, its distance from the middle caudal rays nearly two in its distance from the snout (19 and 36 mm. respectively).

A broad, dark stripe with notched edges from opercle to middle of caudal, bordered above and below by light bands; an irregular series of spots below the lower light band; a series of small spots more or less confluent forming a narrow, dark stripe above the upper light band; back and fins lightly spotted, a short dark bar in front of the opercle, a longer one above middle of pre-opercle.

55. **Pygidium davisi** Haseman. (Plate LI, fig. 5.)

Pygidium davisi Haseman, Ann. Carnegie Mus., VII, 1911, p. 380, pl. LXXVII, fig. 1, and pl. LXXVII.

Habitat.—Coastal streams of southern São Paulo.

2862, and2 861, C. M., type and paratypes. Rio Iguassú near Serrinha Paraná. Dec. 23, 1908. Haseman.

7116*a–d*, C. M., 52–60 mm. Morretes, Paraná, Brazil. Jan. 4, 1909. Haseman.

Head 5.5; D. 7; A. 5 without the imbedded rays; D. 10; A. 9 with the imbedded rays; P. 8; eye slightly in advance of the middle of the head; interocular four times in the length of the head; teeth conic.

Nasal barbel as long as the labial barbel, extending to the base of the opercular spines, maxillary barbel to their tips; pectorals shorter than the head, the first ray not prolonged; origin of ventrals equidistant from tip of snout and tip of caudal or nearer the former, not reaching the vent; origin of anal under the posterior part of the dorsal, the distance between its last ray and the base of the middle caudal rays about five in the length; caudal subtruncate, five and one-half in the length; origin of the dorsal over last half of the ventrals, equidistant between the tip of the caudal and the nasal barbels or eye; the distance between it and the caudal one and six-tenths in its distance from the snout.

Uniform light or dark, or mottled, sometimes with a dark lateral band with one or more series of blotches above it.

56. **Pygidium immaculatum** Eigenmann & Eigenmann. (Plate LII, fig. 1.)[29]

Pygidium immaculatum Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889 (Juiz de Fora; São Matheos; Goyaz); Occasional Papers Cal. Acad. Sci., I, 1890, p. 337; Eigenmann, Report Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Trichomycterus immaculatus Ribeiro, Fauna Brasiliense, IV (*A*), 1912, p. 222.

Habitat.—Rios Parahyba and Doce. Goyaz.

7076*a–b*, C. M., two, 81–93 mm. Rio Doce. May 24 and 25, 1908. Haseman.

[29] The head is a little too short in the figure.

Head 4.75–5; D. 11.5–13; A. 9.5–10.5; P. 8 or 9; eye in the middle of the head or very nearly so, interocular 4–4.5 in the head. Teeth conic.

Nasal barbels extending to the middle of the interopercle, maxillary barbel about to opercular spines; pectorals but little longer than snout and eye, the first ray with its filament equal to head behind the nasal barbel; ventrals reaching vent, their origin very little nearer caudal than to eye; origin of anal just behind the vertical from the base of the last dorsal ray or under the penultimate ray, distance between the base of its last ray and the base of the middle caudal ray four and a half to five times in the length; caudal very slightly emarginate, about seven times in the length; origin of dorsal over posterior part of the ventral, its distance from the base of the middle caudal rays one and two-thirds times in its distance from the snout.

Sides and back uniform, without trace of spots or vermiculations; middle caudal rays dusky.

57. **Pygidium vermiculatum** Eigenmann. (Plate LII, fig. 2.)

Pygidium vermiculatum EIGENMANN, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 699.

Pygidium brasiliense (*non* Lütken) RIBEIRO (*partim*), Fauna Brasiliense, IV (A), 1912, p. 225 (the specimens from Juiz de Fora).

Habitat.—Rio Parahyba.

7074, C. M., one, 131 mm. Juiz de Fora. June 9, 1908, presented by Dr. Ribeiro.

In general appearance like Lütken's figure of *brasiliense*, differing notably in the position of the ventrals.

Head 5.4 in the length; D. 8.5; A. 8.5 (counting in each case the two rudimentary rays); P. 7; width of the head nearly equal to its length; eye in middle of the head, interorbital three in the length of the head. Teeth conic, in bands.

Right nasal barbels reaching to above base of the opercular spines, maxillary barbels of right side nearly as long as head, reaching to the second fourth of the pectoral, both shorter on left side; pectoral rather narrow, the outer ray much prolonged, as long as the head behind the nasal barbel, the fin without the filament equal to the part of the head behind a point midway between eye and posterior nares; origin of ventrals under origin of dorsal, equidistant between base of middle caudal rays and last third of pectorals, ventrals reaching much beyond vent, almost to anal, as long as the snout; origin of anal under penultimate ray of the dorsal, distance between the base of its last ray and the base of the middle caudal ray a little more than five in the length; caudal rounded, six and one-third in the length; dorsal short, rounded, the distance between its origin and the base of the

middle caudal rays one and sixty-seven hundredths in the distance between its origin and the snout.

Sides and back profusely covered with confluent spots, which leave the light color as irregular vermiculations.

58. **Pygidium alternatum** Eigenmann. (Plate LII, fig. 3.)

Pygidium alternatum Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 700.

Pygidium brasiliensis Eigenmann & Eigenmann (*partim*), Proc. Cal. Acad. Sci. (2), II, 1889, p. 51; id. (*partim*), Occasional Papers Cal. Acad. Sci., I, 1890, p. 332; Ribeiro (*partim*), Fauna Brasiliensis, IV (*A*), 1912, p. 223.

Habitat.—Rio Doce.

It is possible that the young specimens of *P. brasiliensis* mentioned by Eigenmann & Eigenmann belong to this species.

7079, C. M., type and paratypes, sixty-seven, largest 81 mm. Rio Doce, May 25, 1908. Haseman.

7080, C. M., eleven, largest 49 mm. Rio Doce, May 25, 1908. Haseman.

7601*a*, C. M., 26 mm. Jacarehy, July 15, 1908. Haseman.

Head 5–5.5; D. 10.5–11.5; A. 7.5 or 8.5 counting the rudimentary rays; P. 7 or 8; eye in middle of the head or slightly farther forward; interocular 3–3.33 in the length of the head. Teeth conic, in bands.

Nasal barbel very little shorter than maxillary barbel, which reaches to the base of the pectoral and is as long as the head; pectoral rays equal to length of head behind the nasal barbels, the first ray with the filament longer than the head; ventrals reaching to, or just beyond, vent; origin of ventrals equidistant from base of middle caudal rays and a point between the posterior nares and the area just behind the eyes; origin of anal under posterior part of dorsal; distance between base of last anal ray and middle caudal rays four and a half to five and a third in the length; caudal subtruncate or rounded, very little longer than head; origin of dorsal over posterior half of ventrals; distance between origin of dorsal and base of middle caudal rays 1.54 in its distance from the snout.

Ten to fourteen large spots along the middle of the sides, an irregular series of much smaller ones below it. Large spots above the median series, frequently alternating with it, sometimes partly confluent into a longitudinal series, sometimes forming with a mid-dorsal series irregular bars across the back.

As the specimens, No. 7079, ranging up to 81 mm., are essentially alike in color and entirely different from the specimens of both smaller and larger size (74–120 mm.) from the same place referred to *P. brasiliense*, No. 7075, they have been

separated from the latter species. They may be identical with some of the younger specimens of *P. brasiliense* mentioned by Eigenmann & Eigenmann in the papers quoted above.

The specimens, No. 7080, are much shriveled but probably belong to this species.

59. **Pygidium goeldii** (Boulenger).

Trichomycterus goeldii BOULENGER, Ann. Mag. Nat. Hist. (6), XVIII, 1896, p. 154.

Habitat.—Colonia Alpina, Therezopolis, nearly 2,600 ft., near Rio de Janeiro.

I give the original description of Boulenger, *l. c.*:

"Head much depressed, as long as broad, six times in total length; eye small, midway between end of snout and opercular border, its diameter half interorbital width; upper maxillary barbel reaching the pectoral; gill-membranes narrowly joined to the isthmus, extending forward to below the eyes. Body as deep as broad; caudal peduncle strongly compressed, twice as long as deep. Dorsal with 10 rays, opposite to the space between ventrals and anal, twice as distant from the end of the snout as from the caudal; anal with 7 rays. Pectorals with the outer ray produced, filiform. Ventrals equally distant from the end of the snout and the posterior border of the caudal fin; latter rounded. Yellowish, with ill-defined brown spots above. Total length 99 millim."

60. **Pygidium brasiliense** (Reinhardt).

Trichomycterus brasiliensis REINHARDT MS. *in* Lütken, Övers. Dansk. Vidensk. Selsk., 1879, No. 3, p. 29 (Rio das Velhas); LÜTKEN, Velhas Flodens Fiske, p. 15, *in* Vidensk. Selsk. Skr. (5), Afd., XII, 1875, pp. 135 and I, pl. III, fig. 8 (Rio das Velhas); ? BOULENGER, Proc. Zoöl. Soc. London, 1891, p. 235 (Rio Grande do Sul); RIBEIRO, Kosmos, 1908 (Ribeiro); Archiv. Mus. Nac. Rio de Janeiro, XIII, 1906 (p. 7 of reprint); Fauna Brasiliense, Peixes, IV (*A*), 1912, p. 223, Arch. Mus. Nac. Rio de Janeiro, XVI.

Pygidium brasiliensis EIGENMANN & EIGENMANN (*partim*), Proc. Cal. Acad. Sci. (2), II, 1889, p. 51; Occasional Papers Cal. Acad. Sci., I, 1890, p. 332; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Trichomycterus brasiliensis tristis LÜTKEN, *l. c.*, p. 138, with figure, and p. I.

Habitat.—Rios das Velhas and Doce south to Ribeira do Iguapé and ? Rio Grande do Sul.

7594, C. M., four, 71–87 mm. Rio das Velhas. May 13, 1908. Haseman.

7550, C. M., one, 133 mm. Burmier. May 14, 1908. Haseman.

7075, C. M., fourteen, 74–120 mm. Rio Doce. May 25 and 27, 1908. Haseman.

Head 4.75–5 in the length; D. 10.5 or 11.5; A. 7.5 or 8.5 counting the rudimentary rays; P. 7; width of head very nearly equal to its length; eye in the middle of the head or partly in the anterior half; interocular 3–3.33 in the length of the head. Teeth conic.

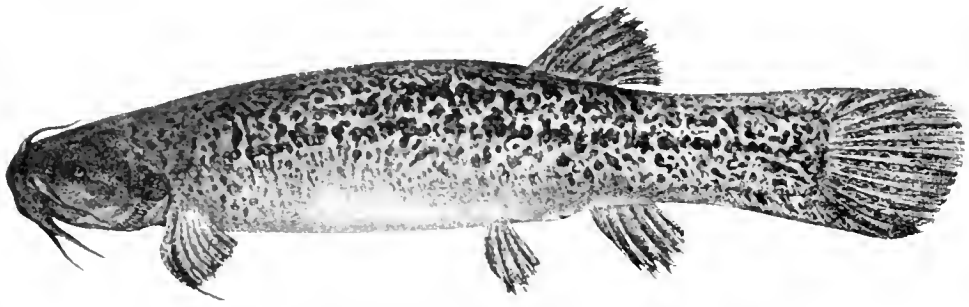


Fig. 17. *Pygidium brasiliense* (Reinhardt). After Lütken.

Nasal barbels extending to a point above the end of the interopercle, maxillary barbel to the gill-opening, or very little shorter or longer; pectoral a little longer than snout and eye, the first ray being very little prolonged in the smallest, equal to the length of the head less the opercle in the largest; origin of ventrals equidistant from base of middle caudal rays and base of pectoral in the specimen from Burmier, or to a point between the eyes and the opercle in the others, reaching very little beyond the vent, about two-thirds to anal, or to the anal in the specimen from Burmier; origin of anal below posterior half of dorsal, the distance between the base of its last ray and the base of the middle caudal rays four and two-thirds to five and a quarter in the length; caudal rounded, five and a half to six and a half in the length; origin of dorsal over posterior half or end of ventrals, the distance between its origin and the base of the middle caudal rays one and two-thirds to one and three-fourths times in the distance between its origin and the snout.

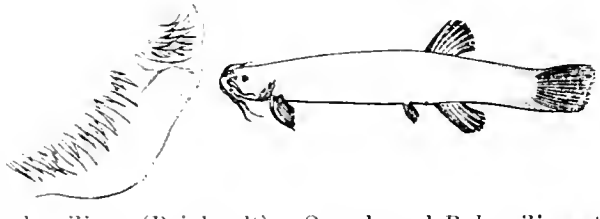


Fig. 18. *Pygidium brasiliense* (Reinhardt). Opercle and *P. brasiliense triste* (Lütken).

The color in the specimens from the Rio Doce is the same. Back and sides with numerous spots and vermiculations, the spots forming an irregular dark line along the middle of the sides in front. The spots and vermiculations are a little finer than in Lütken's figure of *brasiliensis*. In the specimens from Burmier and the Rio das Velhas there is a distinct median lateral band, the markings below it being coarse. In the largest the lateral band becomes obscure.

61. **Pygidium itatiayæ** (Ribeiro).

Trichomycterus brasiliensis itatiayæ RIBEIRO, Archives Mus. Nac. de Rio de Janeiro, XIII, 1906, p. 8, pl. I; Fauna Bras., IV (*A*), 1912, p. 223.

Habitat.—Itatiaya, Serra da Mantiqueira.

Caudal subtruncate; head longer than broad; last ray of the dorsal over the fourth of the anal; a dark lateral band.

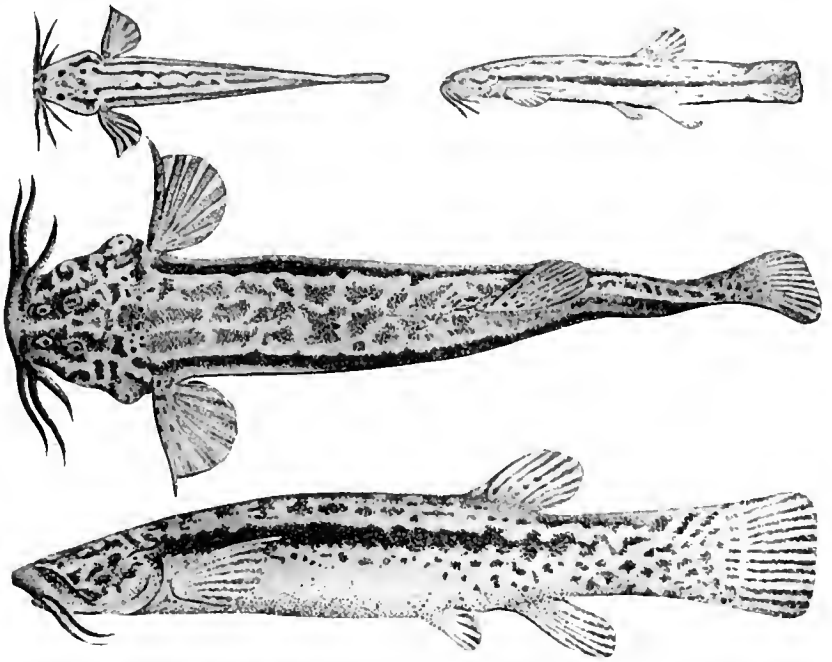


FIG. 19. *Pygidium itatiayæ* (Ribeiro), adult and young. After Ribeiro.

62. **Pygidium triguttatum** spec. nov. (Plate LII, fig. 4.)

7600, C. M., *a* the type 36 mm., *b* to *e*, paratypes 26–34 mm. Jacarehy. July 14 and 15, 1908. J. D. Haseman.

Readily distinguished by the few spines in the interopercle.

Head 5–5.5; D. 8 or 9; A. 6 or 7.5; P. 6; eye in anterior half of the head, 2 in the snout, 6 in the head, about 1.5 in the interorbital; teeth pointed, in very narrow bands; gill-openings reaching forward to below the eye; nasal barbels reaching to tip of opercular spines, or but little beyond the eye; maxillary barbels to the base of the opercular spine or to the axil; pectorals lanceolate, the first ray much prolonged, one and a third times as long as the head in the type, longer than the head in all but one of the paratypes; origin of ventrals equidistant from snout and middle of caudal; tips of ventrals reaching anus in two of the specimens, falling considerably short of the anus in the rest; origin of anal behind the dorsal; distance between last anal ray and caudal 5–5.5 in the length; caudal rounded, but few inconspicuous

accessory rays; distance from origin of dorsal to base of middle caudal rays 1.2–1.4 in the distance between snout and dorsal; distance from origin of dorsal to tip of caudal sometimes less, sometimes greater, than its distance from the snout.

A row of small spots along the middle of the sides, another along the middle of the back and a third between the two.

63. **Pygidium punctatissimum** (Castelnau). (Plate XLV, fig. 1.)

Trichomycterus punctatissimus Castelnau, Anim. Nouv. Am. Sud., 1855, p. 49, pl. 24, fig. 3, Günther, Cat. Fishes Brit. Mus., V, 1864, p. 272; Ribeiro, Fauna Braziliense, Peixes, IV (*A*), 1912, p. 221.

Pygidium punctatissimum Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 52; Occasional Papers Cal. Acad. Sci., I, 1890, p. 334; Proc. U. S. Nat. Mus., XIV, 1891, p. 36; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—Rio Araguay.

Known from the types, with the characters given in the Key.

64. **Pygidium minutum** (Boulenger).

Trichomycterus minutus Boulenger, Proc. Zoöl. Soc. Lond., 1891, p. 235, pl. XXVI, fig. 3.

Pygidium minutum Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 399.

Habitat.—San Lorenzo district, southern Rio Grande do Sul.

Fig. 20. *Pygidium minutum* (Boulenger). After Boulenger.

Head 4.5; D. 8; A. 6; eye a little in advance of the middle of the head, 1.5 in the interorbital; gill-opening not continued forward to below the eye; maxillary barbels three-fifths the length of the head, not reaching the gill-opening; nasal barbels extending to the eye; dorsal entirely in front of the anal; origin of dorsal midway between snout and tip of caudal; caudal rounded. Pale brown above, with three longitudinal series of large squarish brown blotches. Fins immaculate, the largest 40 mm.

65. **Pygidium santæ-ritae** sp. nov. (Plate LII, fig. 5.)

7599, C. M., type, 24 mm. Santa Rita, Rio Preto. July 10, 1908. Haseman.

Head 4; D.11; A. about 9; P. 8; eye very nearly in the middle of the head; about two in the snout, five in the head, a little less than interorbital; teeth pointed, in a single series or in a very narrow band; gill-openings extending to below the middle of the eye; nasal barbel extending but little beyond posterior nares; maxillary barbels to middle of interopercle; outer pectoral ray not prolonged, a little less than head; origin of ventrals equidistant from snout and middle of caudal; anal entirely behind the dorsal, distance between its last ray and the caudal 4.5 in the length; caudal rounded, 5 in the length; distance between origin of dorsal and caudal equal to distance between dorsal and the middle of the eye.

Sides with large spots.

In the length of the barbels and the color this species agrees very closely with *P. minutum* from southern Rio Grande do Sul, with which it may be synonymous. It differs in its longer head, the forward extent of the gill-opening, the more anterior position of the dorsal. While the number of fin-rays as given differs, not much weight attaches to this. I have endeavored to count all of the rudiments.

Genus V. EREMOPHILUS[30] Humboldt. (Plate XXXVI; Plate XL, figs. *A*, *B*.)

Eremophilus sive *Thrichomycterus* Humboldt, Rec. d'Obs. Zoöl. et Anat., I, 1805, p. 17, pl. 6, reprinted in 1912, title-page 1911.

Trachypoma GIEBEL, Zeitschr. Gesellsch. Naturw., III, 1871, p. 97 (type *marmoratum* = *mutisii*).

Type.—Eremophilus mutisii Humboldt.

Like *Pygidium*, but without ventrals.

1. **Eremophilus mutisii** Humboldt. (Pl. XLI, figs. 1, 2; Pl. LIV, figs. 1, 2.)

Eremophilus mutisii HUMBOLDT, *l. c.*, I, 1805, p. 17, pl. 6; VALENCIENNES, *in* Humboldt, II, 1835, p. 340; CUVIER & VALENCIENNES, Hist. Nat. Poiss., XV, 1846, p. 500, pl. 553 (Bogotá); GÜNTHER, Cat. Fishes Brit. Mus., V, 1864, p. 275; EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 53; Occasional Papers Cal. Acad. Sci., I, 1890, p. 339; Proc. U. S. Nat. Mus., XIV,

[30] ἐρημοφίλης, ὁ = loving solitude (of the mountain lakes and streams).

"Je l'ai nommé *érémophile*, à cause de la solitude dans laquelle il vit à de si grandes hauteurs, et dans des eaux qui ne sont presque habitées par aucun autre être vivant. Les naturalists qui craignent que de nouvelles espèces de ce même genre ne viennent a être découvertes dans des situations très-différentes, pourroient changer le nom *d'érémophile* en celui de *thrichomycterus*, tiré des barbillons attachés au nez de ce poisson."

1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400; Indiana University Studies, No. 23, Sept., 1914, p. 230.

Trachypoma marmoratum Giebel, *l. c.*

Habitat.—Plain of Bogotá and north of it for a short distance.

5046*a–p*, C. M.; 12840, I. U. M., many, largest 325 mm. Ponta de Suba, north of Chapinero. Eigenmann.

5049, C. M., two, largest 300 mm. Laguna near Bogotá (bought in the market). Eigenmann.

5048*a–k*, C. M.; 12841, I. U. M., twenty-two, largest 210. Herrera. Eigenmann.

5047*a–h*, C. M.; 12842, I. U. M., sixteen, largest 270 mm. Madrid. Eigenmann.

7445*a*, C. M.; 13834, I. U. M., two, 142 and 165 mm. Rio Chiquinquiere, Boyaca. Gonzales.

7446*a*, C. M., one, 220 mm. Rio Bogotá. Gonzales.

13836, I. U. M., three, 130–160 mm. Rio Funjuelo at Usme Sur near Bogotá.

Head 5.33–6; depth 5–6.33; D. 11.5; A. 9.5; P. 8; head pointed, a little longer than wide; center of the eye very little in advance of the center of the head; interocular three times, or a little more, in the head; teeth conical, in three to five rows; gill-openings not extending forward to below the eye; a very narrow free membrane across the isthmus.

Nasal barbel extending to the base of the opercular spines or shorter; maxillary barbel extending very little if any further than the nasal barbels; pectoral 1.5–2 in the head, its first ray sometimes very slightly produced, origin of anal about under the middle of the dorsal, the distance between the last ray and the middle caudal rays 4.5–5.5 in the length; depth of caudal peduncle 1.25–1.5 in its length, .66–.8 in the greater depth; caudal very broad and short, its length seven or more in the length; origin of dorsal nearly equidistant from tip of caudal and the head, its distance from the base of the middle caudal rays 1.8–2 in its distance from the snout.

Blackish, everywhere with well-defined but irregular spots or vermiculations. The black background most abundant above, the light vermiculations predominant below. In some specimens the dark predominates everywhere, the light being reduced to spots, or vermiculations, in others the light predominates; in the young there is a narrow dark median stripe, and the dark of the caudal peduncle consists of a few irregular spots, on the back in front of the dorsal the typical color of the adult obtains. Very variable.

The specimens from the Rio Funjuelo deserve special mention.

The largest measures a few millimeters over 160; it is not possible to give

the exact length, owing to the curves. This specimen is without pigment. The eye is apparent only on account of the lens and its overlying hyaline skin. The eye measures 2 mm. in diameter. This measurement is taken with the skin removed. The eye is not pigmented.

Another specimen measures 130 mm. It is also without pigment except in the eye. The eye seems to be fully pigmented and measures about 2 mm.

The third specimen measures 133 mm. The caudal and all but a small patch on the dorsal surface of the caudal peduncle are without pigment. The region from the caudal peduncle to the head is pigmented, but much more sparingly than in normal specimens, and there are irregular pigment-free spots. The sides of the head behind the eyes are free from pigment, the dorsal surface of the head and snout are again pigmented. The eye is normally pigmented and measures a little less than 2 mm.

These specimens seem to be identical with the normal "Capitan" in all respects except the color.

As stated elsewhere, the "Capitan" is a fish of considerable importance on the plains of Bogotá. The fish are caught with long-handled dip-nets several feet in diameter. The net is held in a slanting position by one man, one or several others drive the fishes into the net by beating the water. From time to time the net is raised and the fish removed. We supplemented this method by having the Indians drag a small seine, which yielded many smaller specimens. All we caught were about 80 mm. long or longer, *i. e.*, we caught no very young ones. The Indians also secured specimens by thrusting their hands and arms into the holes in the banks. It has heretofore been recorded exclusively from the Plains of Bogotá. Mr. Gonzales has sent two specimens from the Rio Chiquinquiere north of the plain.

Genus VI. Pareiodon[31] Kner. (Plate XXXVII.)

Pareiodon Kner, Sb. Ak. Wiss. Wien, XVII, 1855, p. 160.

Centrophorus Kner, Denkschr. Akad. Wiss. Wien, 1859, XVII, p. 167.

Astemomycterus Guichenot, Rev. et Mag. Nat. Hist., XII, 1860, p. 525, fig. 2 (*pusillus*).

Pariodon Günther, Cat. Fishes Brit. Mus., V, 1864, p. 275.

Type.—Pareiodon microps Kner.

No mental barbels, no nasal barbel, two slender barbels at angle of mouth; outer pectoral ray not prolonged beyond the other rays; gill-membrane confluent with the isthmus, without a free fold in the middle, a narrow fold just below the

[31] παρεία = cheek, ὀδούς, ὁ = tooth.

gill-opening which is restricted to the space behind the interopercular spines, the membrane being confluent with the shoulder behind the opercular spines; mouth subterminal, a single series of teeth in each jaw, about sixteen on the pre-opercle and about thirteen on the mandible. The teeth of the two jaws alike, similar to the teeth at the end of the premaxillary of *Branchioica* and some species of *Vandellia*. They consist of a narrow basal section, an enlarged middle section, from the inner (median) angle of which projects a short spur laterad, the spur being slightly twisted from the plane of the rest of the tooth; the teeth not movable; interopercle with a single series of six backward directed, slightly divergent spines; opercular spines slightly divergent, four spines in the main posterior row; five much smaller ones in the anterior row; caudal forked.

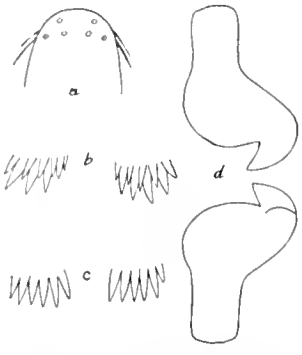


FIG. 21. *Pareiodon microps* Kner. *a*, outline of head from above; *b*, the interopercular spines; *c*, the opercular spines; *d*, a premaxillary and a mandibular tooth, very much enlarged.

Pareiodon has the appearance of an overgrown *Vandellia*, from which it differs in dentition, in the size of the eye, and the general shape of the head.

1. **Pareiodon microps** Kner. (Plate LIV, fig. 3.)

Pareiodon microps KNER, *l. c.* (Borba on the Madeira about four days from its mouth); EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 55; Occasional Papers Cal. Acad. Sci., I, 1890, p. 346; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; RIBEIRO, Fauna Bras., IV (*A*), 1912, p. 232; Comm. Linhas Telegraphicas Estrategicas de Matto-Grosso ao Amazonas. Annexo 5, Sept., 1912, p. 30 (Manáos); FOWLER, Proc. Acad. Nat. Sci. Phila., 1915, 229 (Amazon between mouth of Rio Negro and Peru).

Pariodon microps GÜNTHER, Cat. Fishes Brit. Mus., V, 1864, p. 275; COPE, Proc. Acad. Nat. Sci. Phila., 1872, 290 (between Rio Negro and Peru.)

Trichomycterus pusillus CASTELNAU, Anim. Amér. du Sud, Poissons, 1855, p. 50, pl. 24, fig. 4 (Araguay; Amazon).

Astemomycterus pusillus GUICHENOT, *l. c.* (Araguay; Amazon).

Pareiodon pusillus RIBEIRO, *l. c.*, p. 234.

Habitat.—Amazon Basin.

The specimen in the collection of the Philadelphia Academy of Sciences, mentioned by Cope and Fowler, is about 145 mm. long. I am indebted to Dr. Fowler for the loan of this specimen.

Head 8; depth 6; D. 10, of which eight are full length; A. 7, of which five are full length; eye minute, about thirteen times in the head; center of head a full orbital diameter behind the posterior margin of the eye; interorbital 2.1 in the length of the head, snout 3 in the head, broad; width of head equal to its length; maxillary barbel not reaching to the interopercular spines; lower barbel reaching a little beyond the middle of the maxillary barbel; depth of caudal peduncle two and one-fourth in its length; pectoral about equal to the length of the head without the opercle; distance between origin of dorsal and base of caudal twice its distance from the snout; last dorsal ray slightly in front of the anal; dorsal and anal truncate or slightly emarginate; anus under middle of dorsal; ventrals not reaching anus, their origin equidistant from tip of caudal and interopercle; caudal deeply forked, the upper lobe two and one-half times as long as the middle rays; caudal fulcra not conspicuous.

Genus VII. HENONEMUS[32] Eigenmann & Ward. (Plate XXXVI).

Henonemus EIGENMANN & WARD, Ann. Carnegie Mus., IV, 1907, p. 118 (*intermedius*).

Cobitiglanis FOWLER, Proc. Acad. Nat. Sci. Phila., 1914, p. 268, fig. 16 (*taxistigma*).

Type.—Stegophilus intermedius Eigenmann & Eigenmann.

The genus *Henonemus* was created for *Stegophilus intermedius* on the observation that it has but one barbel at the angle of the mouth. The second (lower) barbel at the angle of the mouth is so minute that it ought not to be considered of generic value, especially since a minute barbel has been found on closer observation in a number of cases where but one barbel had been recorded. It is probably present in the type of *Henonemus*. The types of *Homodiætus* and *Henonemus* differ in the number of opercular spines, four or five in the former, but two in the latter. The names may, therefore, be at least temporarily retained.

Cobitiglanis was proposed as a subgenus of *Ochmacanthus*. However, the type of *Cobitiglanis* is not related to *Ochmacanthus*. *Cobitiglanis taxistigma* is scarcely distinct from *H. punctatus* and the name *Cobitiganis* is a synonym of the subgenus *Henonemus*.

This genus, as far as known, consists of free-living species, and is closely related to the commensal *Stegophilus*. The mouth is wide, inferior, provided with numerous teeth in series on the jaws and lips; those of the middle of the upper lip are long and in part are homologous with those of *Vandellia;* the opercle bears two spines, the pre-opercle five or more. Where observed, the lower barbel is very minute, followed by an additional barbel or labial lobe; the lower jaw is well formed,

[32] ἑν = *one*, νῆμα = *thread*. A misnomer, since there are two maxillary barbels.

the rami transverse, united. The genus differs from *Stegophilus* chiefly in the shape of the caudal, which is emarginate instead of rounded, and in the number of opercular spines.

KEY TO THE SPECIES OF HENONEMUS.

a. Origin of dorsal equidistant from tip of caudal and interopercle; origin of ventrals nearly equidistant from tip of lower caudal lobe and snout.

b. Sides plain, caudal spotted, last half of its lower lobe black; D. 10; A. 9.

1. **macrops** (Steindachner).

bb. Sides with a median series of spots, and smaller spots above them; tip of lower caudal lobe and an oblique band across the upper lobe black.....2. **punctatus** (Boulenger).

bbb. Sides with a regular series of spots, smaller spots above them; lower caudal lobe not black at tip, several obscure spots on dorsal, caudal and base of pectoral.....3. **taxistigmus** (Fowler).

aa. Origin of dorsal equidistant from tip of caudal and occiput; origin of ventrals equidistant from bases of caudal and pectoral; caudal with faint dusky spots; upper surface with dark spots; a series of larger spots along the middle of the sides.....4. **intermedius** (Eigenmann & Eigenmann).

1. **Henonemus macrops** (Steindachner).

Stegophilus macrops STEINDACHNER, Flussf. Südam., IV, 1882, p. 28, pl. VI, fig. 2–2*a* (Lake Manacapurú); EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 55; Occasional Papers Cal. Acad. Sci., I, 1890, p. 344; Proc. U. S. Nat. Mus., XIV, 1891, p. 37.

Henonemus macrops EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401; RIBEIRO, Fauna Bras., IV (*A*), 1912, p. 231.

Habitat.—Lake Manacapurú.

FIG. 22. *Henonemus macrops* Steindachner. (After Steindachner.)

Known from the types only, which are in the Vienna Museum. Head 5; depth 5; D. 10; A. 9; P. 6; eye 3.4 in the head; width of head 1.25 in its length; barbel scarcely more than half as long as the eye; pectoral equals the head without the snout; distance between caudal and origin of dorsal 1.5 in its distance from the snout; origin of anal under the last dorsal ray; sides of head and body without spots; tip of lower caudal lobe dark, the other fins plain.

2. **Henonemus punctatus** (Boulenger). (Plate XL, fig. *C*.)

Stegophilus punctatus (BOULENGER), Proc. Zoöl. Soc. Lond., 1887, p. 279, pl. XXI, fig. 4 (Canelos); EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II,

1889, p. 54; Occasional Papers Cal. Acad. Sci., I, 1890, p. 343; Proc. U. S. Nat. Mus., XIV, 1891, p. 37.

Henonemus punctatus EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401.

Habitat.—Canelos, Ecuador; Santarem, Brazil.

Mr. Haseman collected the following specimens:

7083, C. M., fourteen, largest 88 mm. Santarem, Dec. 9, 1909.

7544, C. M., four, 72–90 mm. San Antonio, Rio Madeira, Nov. 3, 1909.

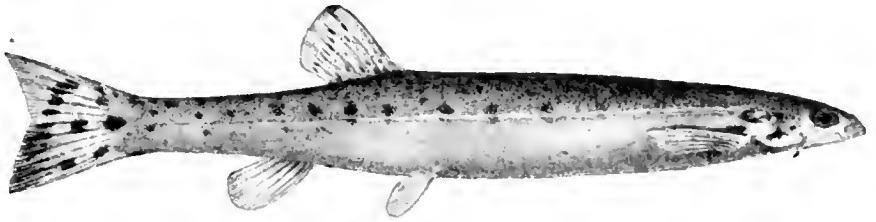


FIG. 23. *Henonemus punctatus* (Boulenger). After Boulenger.

Head 5.5–6; depth 6.5–7; D. 10 or 11; A. 8; P. 6; eye 4 in the head; width of the head 1.2 in its length; opercle with two spines, interopercle with four in the main row, of which the upper is much larger, two in the second row; three rows of movable teeth in the lip of the upper jaw, the rows close together, the teeth minute,

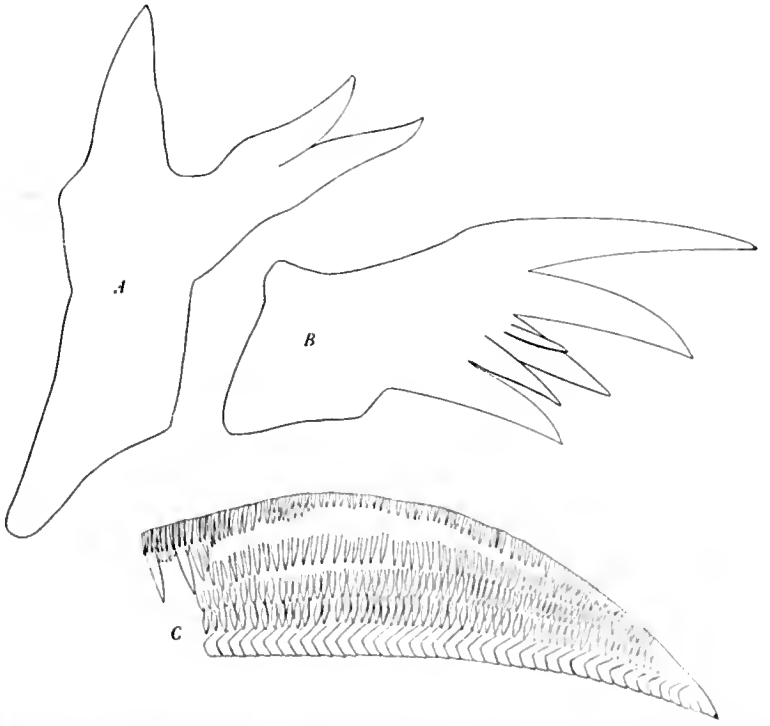


FIG. 24. *Henonemus punctatus* (Steindachner). *A*, opercle with its two spines; *B*, pre-opercle with its spines; *C*, half of the premaxillary with its teeth.

except for the middle ones of the inner series, which are much larger, similar to those in the premaxillary of *Vandellia;* four rows on the premaxillary, of which the three outer rows are similar to, but a little larger than, the labial teeth; the teeth of the inner series are pressed together, broad, bent toward the middle line near the tip and then are abruptly bent backward and inward, then outward; about fifty teeth in the inner row on each side, about seventy-five in the next row; five rows of teeth in the lower jaw, the outer series labial, those of the next three rows minute, recurved hooks, those of the innermost series like those of the inner series of the upper jaw; eye large, without a free orbital rim; posterior nares in a line with the anterior margin of the eye, much closer together than the anterior; no nasal barbel; maxillary barbel broad at base entirely concealing the very minute second barbel.

Axillary gland large, the pectorals considerably shorter than the head; distance of origin of dorsal from caudal 1.5–1.75 in its distance from the snout; origin of anal under or behind the last dorsal ray; back with numerous small spots; sides with a row of much larger spots; lower caudal lobe dark toward tip, base of the fin spotted like the sides, upper lobe free from chromatophores toward its tip, a few spots along lower margin of caudal peduncle; dorsal with spots on its basal half.

3. **Henonemus taxistigmus** (Fowler).

Ochmacanthus (*Cobitoglanis*) *taxistigma* Fowler, Proc. Acad. Nat. Sci. Phila., 1914, p. 268 (*Rupununi* River).

Habitat.—Rupununi River, British Guiana.

Known from the type, 39344 A. N. S. P., 93 mm., which I have had the opportunity to examine through the courtesy of Dr. H. W. Fowler.

Head 5.5; depth 6.5; D. 10; A. 7.5; P. 7; eye 3–3.33 in the head, width of head 1.1, snout 3.25, width of mouth 1.5, interorbital 3.5, pectoral 1.4, lower caudal lobe 1.17, caudal peduncle 2.5; lower barbel one-fifth as long as the upper; upper jaw with four series of teeth, upper lip with three, at least seven series in the mandible; pre-opercle with five or more spines; opercle with two smaller spines; origin of dorsal equidistant from tip of caudal and interopercle.

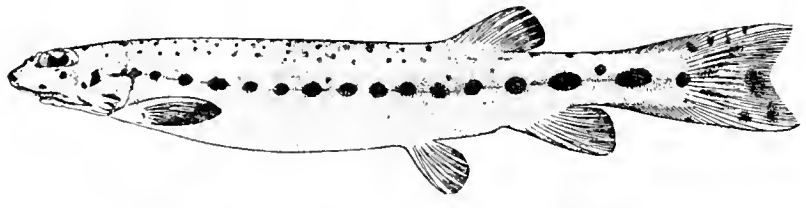


Fig. 25. *Henonemus taxistigmus* (Fowler). After Fowler.

Predorsal region with about four series of irregular, dusky spots, upper surface

of head with similar spots, one marking the interopercular, another the opercular spines; a few median, dusky spots behind the dorsal; sixteen sharply defined, dusky blotches along the lateral line increasing in size to the caudal peduncle. Fins all pale or whitish, several obscure spots of dusky on dorsal, caudal, and base of pectoral.

4. **Henonemus intermedius** (Eigenmann & Eigenmann).

Stegophilus intermedius EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 54; Occasional Papers Cal. Acad. Sci., I, 1890, p. 343; Proc. U. S. Nat. Mus., XIV, 1891, p. 37.

Henonemus intermedius EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401; Ribeiro, Fauna Bras., IV (*A*), 1912, p. 230.

Habitat.—Headwaters of the Rio Araguay.

This species, found in a region intermediate between the localities where *punctatus* and *maculatus* are found, combines in a remarkable way the characters of those species.

Type, No. 9842, M. C. Z., one specimen, 80 mm. Goyaz. Senhor Honorio.

Head 5.5; D. 9; A. 7; eye equals snout, 3.5 in the head; mouth large, upper lip with two series of teeth, premaxillary and mandible with four series of depressible teeth, those of the inner series enlarged at the tip; barbel shorter than eye; head a little longer than wide; opercle with two spines, interopercle with five or six claw-like spines.

Elongate, compressed behind, depressed forward; head somewhat longer than wide, snout pointed; eye large, once in the snout, three and one-half times in the head. Mouth large. Lower lip not dilated. Origin of dorsal about equidistant from tip of caudal and occiput; caudal emarginate; anal placed entirely behind the dorsal; origin of ventrals equidistant from bases of caudal and pectoral. Light brown; entire upper surface with rather large dark brown spots; a series of larger dark spots along the middle line of the sides, the spots becoming larger towards the tail; caudal with a few, faint, dark spots.

Genus VIII. PSEUDOSTEGOPHILUS[33] Eigenmann & Eigenmann.

Pseudostegophilus EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 54.

Type.—**Stegophilus nemurus** Günther.

This genus has the characters of *Homodiætus* but has a deeply forked caudal.

[33] ψευδής = false; *Stegophilus*, the name of a related genus, see p. 353, from στέγος, τό = a roof, and φίλος, ὁ = a lover.

1. **Pseudostegophilus nemurus** (Günther). (Plate XLIV, fig. 5.)

Stegophilus nemurus Günther, Proc. Zoöl. Soc., London, 1869, p. 429. (Peruvian Amazon.)

Pseudostegophilus nemurus Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 54 (Marañon or Ucayale); Occasional Papers Cal. Acad., Sci. I, 1890, p. 341; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Upper Amazon, Rio Mamoré.

7547*a–f*, C. M., 63–78 mm. Rio Mamoré. Sept. 19, 1909. J. D. Haseman.

Head 5; depth 6–6.5; D. 9; A. 7; P. 6; eye 4–4.5 in the head, less than snout or interorbital; maxillary barbel about as long as the eye, lower barbel very minute. Five rows of teeth on the upper lip, four in the upper jaw, six rows in the lower jaw and lip; gill-membrane not forming a fold across the isthmus; eight or nine spines on the interopercle and opercle; pectoral a little shorter than the head; origin of ventrals about equidistant from tip of snout and tip of middle caudal ray (its base in a specimen in the Mus. Comp. Zoöl.); origin of anal behind the dorsal, the distance of the base of its last ray from the base of the middle caudal ray four and one-half in the length; caudal deeply forked, the lobes pointed, the upper lobe longer than the lower; distance of origin of dorsal from base of middle caudal rays 1.5–1.6 in its distance from the snout; a dark shade across the head between the eyes, another between the opercles, four bands across the back and sides about equal to the interspaces, the margins of the bands darkest; lower caudal lobe and tip of the upper black.

Genus IX. Homodiætus[34] Eigenmann & Ward. (Plate XXXVII.)

Homodiætus Eigenmann & Ward, Annals Carnegie Mus., IV, 1907, p. 117, pl. XXXIV, figs. 2 and 3 (*anisitsi*).

Type.—Homodiætus anisitsi Eigenmann & Ward.

Opercle with four or five spines directed upward and backward, interopercle with more, directed downward and backward; eye 3.5–5 in the head. Otherwise like *Henonemus*.

Key to the Species of Homodiætus.

a. Caudal slightly emarginate, oblique; accessory rays numerous; origin of dorsal equidistant from tip of caudal and eye; origin of ventrals equidistant from snout and caudal; D. 8; A. 8; back and sides with chromatophores, but without distinct spots; middle caudal rays black.

1. **anisitsi** Eigenmann & Ward.

[34] ὁμοδίαιτος = living or eating with others. In allusion to the known parasitic habits of some of its relatives.

aa. Caudal forked or deeply emarginate, accessory rays few, inconspicuous; origin of dorsal a little nearer tip of snout than tip of upper caudal lobe, or the reverse; origin of ventrals equidistant from base of caudal and the eye, or a little nearer the former; D. 10; A. 7; back and sides with conspicuous spots unsymmetrically distributed, sometimes in part arranged as a median series; a spot at base of caudal, tips of caudal lobes black.....2. **maculatus** (Steindachner).

1. **Homodiætus anisitsi** Eigenmann & Ward. (Plate LVI, figs. 3 and 5.)[35]

Homodiætus anisitsi EIGENMANN & WARD, Ann. Carnegie Mus., IV, 1907, p. 117, pl. XXXIV, figs. 2 and 3 (Villa Rica); EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401.

Habitat.—Villa Rica, Paraguay.

Known only from the type in the collection of Indiana University.

10155, I. U. M., ♀, 43 mm., the type. Small creek at Villa Rica, Paraguay. Anisits.

Head 6.5; depth 5.75; D. 8; A. 8; eye equals snout, 3.5 in the head, about equal to interorbital; head nearly as wide as long; opercle with about four spines, interopercle with six; the barbel shorter than the eye, the inner barbels much smaller; upper jaw and lips each with about four distinct series of teeth; those on the lips freely movable; the teeth narrow, more or less spoon-oar-shaped, those of the inner series slightly larger; lower lip without teeth, three series of teeth on the jaw.

Axillary gland very large; origin of dorsal equidistant from tip of caudal and posterior margin of the eye; caudal slightly emarginate, the upper lobe longest; origin of anal under end of dorsal; ventrals reaching vent, which is equidistant from tip of mouth and tip of caudal, origin of ventrals equidistant from snout and caudal. Accessory rays numerous.

In alcohol uniformly pale. The fresh specimen preserved in formalin was straw-colored, the back with numerous large, conspicuous, stellate, black chromatophores, and many more smaller, much less conspicuous, brown ones; sides with a few small, stellate, black, chromatophores, gradually giving rise to a regular series along the middle of the tail; a dusky streak along the sides between the myotomes of the body and the thin covering of the abdominal cavity; a small, black spot at the base of the middle caudal ray; middle caudal rays dark, becoming intensely black toward tip; oblique bars extending from the end of the second ray below median dark one downward and forward to the tip of the lower caudal fulcra and then as a black line forward along the tips of the fulcra; another one like it in all respects from the tip of the second ray above the median dark one upward and forward to the tip of the caudal fulcra and then forward along their tips as a black line; remaining fins more or less dotted.

[35] The caudal should be emarginate in the figure.

Alimentary canal straight, without convolutions or bends, the thin-walled stomach lying lengthwise and giving rise to a short, thin intestine, which merges into the much longer and larger, but thin-walled, large intestine which appears to be filled with minute grains of sand.

2. **Homodiætus maculatus** (Steindachner).

Stegophilus maculatus Steindachner, Denk. Ak. Wiss., Wien, XLI, 1879, p. 25, IV, fig. 2 (La Plata); Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 54; Occasional Papers Cal. Acad. Sci., I, 1890, p. 343; Proc. U. S. Nat. Mus., XIV, 1891, p. 37.

Henonemus maculatus Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401.

Habitat.—La Plata, in Province Buenos Aires; Uruguay Basin.

Known from the type, a specimen 105 mm. long, and

7545*a–d*, C. M., 67–69 mm. Uruguayana, Feb. 6, 1907. J. D. Haseman.

7546*a–c*, C. M., 64–70 mm. Cacequy. Feb. 2, 1907. J. D. Haseman.

Head 5.75–6.75; depth 6–9; D. 9; A. 7; P. 6; eye 3.66–4 in head, equal to snout or interorbital; maxillary barbel filamentous, equal to the eye, the inner barbel much smaller; seven series of teeth in the upper jaw and lip, five in the lower; about seven, graduate, opercular spines, about nine larger interopercular spines; gill-membrane forming a free fold across the isthmus; anal behind the dorsal. In the type, a series of spots along the back, another row of spots along the middle of the sides; two or three rows of smaller spots between the two; base of caudal with a dark cross-bar, several small spots along the upper edge of the caudal; tips of the caudal dark spotted.

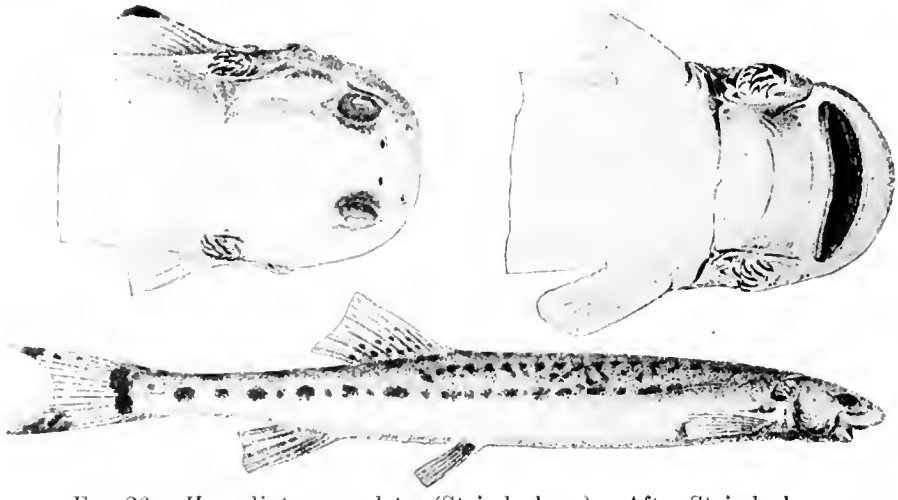


Fig. 26. *Homodiætus maculatus* (Steindachner). After Steindachner.

In the specimens collected by Haseman the color-marking is less regular, the sides and back with unsymmetrically placed spots, largest on the caudal peduncle, smallest on top of the head, sometimes arranged in a series along the middle of the sides; the spot at the base of the caudal largely above the middle.

Genus X. Stegophilus[36] Reinhardt. (Plate XXXVII.)

Stegophilus Reinhardt, Vidensk. Meddel. Naturh. Foren., Kjöbenhavn., 1858 (1859), p. 79, pl. II.

Type.—*Stegophilus insidiosus* Reinhardt.

No nasal or mental barbel, lower barbel at angle of mouth excessively minute, a minute dermal flap below the lower barbel; mouth very wide, inferior; eye large, superior; posterior nares between the front parts of the eyes; opercle and interopercle with several spines; gill-opening narrow, about a third as wide as the mouth, in front of the pectoral, the membrane not forming a free margin; first pectoral ray not produced in a filament; origin of ventral one and a half to two times as far from snout as from caudal; caudal rounded, not greatly contracted at base, the accessory rays not conspicuous; origin of dorsal behind the vertical from the origin of the ventrals; teeth very numerous, in regular series, those in the middle of the upper jaw larger than the others.

1. Stegophilus insidiosus Reinhardt.

Stegophilus insidiosus Reinhardt, *l. c.*, p. 79–97; Günther, Cat. Fishes Brit. Mus., V, 1864, p. 276; Lütken, Velhas Flodens Fiske, p. 15; Vidensk. Selsk. Skr. (5), Afd. XII, 1875, p. 135, and I, text figures 1–3 (Rio das Velhas); Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 55; Occasional Papers Cal. Acad. Sci., I, 1890, p. 344; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 400.

Habitat.—Parasitic in large fishes (*Pseudoplatystoma orbignianum* = *coruscans*) of the San Francisco basin and free on sand bars of the upper San Francisco basin.

7551, C. M., one, 32 mm. Opposite Januaria. Dec. 12, 1907. Haseman.

This example is the first one secured since Reinhardt obtained his specimens from the gill-chamber of a large catfish, *Pseudoplatystoma*. Haseman took his specimen on Dec. 12, 1907, from the sandy shore of an island in the Rio San Francisco, in front of the town of Januaria. If this specimen is really identical with those secured by Reinhardt from the same river basin, *Stegophilus* appears to have the general habit of members of the family of burrowing in sand as well as the peculiar habit of entering the gill-chambers of other fishes. This double, Jekyl and

[36] στέγος, τό = a roof; φίλος, ο = a lover, *i. e.*, loving a covered home, in allusion to its habit of living in the gill-cavities of other fishes.

Hyde, habit of *Stegophilus* lends probability to the reported habit of *Vandellia* of entering the urethræ of bathers. For an account of the habit of the species see page 267.

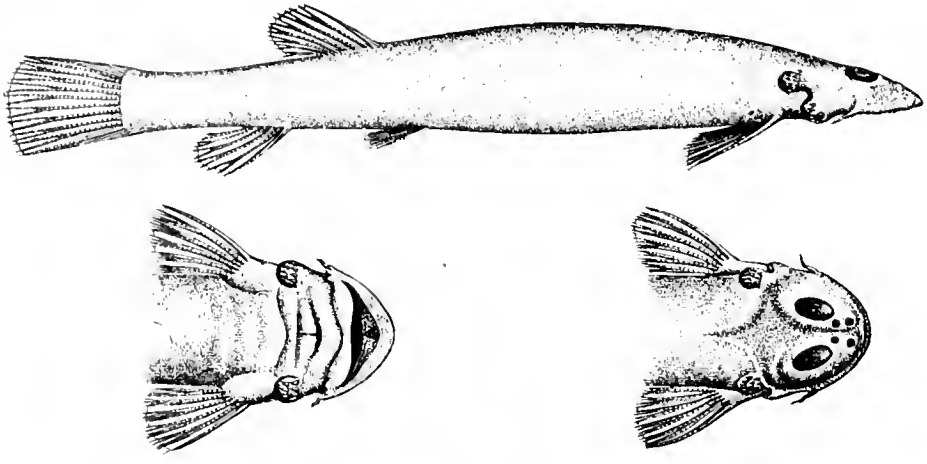


FIG. 27. *Stegophilus insidiosus* Reinhardt. (After Lütken.)

Head about six times in the length; D. 8; A. 7; P. 7; eye about equal to snout or interorbital, four times in the head; maxillary barbel equal to half the width of the mouth, extending to the interopercular spines, lower barbel about four-tenths as long; a thin, narrow membranous flap below the lower barbel; head flat below, its width equal to its length less the opercular spines.

This specimen has hardened in the alcohol and it is not possible to describe the details of the teeth.

Ten or eleven hooks in two series, on the interopercle, directed downward and backward, eleven or twelve thorns on the opercle in three or four irregular series, increasing in size from the minute anterior ones to the strong posterior one.

Pectoral about as long as the head without the snout; origin of ventrals equidistant from base of caudal and tip of pectoral; distance between origin of dorsal and base of middle caudal rays 2.33 in its distance from the snout, distance between last anal ray and base of caudal 6.5 in the length; caudal rounded, ventral accessory rays inconspicuous, a few prominent dorsal accessory rays.

No color-markings.

Genus XI. ACANTHOPOMA[37] Lütken. (Plate XXXVII.)

Acanthopoma LÜTKEN, Vidensk. Meddel. Naturh. Foren. Kjöbenhavn, for 1891, 1892, p. 53, fig. (*annectens*).

Like *Stegophilus*, the gill-membranes forming a free fold across the isthmus.

[37] ἄκανθος, ὁ = spine; πῶμα, τό = opercle.

1. Acanthopoma annectens Lütken.

Acanthopoma annectens LÜTKEN, *l. c.* (Huallága); EIGENMANN, Ann. Carnegie Mus., IV, 1907, p. 119; Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401.

Habitat.—Huallaga.

Known from the type 100 mm. long in the collection of Prof. R. Leuckart. Anterior part, especially the head, depressed; head parabolic; eyes not large; distance between anterior nares twice the distance between the posterior, neither with a barbel; a group of four to six large and some small spines on the opercle; another larger group, ten to twelve, on the interopercle; mouth inferior; upper jaw with six to seven very regular rows of very small teeth; in the lower jaw are "naeppe mere end en enkelt Roekke telstede." Free margin of the gill-membrane begins behind the interopercle and is continued across the isthmus without uniting with it.

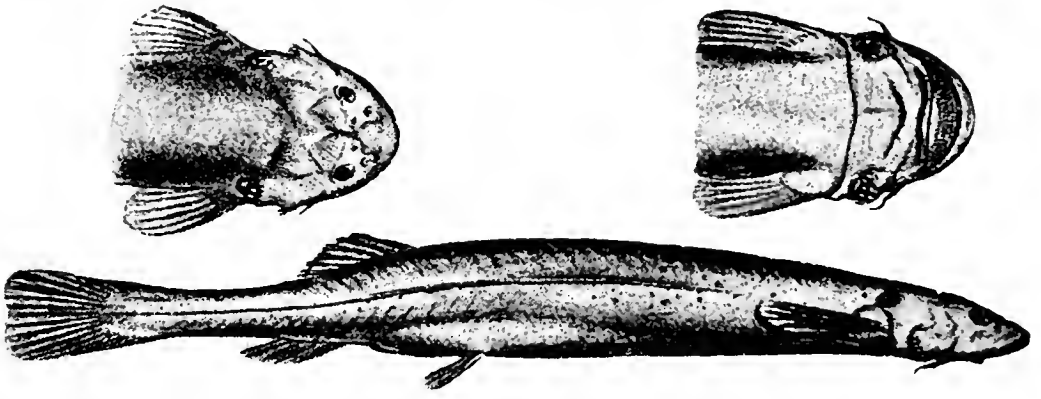


FIG. 28. *Acanthopoma annectens* Lütken. (After Lütken.)

Origin of ventrals equidistant from bases of caudal and pectoral, or tip of caudal and the mouth; origin of dorsal nearly twice as far from snout as from base of caudal; origin of anal under end of dorsal; caudal slightly emarginate; back with obscure spots.

Called *annectens* to indicate its supposed position between the Pygidiinæ and Stegophilinæ.

Lütken says it is nearest *Henonemus microps* = *macrops*?

Genus XII. OCHMACANTHUS[38] Eigenmann. (Plate XXXVII.)

Ochmacanthus EIGENMANN, Mem. Carn. Mus., V, June, 1912, p. 213.

Gyrinurus RIBEIRO, Comm. Linhas Telegraphicas Estrategicas de Matto-Grosso ao Amazonas, Annexo No. 5, Sept., 1912, p. 27, pl. with three figures.

Type.—Ochmacanthus flabelliferus Eigenmann.

[38] ὄχμα, τό = a hold; ἄκανθος, ὁ = a spine.

No nasal or mental barbels; lower barbel at angle of mouth minute or well developed; mouth very wide, inferior; eye large, superior; posterior nares between the anterior margins of the eyes; gill-opening very small; first pectoral ray not spinous, not produced in a filament; accessory caudal rays very numerous, the caudal greatly contracted at base; origin of anal behind that of the dorsal; teeth very numerous, in regular series, none on the lip of the upper jaw.

KEY TO THE SPECIES OF OCHMACANTHUS.

a. Maxillary barbel reaching pectoral; origin of dorsal equidistant between tip of caudal and snout or nearer caudal; accessory caudal rays highest near the middle; distance between last anal ray and caudal two in its distance from the snout. (*Gyrinurus*).....1. **batrachostoma** (Ribeiro).

aa. Maxillary barbel about as long as the eye, reaching tip of interopercular spines; origin of dorsal much nearer tip of caudal than snout; accessory caudal rays graduate to the caudal into which they gradually merge. (*Ochmacanthus*).

b. Distance between last anal ray and caudal 4–4.5 in the length; origin of dorsal in advance of origin of anal; ventrals not reaching anal; gill-opening extending from the operele to behind the middle or lower part of the opercular spines .....2. **reinhardti** (Steindachner).

bb. Distance between last anal ray and caudal three in its distance from the snout; origin of dorsal over origin of anal, ventrals reaching anal; gill-openings confined to the region between the interopercular and opercular spines.....3. **fiabelliferus** Eigenmann.

1. **Ochmacanthus batrachostoma** (Ribeiro). (Plate LV, figs. 1–3.)

Gyrinurus batrachostoma RIBEIRO, *l. c.* (S. Luiz de Caceres.)

Habitat.—Upper Paraguay.

Known from the type, a specimen 32 mm. long, and

7553, C. M., about 31 mm. Puerto Suarez, swampy shore of big bay between Brazil and Bolivia. May 7, 1909. Haseman.

7554, C. M., 30 mm. Rio Jaurú, twenty-eight miles above its mouth at Campos Alegre, thirty miles southwest of Caceres. June 2, 1909. Haseman.

Head 5.5–6.5; depth 6.5–9; D. 10–12; A. 8–9; P. 4; eyes superio-lateral, three or four in the head, longer than the snout, about equal to the interorbital; maxillary barbel reaching axil of pectoral, the lower one to the opercular spines; head as broad as long; six to eight opercular spines arranged in a group; interopercle with about five to eight spines in one or two series; teeth conical, in three parallel series; body depressed in front, compressed behind; dorsal and anal rounded; dorsal behind the ventrals, its origin equidistant from tip of snout and tip of caudal in the figure of the type, its distance from the caudal 1.3–1.5 in its distance from the snout in the specimens enumerated above; anal partly under dorsal, distance of its last ray from the caudal about 3.5 in its distance from the caudal in the specimens at hand; caudal minute, rounded, hidden in the accessory rays which are greatly

developed into fins like those of a larval frog; everywhere except on the belly spotted.

Twenty-one vertebræ behind the anal.

The type was caught among water-weeds (*Eichornea azurea*).

2. **Ochmacanthus reinhardti** (Steindachner). (Plate LV, fig. 4.)

Stegophilus reinhardti Steindachner, Flussf. Südam., IV, 1882, p. 28, pl. VI, fig. 1 (Lake Manacapurú; Rio Içа; Montalegre; Teffé; Tabatinga); Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 55; Occasional Papers Cal. Acad. Sci., I, 1890, p. 344;Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401; Ribeiro, Fauna Bras., IV (*A*), 1912, p. 401.

Habitat.—Amazons.

7552, C. M., 38 mm. Amazon, at upper end of island four miles above Santarem. Dec. 9, 1909. Haseman.

7555*a–b*, C. M., 35–46 mm. Igarape de Jaura, entering R. Tapajos two miles above Santarem. Dec. 11, 1909. Haseman.

Head 7; D. 11–13 (9 or 10 developed rays); A. 10–11 (8 or 9); P. 6, partly adnate; eye equals snout, less than interorbital, entirely in the anterior half of the head, 4–5 in the head; maxillary barbel reaching interopercular spines, the lower barbel a third or fourth as long; 8 or 9 interopercular spines, 9 to 12 opercular; width of head equal to its length. Three series of teeth in the upper jaw, those of the inner series close set, much more numerous than those of the outer series, the teeth of the outer two series at the middle of the mouth a little longer and more slender than the rest; lower jaw with two complete series of teeth, the inner series similar to inner series of the upper jaw, those of the outer series larger, fewer, and much more movable than those of the inner, about fifteen in the outer series, about forty in the inner; four increasingly shorter series from the inner series outward near the middle of the jaw.

A prominent pectoral pore, pectoral equal to the head or to the head without the snout. Origin of ventrals equidistant from bases of caudal and pectoral or a little farther forward, distance between last anal ray and caudal 4–4.5 in the length; distance between origin of dorsal and base of caudal 1.75–2 in its distance from the snout; caudal rounded, with many prominent accessory rays.

Back gray, sides and fins mottled.

3. **Ochmacanthus flabelliferus** Eigenmann. (Plate LV, fig. 5.)

Ochmacanthus flabelliferus Eigenmann, Mem. Carnegie Mus., V, 1912, p. 213.

Habitat.—Essequibo basin.

1729, C. M.; 12111, I. U. M., type and paratypes, three, 33–35 mm. (Konawaruk.)

Head 5.33; depth 7; D. 8; A. 7; eye 1 in snout, 3.75 in head, 1 in space between the eyes. Width of head equal to its length; snout semicircular in outline, the head depressed; mouth very wide, its width equal to the length of the head less half the snout; upper jaw with three series of teeth; teeth of the two outer series conical, those of the inner series broad, removed from the others, forming a solid palisade; no labial teeth; lower jaw with an outer series of long, curved, claw-like teeth in the lip, and four series in the jaw, of which the first is short, near the middle, the second extends farther to the sides, the third is longest, extending from the middle to the side of the jaw, the fourth is shorter again and confined to the sides, not reaching the median line of the jaw. Interopercle with nine claw-like erectile spines; opercle somewhat prolonged, carrying a bunch of nine spines similar to those of the preopercle above and behind the gill-opening. Gill-opening small, entirely above the level of the middle of the pectoral; outer maxillary barbel about as long as the eye, the inner one minute. Pectorals partly adnate; ventrals small, free, reaching anal; dorsal about equal to the anal and but slightly farther forward.

"Light, with numerous chromatophores more or less aggregated in places; a black spot on base of caudal."

The only specimens known were killed with hiari poison in a small pool of back-water from the Essequibo.

Genus XII. Vandellia[39] Cuvier & Valenciennes. (Plate XXXVIII.)

Genus XIII. Urinophilus Eigenmann.

Vandellia Cuvier & Valenciennes, Hist. Nat. Poiss., XVIII, 1846, p. 386, pl. 547.

Type of Vandellia.—*Vandellia cirrhosa* Cuvier & Valenciennes.

Long, slender fishes with small inferior mouth; a few teeth in a single series in the middle of the upper jaw; peculiar, claw-like teeth on the end of the maxillary in some species, probably all of them; teeth on the mandible in some species, none in other species; the mandibular rami not meeting, separated by a wide membrane; opercular spines directed obliquely upward and backward, interopercular spines directed downward and backward; gill-opening small; no nasal or mental barbels, the lower of the barbels at angle of mouth very minute; first pectoral ray not prolonged in a filament; ventrals very much nearer to caudal than to tip of snout; origin of the anal behind that of the dorsal.

[39] In honor of Domingo Vandelli, professor of natural history at Lisbon, who sent the types of the genus to Lacépède.

There are two generic types contained in the genus as here understood. One of the two genera has teeth on the mandibles and is represented by *V. sanguinea* at least; the other genus lacks teeth in the mandible, and *plazai* and *hasemani* at least belong to this genus. I do not know whether the type of *Vandellia* belongs to the one or the other of the genera. The new one may be named *Urinophilus*. The type is to be selected after the structure of the mandible in *Vandellia cirrhosa*, the type of *Vandellia*, has been examined.

The dentition of the *Vandelliinæ* is very peculiar. There are one or two series or a patch of pointed teeth in the center of the upper jaw. They are immediately below the center of the ethmoid at its anterior end, in other words, in the region occupied by the premaxillary in related forms. The bones are so thin and the fish so small, that it is difficult to determine all of the outlines of the bones, or to determine the identity of all of the bones. The bone on which these teeth are inserted is, in all probability, the premaxillary. The lateral points of the ethmoid are forked, and dovetail into the forked ends of maxillaries somewhat after the fashion of the two hands locked into each other between the thumbs and fingers. On the distal half of the maxillary of *Vandellia* there are from two to four comparatively large and very peculiar "claw-teeth," arranged like overlapping shingles, the outermost one being next the bone, the second from the end overlapping this and so on to the proximal one. The individual teeth consist of a flat, oval disk, from the upper proximal corner of which the tooth proper points toward the end of the bone. The bone touches the palatines proximally and the maxillary barbel is joined rather firmly to the end of it, all of which indicates that this bone is the maxillary. In *Branchioica* only one or two teeth of this sort are present, but between them and the ethmoid there is a series of slender, pointed teeth, similar to those on the premaxillary.

Catfishes with teeth on the maxillaries are very unusual. Outside of the *Vandelliinæ*, teeth are only found on the maxillary in *Diplomyste* of the *Diplomystidea* of Chile.

Covering the end of the maxillary and joined to the dorsal surface of the base of the barbel is a thin, comma-shaped bone, which may be the nasal.

Teeth, such as those described on the maxillary, have so far been noticed in *Vandellia hasemani*, *sanguinea*, and *plazai*. *V. cirrhosa* and *V. wieneri* have not been examined in this respect. Teeth like these are found in another member of the family, *Pareiodon* (compare figures 21 and 34–35).

In *Paravandellia* and *Branchioica* the "claw-teeth" of the proximal part of the maxillary are replaced by slender, pointed teeth, and there are more than one

series of teeth on the premaxillary. In *Branchioica* a "claw-tooth" is present at the end of the maxillary.

The rami of the lower mandibles of the *Vandelliinæ* seen from below are elongate triangles, converging forward, but not joined, in fact, not meeting in the center. Teeth may or may not be present in the lower jaw. When present, they are recurved, pointed, in two series at the end of the jaws, in apposition to the maxillary teeth.

The alimentary canal is a simple, straight tube, of nearly uniform diameter, evidently greatly distensible.

KEY TO THE SPECIES OF VANDELLIA.

a. Mandible without teeth, thorn-like teeth at end of maxillary of *V. plazai* and *hasemani*. (Neither mandible nor maxillary examined in *V. cirrhosa* and *wieneri*.)

b. Caudal truncate or slightly emarginate.

c. D. 8–9; A. 9–10; P. 6; depth 9; premaxillaries with five to eight teeth; maxillary barbel two in the head; caudal slightly emarginate, the lobes rounded, equal; pectorals longer than the head.....1. **cirrhosa** Cuvier & Valenciennes.

cc. D. 9; A. 8; P. 7; depth 12; premaxillaries with five to nine teeth; maxillary barbels less than half the length of the head; caudal emarginate, the lobes rounded; pectorals as long as the head.....2. **plazai** Castelnau.

bb. Caudal forked; D. 11; A. 10; P. 6; depth 7–8.

d. Premaxillaries with nine teeth; mouth wide, angle of gape nearly opposite the maxillary barbel; maxillary barbels about 3 in the head; distance between the origin of the dorsal and origin of the caudal 2.75 in the distance of the dorsal from the snout; pectorals shorter than the head.....3. **wieneri** Pellegrin.

dd. Premaxillaries with about six teeth; mouth small, the angle of the gape far in advance of the base of the barbel; maxillary barbel 2–2.5 in the head; distance between origin of dorsal and base of middle caudal rays two and a quarter to two and one-half in its distance from the snout; pectoral about equal to the length of the head.

4. **hasemani** Eigenmann.

aa. A patch of minute teeth on each mandible; one or two claw-like teeth on the end of the maxillary, just in front of the barbels; caudal truncate; D. 11; A. 8; P. 6; premaxillaries with five teeth; maxillary barbel two in the head; distance between origin of the dorsal and the origin of the caudal 2.8 in the distance of dorsal from the snout; pectorals little shorter than the head..5. **sanguinea** Eigenmann.

1. **Vandellia cirrhosa** Cuvier & Valenciennes.

Vandellia cirrhosa CUVIER & VALENCIENNES, Hist. Nat. Poiss., XVIII, 1846, p. 386, pl. 547; CASTELNAU, Anim. Amér. du Sud, 1855, p. 51, pl. 28, fig. 2 (Brazil); GÜNTHER, Cat. Fishes Brit. Mus., V, 1864, p. 277; EIGENMANN & EIGENMANN, Proc. Cal. Acad. Sci. (2), II, 1889, p. 55 (Hyavary); Occasional Papers Cal. Acad. Sci., I, 1890, p. 345; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; BOULENGER, Proc. Zoöl. Soc. Lond., 1897, pp. 901 and 920, Trans. Zoöl.

Soc. Lond., XIV, 1898, p. 426; JOBERT, Archiv. Parasit, I, 1898, p. 494; PELLEGRIN, Bull. Soc. Philom. Paris (10), I, 1909, p. ? (Apuré, Manáos); EIGENMANN, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401; RIBEIRO, Comm. de Linhas Telegraphicas Estrategicas de Matto-Grosso aõ Amazonas, Annexo 5, 1912, p. 30 (Manáos).

Habitat.—Amazon and Orinoco basins; Rio Jurua; Hyavary; Manáos; Apuré.

This fish, the bad repute of which is widespread (see page 265) in South America, is represented in Museums by only the few specimens in the following list, in part copied from Pellegrin:

Jardin des Plantes, Paris, three, locality? Vandelli.
Jardin des Plantes, Paris, one, Apuré. Geay.
Jardin des Plantes, Paris, two, Manáos. Anthony.
Mus. Comp. Zoöl., Cambridge, one, 40 mm., Hyavary. Bourget.
British Mus., London, ? many, Jurua. Bach.
Mus. Nac. Rio de Janeiro, one, 94 mm., Manáos. Ribeiro.

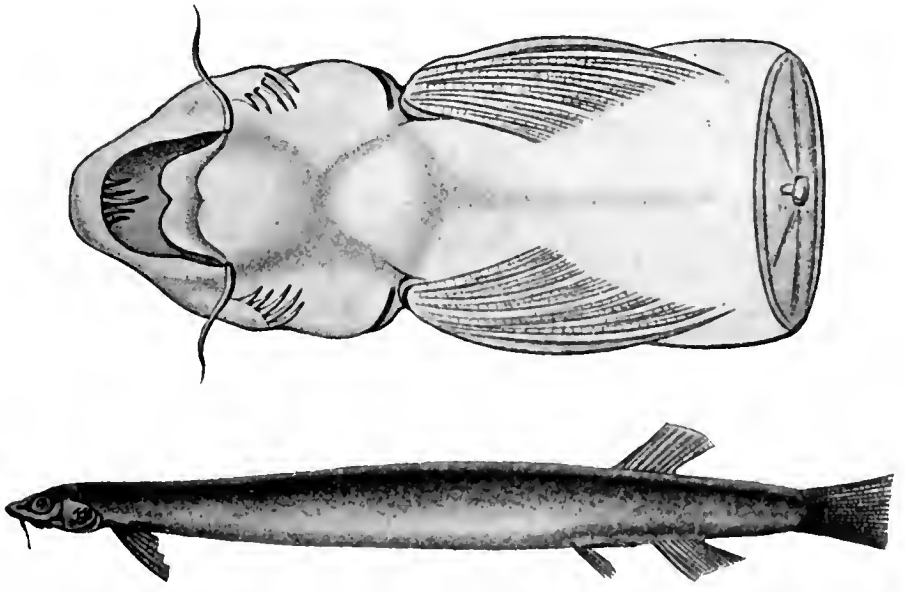


FIG. 29. *Vandellia cirrhosa* Cuvier & Valenciennes. (After Cuvier & Valenciennes.)

Head 8–10.5 (9–11.5 including the caudal); depth 9; D. 8–9; A. 9–10; P. 6. Head slightly longer than wide; eye less than 3 in the head, greater than the snout; six to ten spines on the opercle, five to ten on the interopercle; five to eight teeth on the premaxillary; origin of dorsal twice as far from tip of snout as from margin of caudal; dorsal partly over anal.

2. **Vandellia plazai** Castelnau. (Plate LIII, fig. 3.)

Vandellia plazaii Castelnau, Anim. Amer. du Sud, Poissons, 1855, p. 51, pl. 28, fig. 1 (Ucayale); Vaillant, Bull. Soc. Philom. (7), IV, 1880, p. 159 (Calderon); Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 55 (Lake Hyanuary); Occasional Papers Cal. Acad. Sci., I, 1890, p. 345; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Pellegrin, Bull. Soc. Philom. Paris (10), I, 1909, p. ? (Calderon); Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401; Ribeiro, Comm. de Linhas Telegraphicas Estrategicas de Matto-Grosso ao Amazonas, Annexo 5, 1912, p. 30 (Manáos).

Vandellia plaza Günther, Cat. Fishes Brit. Mus., V, 1864, p. 277.

Habitat.—Middle and Upper Amazon basin; Ucayale, Calderon; Lake Hyanuary.

This species also is known from but few specimens, as follows:

Jardin des Plantes, Paris, ? Ucayale. Castelnau.

Jardin des Plantes, Paris, one, Calderon. Jobert.

Mus. Comp. Zoöl., Cambridge, Mass., one, 125 mm., Lake Hyanuary. Bourget.

Mus. Nac. Rio de Janeiro, one, 67 mm., Manáos? Ribeiro.

7541, C. M., one, 66 mm. Dec. 9, 1909. Santarem. Haseman.

It is principally distinguished by its more elongate form.

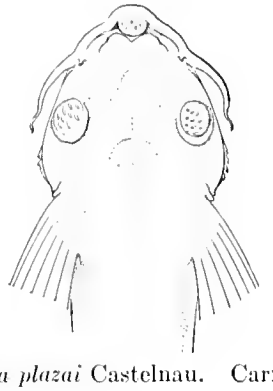


Fig. 30. *Vandellia plazai* Castelnau. Carn. Mus., No. 7541.

Head 9–11 (10–12 in the total length); depth 12–15.3 in the total length; D. 9–10; A. 8–9; P. 7; twelve to sixteen opercular spines in 3 or 4 rows, seven or eight on the interopercle; head more rounded than in *cirrhosa;* barbel less than half the length of the head; pectoral as long as the head; 8 or 9 teeth in the upper jaw.

3. **Vandellia wieneri** Pellegrin.

Vandellia wieneri Pellegrin, C. R. Ac. Sc., November 29, Vol. 149, 1909, p. 1016; Bull. Soc. Philom. Paris (1), X, 1909, p. 199, page of reprint 3, figure in the

text; Mission Géodesique de l'Equateur, XII, 1912, p. 2, p. 10, pl. I, fig. 2, near the mouth of the Rio Misahually.

Habitat.—Rio Napo, Ecuador.

This species is known from the type. It is distinguished by its short body, short barbel, and forked tail.

A.9934, Paris Museum, one, 92 mm. Rio Napo near the mouth of the Misahually, Ecuador. Charles Wiener.

Fig. 31. *Vandellia wieneri* Pellegrin. (After Pellegrin.)

Head over 7; depth 7; D. 11; A. 10; P. 6; 9 teeth; lower jaw incised in middle, without teeth; maxillary barbel about three in the head; eye two in the snout; fifteen opercular spines in four series, directed obliquely upward and backward; seven or eight interopercular spines in two rows; dorsal about two and three-fourths times nearer caudal than snout; ventrals a little in advance of the last third of the body; caudal peduncle 2.5 as long as high. Named for the collector, Mr. Charles Wiener.

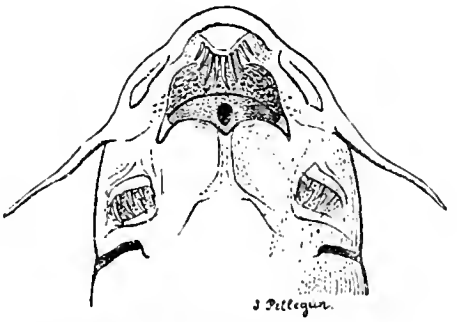


Fig. 32. *Vandellia wieneri* Pellegrin. (After Pellegrin.)

4. **Vandellia hasemani** Eigenmann. (Plate XVIII, fig. 3.)

7542, C. M., type, 72 mm.; 7543*a–b*, C. M., paratypes, 68 and 69 mm. Rio Mamoré. Haseman.

Evidently similar to *V. wieneri*. Head 8–8.5; depth 8; D. 11; A. 10; P. 6. Five or six teeth in the premaxillaries, two thorn-like teeth on the distal part of the anterior face of the premaxillary, two or three more slender teeth on the distal part of the lower face of the premaxillary; mandibular rami without teeth, widely separated from each other, the membrane between the two rami but little emarginate; angle of gape about halfway between the premaxillary and the barbel; maxil-

lary barbel 2–2.5 in the length of the head; lower barbel minute; about ten interopercular thorns, fifteen or more on the opercle; broad, free, fleshy lobes behind the opercular and pre-opercular spines; gill-openings about half as wide as the mouth;

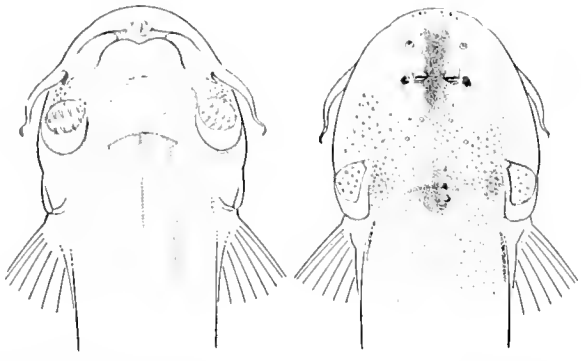


Fig. 33. *Vandellia hasemani* Eigenmann. Type, No. 7543*a*, Carn. Mus., 72 mm.

eye entirely in the anterior half of the head; the posterior nares nearly as large as the eyes and between the anterior halves of the latter, anterior nares with a short flap; pectorals about equal to the length of the head; origin of ventrals equidistant

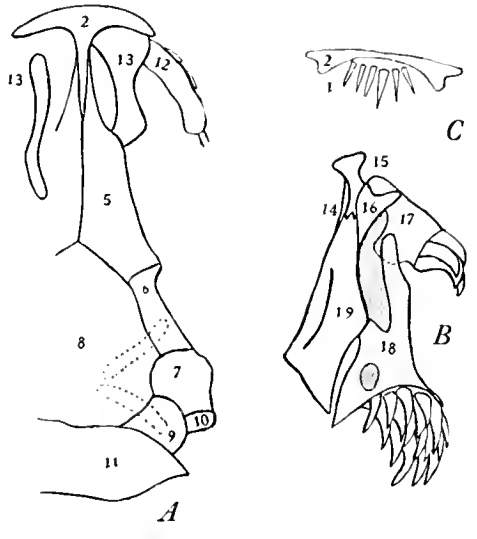


Fig. 34. *Vandellia hasemani* Eigenmann. *A*, skull from above; *B*, hyomandibular and opercular apparatus; *C*, end of ethmoid and premaxillary teeth from in front, 1, premaxillary; 2, ethmoid; 5, frontal; 6, sphenotic; 7, pterotic; 8, supraoccipital; 9, epiotic; 10, supraclavicle; 11, parapophysis of coalescep vertebræ; 12, maxillary; 13, palatine; 14, metapterygoid; 15, quadrate; 16, preopercle; 17, interopercle; 18, operele; 19, hyomandibular.

from tip of caudal and eye or opercle, reaching a little beyond the anus; origin of anal under middle of dorsal; distance between anal and base of middle caudal rays 4.5–5.25 in the length; caudal forked for about two-ninths of its length; origin of

dorsal over the tips of the ventrals, distance of origin of dorsal from caudal 2.25–2.5 in its distance from the snout.

Back and basal part of caudal truncate.

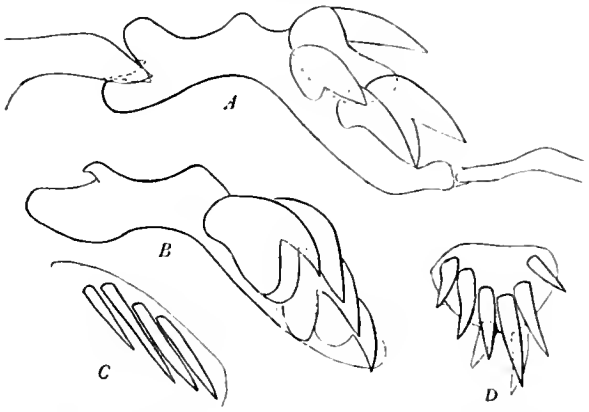


FIG. 35. *Vandellia hasemani* Eigenmann. *A*, Left premaxillary from below, with two functional and two relay teeth. *B*, left premaxillary of another individual with four teeth. *C*, the same, looking at the edge of the teeth. *D*, premaxillary from below.

5. **Vandellia sanguinea** Eigenmann. (Plate LIII, fig. 2.)

Vandellia sanguinea EIGENMANN, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 701.

7082, C. M., type, 62 mm. San Antonio de Rio Madeira. Nov. 3, 1909. Haseman.

This species differs from the others of the genus *Vandellia* in having concealed teeth on the ends of the mandibles. It resembles them so much in other points that it naturally raises the question whether these structures have not been overlooked in *V. cirrhosa* and *wieneri*. They cannot be seen without considerable effort. The species greatly resembles *V. plazai*. Mr. Haseman noted that the specimen was white (translucent?), the alimentary canal straight and gorged with blood.

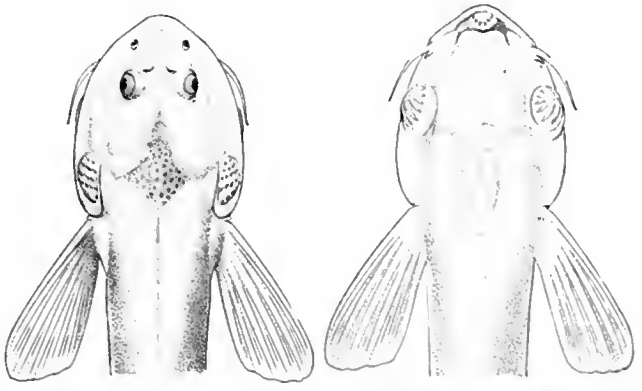


FIG. 36. *Vandellia sanguinea* Eigenmann. No. 7082, Carn. Mus. Type, 62 mm.

Head 11.66; depth 12; D. 4 + 8.5; A. 3 + 7; P. 7; nearly the entire eye in the anterior half of the head, a little more than four in the length of the head to the tip of the opercular spines. (The eye is too small in the drawings.)

Maxillary barbel extending to the tip of the interopercular spines, two in the head; the lower barbel minute, only about half a millimeter long as compared with the 2.5 mm. of the maxillary barbel; two flat, recurved teeth on the end of the

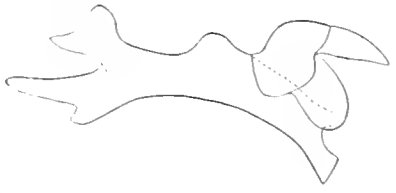


FIG. 37. *Vandellia sanguinea* Eigenmann. Left premaxillary, showing one of the concealed teeth.

premaxillary concealed just in front of the barbel; five premaxillary teeth graduated from the long middle one to the minute lateral ones; mandibles widely separated from each other with about five minute teeth; the teeth concealed by the lip; five spines in the main row of the interopercle, the middle ones very strong, directed backward, about five spines in supplementary rows; five spines in the main row of the opercle, about ten in supplementary rows; distance from origin of ventrals to base of middle caudal rays two times in its distance from the snout; origin of anal behind the origin of the dorsal, the last dorsal ray over the middle of the anal; distance between anal and base of middle caudal rays five and one-half times in the length; distance from origin of dorsal to base of middle caudal rays two and eight-tenths times in its distance from the snout; caudal truncate, with numerous accessory rays. Translucent, the eyes black.

Genus XV. PARAVANDELLIA[40] Ribeiro. (Plate XXXVIII.)

Paravandellia RIBEIRO, Comm. Linhas Telegraphicas Estrategicas de Matto-Grosso ao Amazonas, Annexo No. 5, Sept., 1912, p. 29.

Type.—Paravandellia oxyptera Ribeiro.

No nasal or mental barbels, one (probably two) barbels at the angle of the mouth; first pectoral ray not continued as a filament; gill-opening small; mouth inferior, with a band of teeth in the middle of the upper jaw and a single series laterally; no teeth on the mandible; ventrals much nearer tip of caudal than snout; opercular and interopercular spines separate from each other. Caudal forked ("furcada"). Ribeiro says that this genus may be considered between *Stegophilus* and *Vandellia*, having the general appearance of the former.

[40] παρά = near, *Vandellia* = name of a related genus.

1. Paravandellia oxyptera Ribeiro.

Paravandellia oxyptera RIBEIRO, *l. c.*

Habitat.—Paraguay River near Caceres.

Head triangular, eight times in the length including the caudal; D. 12; A. 10; P. 7; dorsal behind the ventrals, partly over anal, both behind the middle of the body; origin of dorsal nearer tip of caudal than base of pectorals; eyes without a free margin, large, two and one-half times in head, equal to snout; maxillary barbel reaching at most to tip of interopercular spines; pectorals large, falcate, one-fourth longer than head, the first ray longest, the next rapidly graduate, the outer rays longer again; caudal forked, the upper lobe a little the longer; anal similar to the dorsal, under the last rays of the latter.

White, the eyes black

The single specimen of this genus and species known, 22 mm. long, was taken in the same locality in which the *Ochmacanthus* (*Gyrinurus*) *batrachostoma* was caught, among the "pseudo-rhyzomas de Agua-pé" *Eichornea azurea*, in the margin of the Paraguay River near San Luiz de Caceres.

Genus XVI. BRANCHIOICA Eigenmann.[41]

Branchioica EIGENMANN, Proc. Am. Phil. Soc., LVI, Jan., 1918, p. 702.

Type.—*Branchioica bertonii* Eigenmann.

It is quite possible that this genus will, on direct comparison of specimens, prove a synonym of *Paravandellia*. It has the same general characters, but comes from the lower Paraguay, while *Paravandellia* comes from the upper. The present species was taken from a fish, while *Paravandellia* seems to be free swimming. It is quite possible that teeth will be found in *Paravandellia* at the end of the maxillary (premaxillary?) and on the mandibles when they are examined minutely. *Paravandellia* is said to have the caudal forked, while *Branchioica* has it subtruncate.

No nasal or mental barbels, two barbels at angle of the mouth, of which the lower is minute; first pectoral ray not spinous, not prolonged in a filament; gill-openings small, the membrane perfectly confluent with the isthmus; mouth inferior; two series of teeth in the front of the upper jaw, a single series of much smaller teeth laterad of these; maxillary with claw-like teeth at its end, just in front of the barbel and entirely concealed; two short series of teeth on the ends of the mandibles, opposite the lateral series of teeth of the upper jaw, the two rami of the mandibles not meeting; opercular and interopercular patches of spines separate from each other; caudal subtruncate.

[41] *βράγχια, τα* = the gills of fishes; *δικεω* = to inhabit.

The first specimen of this genus was received and described several years ago. Both the specimen and description were forgotten, the latter never published. The two specimens 13950 I. U. M. were received much later and independently described.

2. **Branchioica bertonii** Eigenmann. (Plate XLIII, figs. 3–5.)

Branchioica bertoni Eigenmann, Proc. Am. Philos. Soc., LVI, Jan., 1918, p. 703.

13950, I. U. M., type, 24 mm., paratype about the same length over all, much curved. Taken from a large Characin, *Piaractus brachypomus* (Cuvier). Asunción, Paraguay. Collected by A. de W. Bertoni.

7545, C. M., paratype, 24 mm. Puerto Bertoni, Alto Paraná, from the branchia of *Piaractus brachypomus* (Cuvier). Bertoni.

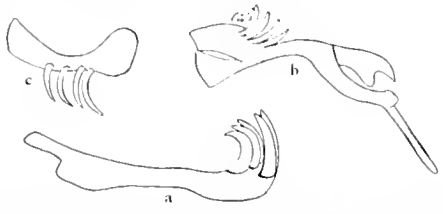


Fig. 38. *Branchioica bertonii* Eigenmann. *a*, mandible; *b*, left maxillary with its five teeth; *c*, portion of another maxillary, showing the proximal teeth only.

Head about 5.5; depth 5.5; D. 10; A. 7; P. 6; eyes superior, nearly the entire eye in the anterior half of the head, 3.5 in the head, about equal to the length of the snout, considerably larger than the interorbital; maxillary barbel extending to very near the interopercular spines, the lower barbel very minute; caudal peduncle slender, abdomen well rounded; premaxillary with two irregular series of slender, pointed teeth, those of the posterior series much the larger, about five in number, subequal, both series graduated from the larger ones nearer the center outward; laterad of the median series (on the premaxillary?) are four or five similar but smaller teeth, graduated from the larger proximal one; the rami of the lower jaw widely separated from each other, each with about five, recurved, pointed teeth in two series on its end, in apposition to the lateral series of the upper jaw; gill-opening minute, circular, gill-membranes perfectly confluent with the isthmus; opercle with a bunch of about twelve, subequal, upward directed spines; interopercle with about eleven curved, downward directed spines, arranged in two series; distance from origin of ventrals to caudal 1.6 in its distance from the snout, origin of anal behind the origin of the dorsal; distance between anal and caudal about 5 in the length; pectoral falcate, the outer ray not prolonged as a filament, about as long as the head; origin of dorsal between that of the ventrals and anal, twice as far

from snout as from caudal; caudal narrow, obliquely rounded or subtruncate, with few inconspicuous fulcra.

Translucent; eyes black; chromatophores on the snout, along the back, along the base of the anal, on the base of the caudal, along the side of the abdominal cavity, and a few on the pectoral.

Genus XVII. Tridens Eigenmann & Eigenmann. (Plate XXXIX.)

Tridens Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), I, 1889, p. 53.

Type.—*Tridens melanops* Eigenmann & Eigenmann.

Anal long, with twenty or more rays, its origin in front of that of the dorsal; ventrals small, nearer to tip of snout than to base of caudal; head greatly depressed, the eye lateral, infringing on the upper and lower surfaces; a series of fine labial teeth, stronger teeth in the jaws; gill-membranes united, forming a broad, free fold across the isthmus; no nasal or mental barbel, two maxillary barbels; opercle and interopercle armed, the patches of spines separate.

The two species originally placed in this genus differ so greatly that they should probably be placed in separate genera. The specimens known are all very small, 27 mm. and less.

Key to the Species of Tridens.

a. Depth 13; head 9; D. 10–12; A. 20–25; opercle with three spines; barbels minute, scarcely evident; distance between origin of dorsal and tip of caudal three in the length; distance between origin of anal and tip of caudal two and five-tenths in the length; caudal rounded, without accessory rays.

1. **melanops** Eigenmann & Eigenmann.

aa. Depth 6; head 6; D. 9; A. 22; opercle with 6 or more spines; maxillary barbel extending to the base of the pectoral; distance between origin of dorsal and tip of caudal two in the length; distance between origin of anal and tip of caudal less than two in the length; caudal emarginate; eye large, nearer end of opercle than tip of snout; first pectoral ray greatly produced.

2. **brevis** Eigenmann & Eigenmann.

1. **Tridens melanops** Eigenmann & Eigenmann. (Plate XLIII, figs. 1–2.)

Tridens melanops Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 53 (Içá); Occasional Papers Cal. Acad. Sci., I, 1890, p. 339; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401.

Habitat.—Içá, near boundary between Brazil and Peru.

Known from the types, the largest 27 mm., in the Museum of Comparative Zoölogy, one of which was received by Indiana University in 1891 and bears the number 4245.

Head 9; depth 13; D. 10–12; A. 20–25.

Body compressed, extremely slender. Head broad, the snout rounded; mouth broad, inferior. Opercle long and slender, terminating in three spines, trident-shaped. Pre-opercle with similar but smaller spines. Barbels minute, scarcely evident. Distance of origin of dorsal fin from extremity of caudal 3 in the length; origin of anal fin from extremity of caudal 2.5 in the length. Anal rays rapidly decreasing in height backward, the last ray about under the last ray of the dorsal. Caudal rounded, without accessory rays.

Yellowish; posterior half of the caudal fin dusky; a series of black spots along the base of the anal.

2. **Tridens brevis** Eigenmann & Eigenmann.

Tridens brevis Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 54 (Tabatinga); Occasional Papers Cal. Acad. Sci., I, 1890, p. 340; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401.

Habitat.—Tabatinga.

Known from the type, 21 mm. long, in the Museum of Comparative Zoölogy. A recent search for it has failed to locate it.

Head 6; depth 8; D. 9; A. 22.

Body short and deep. Head as broad as long; mouth broad, inferior. Opercle with a bunch of six or more spines; pre-opercle with a smaller bunch of spines. Barbels well developed, the outer one extending to the base of the pectoral, the inner to the gill-opening. Eye large, nearer end of opercle than tip of snout. Distance of origin of dorsal from tip of caudal little more than two in the length. Anal inserted very little in front of the dorsal and extending some distance beyond it, its rays decreasing in height toward the caudal. Origin of anal from extremity of caudal less than 2 in the length. First pectoral ray greatly produced. Caudal emarginate.

Yellowish; blackish dots along the bases of the fins; a series of blackish dots along the middle line of the sides; similar spots on the back. Head with brown dots.

Genus XVIII. Miuroglanis[42] Eigenmann & Eigenmann. (Plate XXXIX.)

Miuroglanis Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 55.

Type.—*Miuroglanis platycephalus* Eigenmann & Eigenmann.

Anal long, with fifteen rays, its origin in front of that of the dorsal; no nasal or mental barbel; two barbels at angle of mouth; head greatly depressed, eye lateral,

[42] μείουρος = curtailed; γλάνις, ὁ = a catfish.

behind the angle of the mouth; mouth subinferior; several series of strong teeth in each jaw; gill-membrane broadly united with the isthmus, without a free margin; opercular and subopercular patches of spines confluent.

1. **Miuroglanis platycephalus** Eigenmann & Eigenmann.

Miuroglanis platycephalus Eigenmann & Eigenmann, Proc. Cal. Acad. Sci. (2), II, 1889, p. 56 (Jutahy); Occasional Papers Cal. Acad. Sci., I, 1890, p. 347; Proc. U. S. Nat. Mus., XIV, 1891, p. 37; Eigenmann, Reports Princeton Univ. Exped. Patagonia, III, 1910, p. 401; Ribeiro, Fauna Bras., IV (*A*), 1912, p. 227.

Habitat.—Jutahy.

Known from the type 17 mm. long, collected during the Thayer expedition by William James. A recent search for it in the collections of the Mus. Comp. Zoöl. has failed to locate it.

Head 5.5; D. 10; A. 15. Body short, compressed, and rather deep. Head greatly depressed, wider than long. Eye large, lateral, placed behind the angle of the mouth. Mouth subinferior, the upper jaw projecting slightly. Upper maxillary barbel scarcely extending to the gill-opening; no nasal barbels. The opercular and pre-opercular patches of spines united. Origin of the dorsal fin little behind that of the anal, its distance from the tip of the snout somewhat less than twice its distance from the tip of the caudal.

Appendix to the Monograph on the Pygidiidæ.

PHREATOBIUS[43] Goeldi.

Phreatobius Goeldi, Comptes Rendus Congrès Intern. Zoöl., Berne, 1904, p. 549; Fuhrmann, Verhandl. Schweitz. Naturf. Gesellsch. Aarau, 1905, p. 50; Archives des Sciences Phys. Nat. Genève (4), 20, 1906, p. 578.

Type.—*Phreatobius cisternarum* Goeldi.

Origin of dorsal slightly in front of origin of the ventrals, much nearer snout than to caudal; no nasal barbel; maxillary barbel similar and about as long as the two mental barbels, placed nearer the anterior nares than to the angle of the mouth; the mental barbels of each side close together, but remote from their fellows of the other side, placed directly below the maxillary barbel; mouth terminal, wide, the lower jaw projecting; teeth in the upper jaw in about three series, in two series in the lower jaw in front, in one series on the side; the inner teeth the larger and in very regular series; gill-membrane extending but little above the base of the pec-

[43] φρέαρ, τo = cistern; βίος, ὁ = life.

toral, narrowly joined to the isthmus at a point about half-way between its posterior angle and the snout; first pectoral ray not spinous; anal very long, its origin under the end of the dorsal, its base more than one-third of the length; caudal small, accessory rays large and numerous, continuous with the anal fin and extending as a similar fin on the back for two-fifths of the distance to the snout; opercle and interopercle unarmed; eyes rudimentary, near the posterior nares.

This genus is distinguishable by the concomitant elongation of the caudal portion of the body, the anal fin and the accessory portion of the caudal, by the position of the dorsal in relation to the ventrals and by the development of the barbels and absence of opercular armature.

1. **Phreatobius cisternarum** Goeldi. (Plate LVI, figs. 1, 2 and 4.)

Phreatobius cisternarum Goeldi, Comptes Rendus Congrès intern. Zoöl., Berne, 1904, p. 549; Fuhrmann, Verhandl. Schweitz Naturf. Gesellsch. Aarau, 1905, p. 50; Archives des Sciences Phys. Nat. Genève (4), 20, 1906; p. 578 (allied to *Clariidæ*, not to *Leptosidæ* and *Trychomycteriæ; fide* Zoölogical Record).

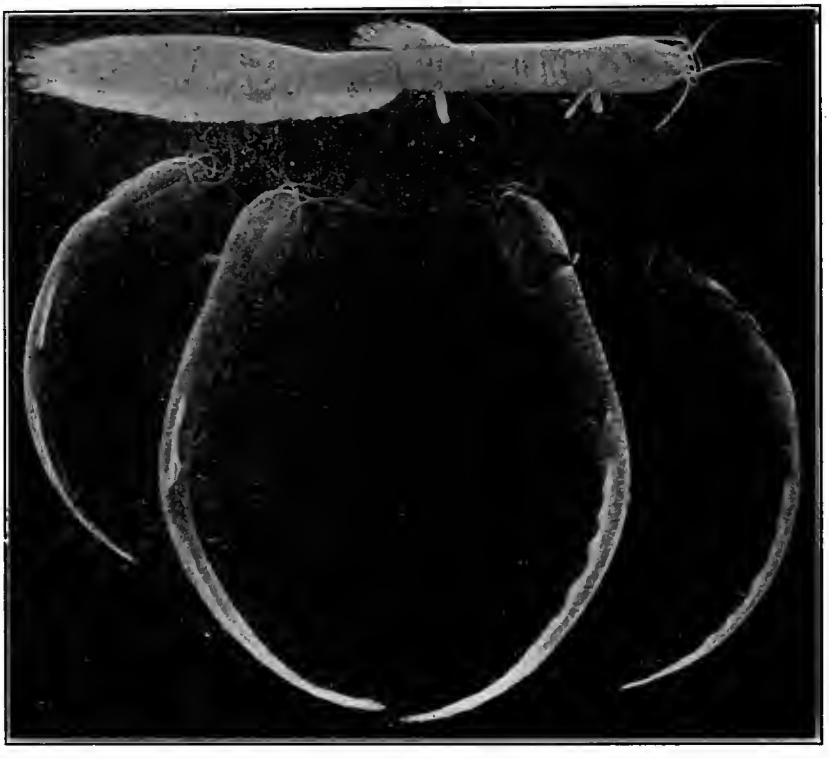


Fig. 39. *Phreatobius cisternarum* Goeldi. (By permission of Dr. O. Fuhrmann.)

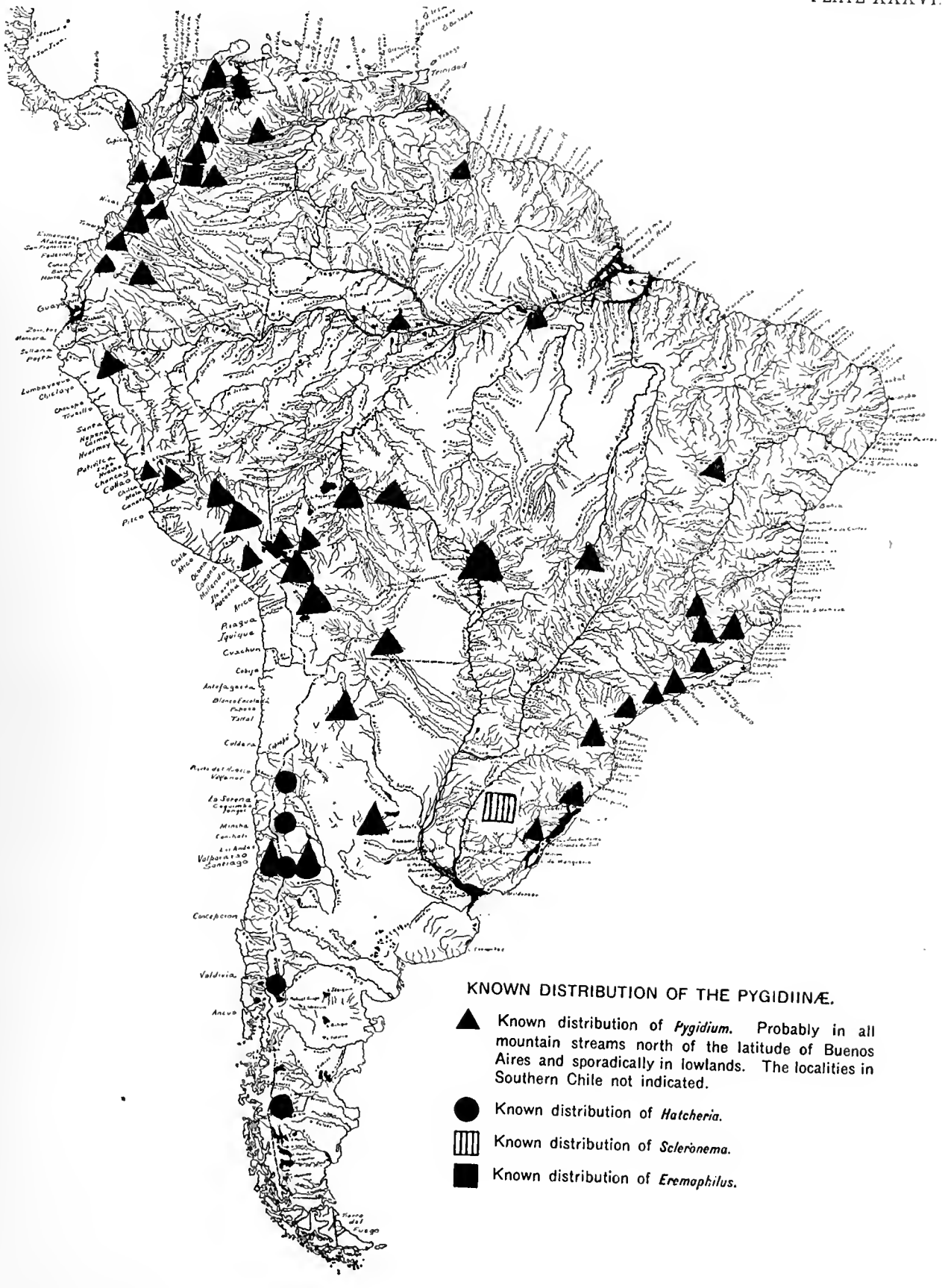
The generic as well as specific descriptions of this species are drawn from photographs lent me by Dr. O. Fuhrmann, and from a specimen 40 mm. long, also sent

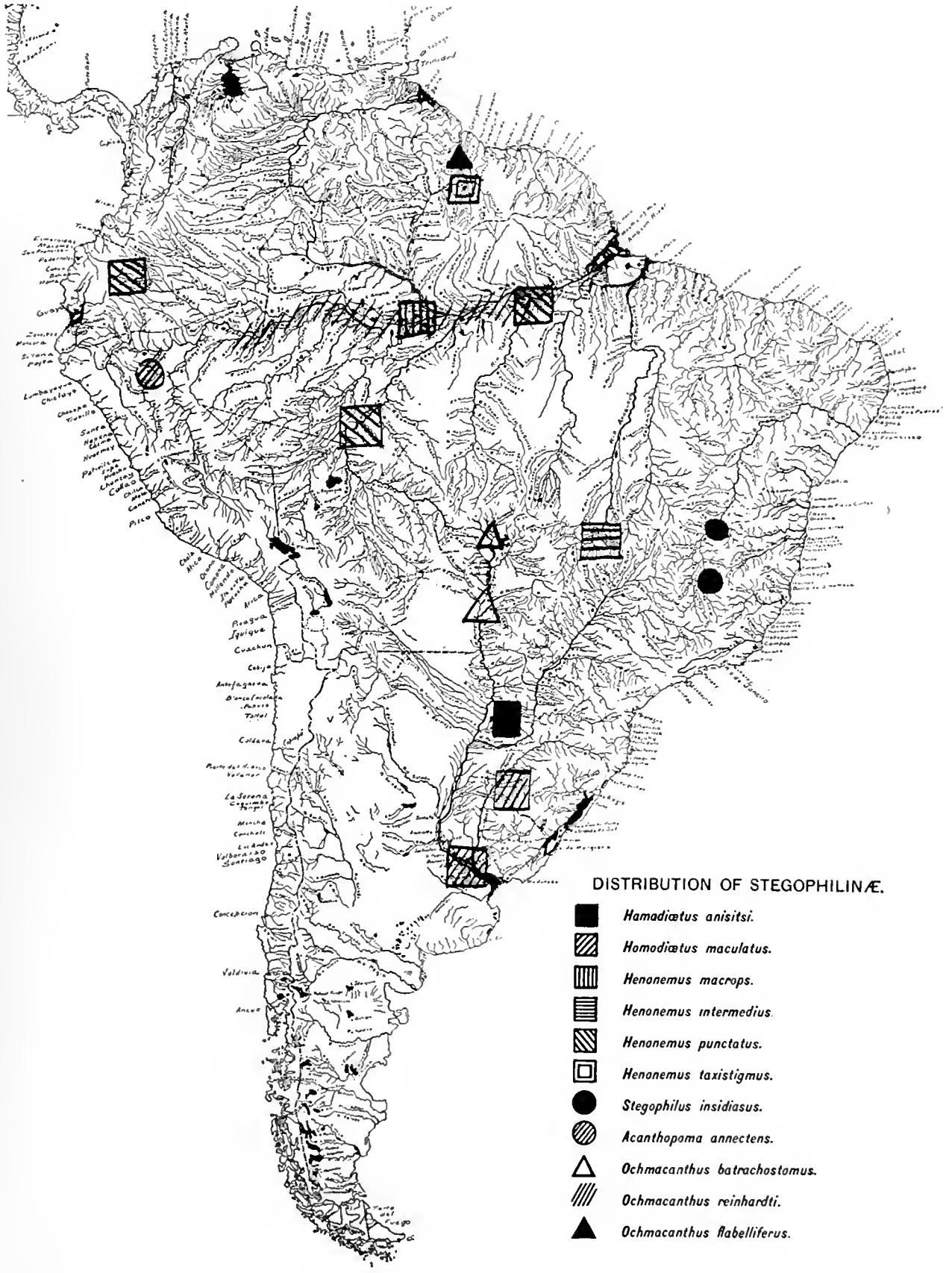
me by Dr. Fuhrmann, whose generosity, since he himself proposes to publish an account of the anatomy of the species, I greatly appreciate.

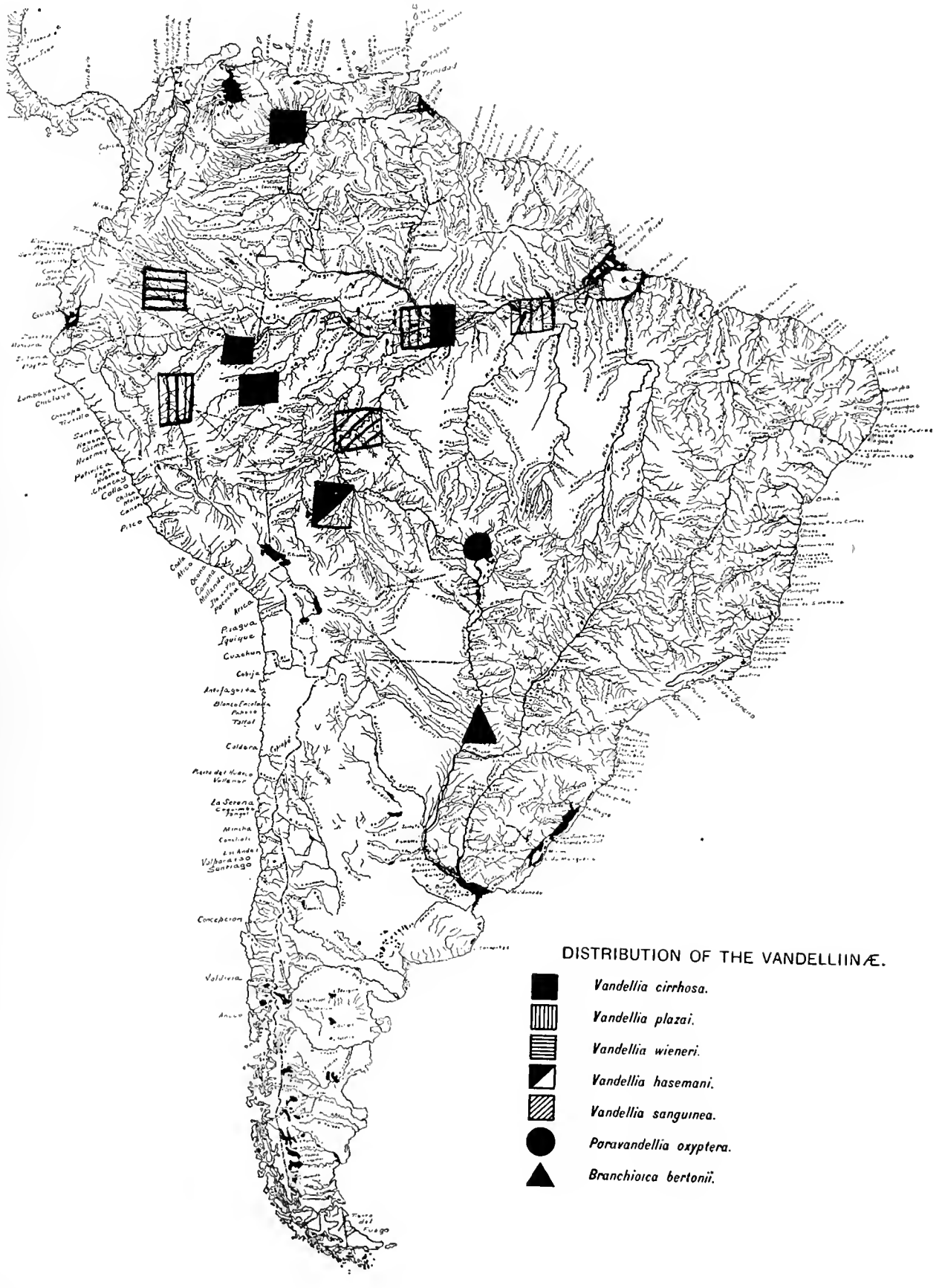
7603, C. M., 40.5 mm. Marajo. From Dr. O. Fuhrmann.

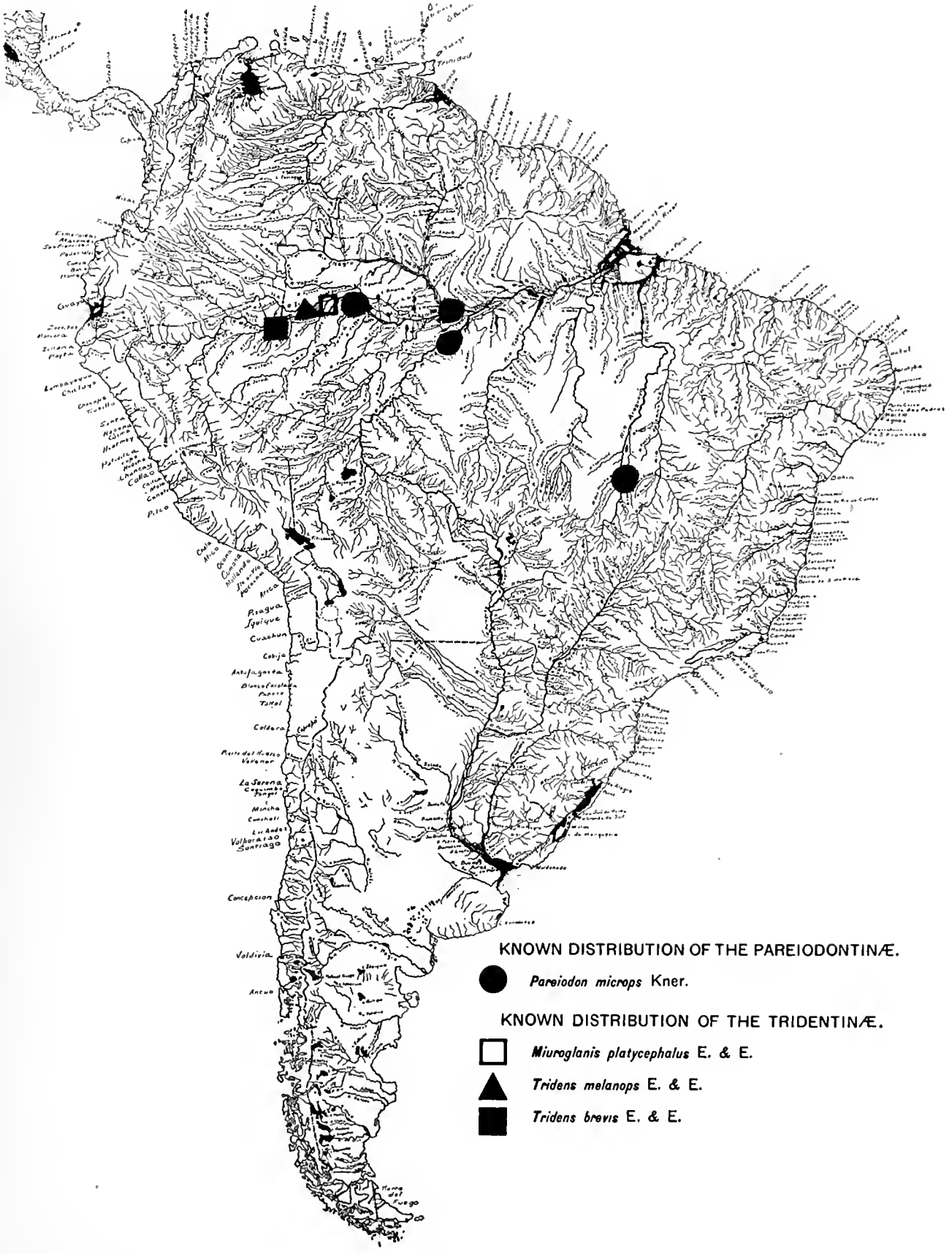
Head about 7; depth about 12; D. 7 (showing in photograph); A. about 25 (showing in photograph).

Heaviest at back part of head, tapering regularly to the base of the caudal, the depth of which is about one-third that of the head; mental barbels in pairs, not reaching pectoral, maxillary barbels sometimes to middle of pectoral; pectoral short and narrow, but little more than half as long as the head; distance from snout to origin of ventrals about one and a half in the distance between caudal and origin of ventrals; caudal small, rounded, one and one-half in the length of the head; origin of dorsal in advance of that of the ventrals, its last ray about over origin of anal; upper accessory caudal rays beginning about over the origin of the second third of the anal, the highest one but little lower than the dorsal rays; anal continuous with the lower accessory caudal rays; ventrals a little shorter than the pectorals. Color uniform.


KNOWN DISTRIBUTION OF THE PYGIDIINÆ.
Known distribution of *Pygidium*. Probably in all mountain streams north of the latitude of Buenos Aires and sporadically in lowlands. The localities in Southern Chile not indicated.
Known distribution of *Hatcheria*.
Known distribution of *Sclerònema*.
Known distribution of *Eremophilus*.


DISTRIBUTION OF STEGOPHILINÆ.
Hamadiœtus anisitsi.
Homodiœtus maculatus.
Henonemus macrops.
Henonemus intermedius.
Henonemus punctatus.
Henonemus taxistigmus.
Stegophilus insidiasus.
Acanthopoma annectens.
Ochmacanthus batrachostomus.
Ochmacanthus reinhardti.
Ochmacanthus flabelliferus.

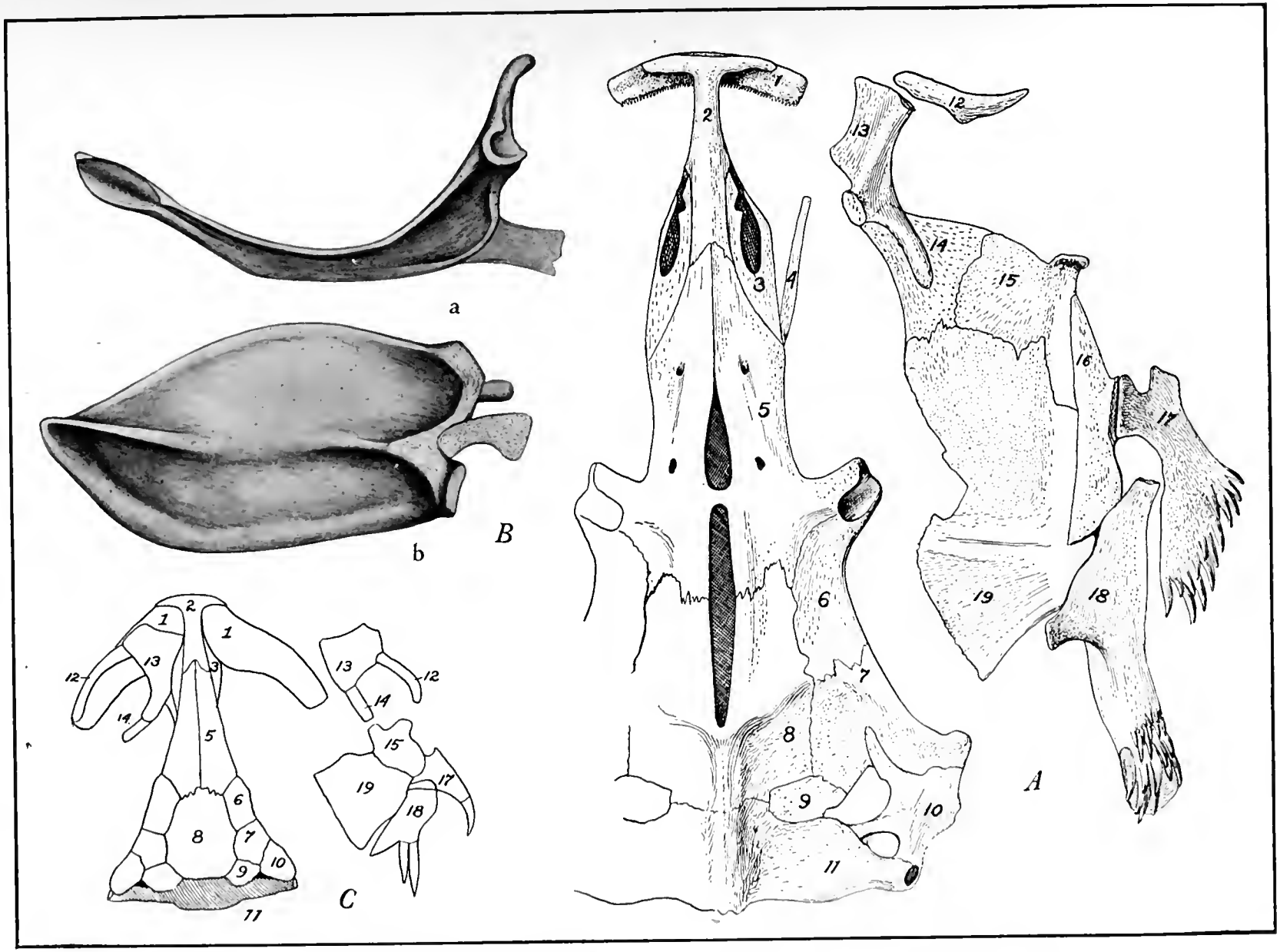

DISTRIBUTION OF THE VANDELLIINÆ.
Vandellia cirrhosa.
Vandellia plazai.
Vandellia wieneri.
Vandellia hasemani.
Vandellia sanguinea.
Paravandellia oxyptera.
Branchiorca bertonii.


KNOWN DISTRIBUTION OF THE PAREIODONTINÆ.
Pareiodon microps Kner.
KNOWN DISTRIBUTION OF THE TRIDENTINÆ.
Miuroglanis platycephalus E. & E.
Tridens melanops E. & E.
Tridens brevis E. & E.

EXPLANATION OF PLATE XL.

A and *B*, *Eremophilus mutisii* HUMBOLDT; *C*, *Henonemus punctatus* (BOULENGER).

1, Premaxillary; 2, Ethmoid; 3, Lateral Ethmoid; 4, Nasal; 5, Frontal; 6, Sphenotic; 7, Pterotic; 8, Supraoccipital: 9, Epiotic; 10, Supraclavicle; 11, Parapophysis of coalesced vertebræ; 12, Maxillary; 13, Palatine; 14, Metapterygoid; 15, Quadrate; 16, Pre-opercle; 17, Interopercle; 18, Opercle; 19, Hyomandibular; *a*, clavicle from the side; *b*, posterior face of clavicle.



A and *B*. *Eremophilus mutisii* HUMBOLDT. *C*. *Heronemus punctatus* (BOULENGER).

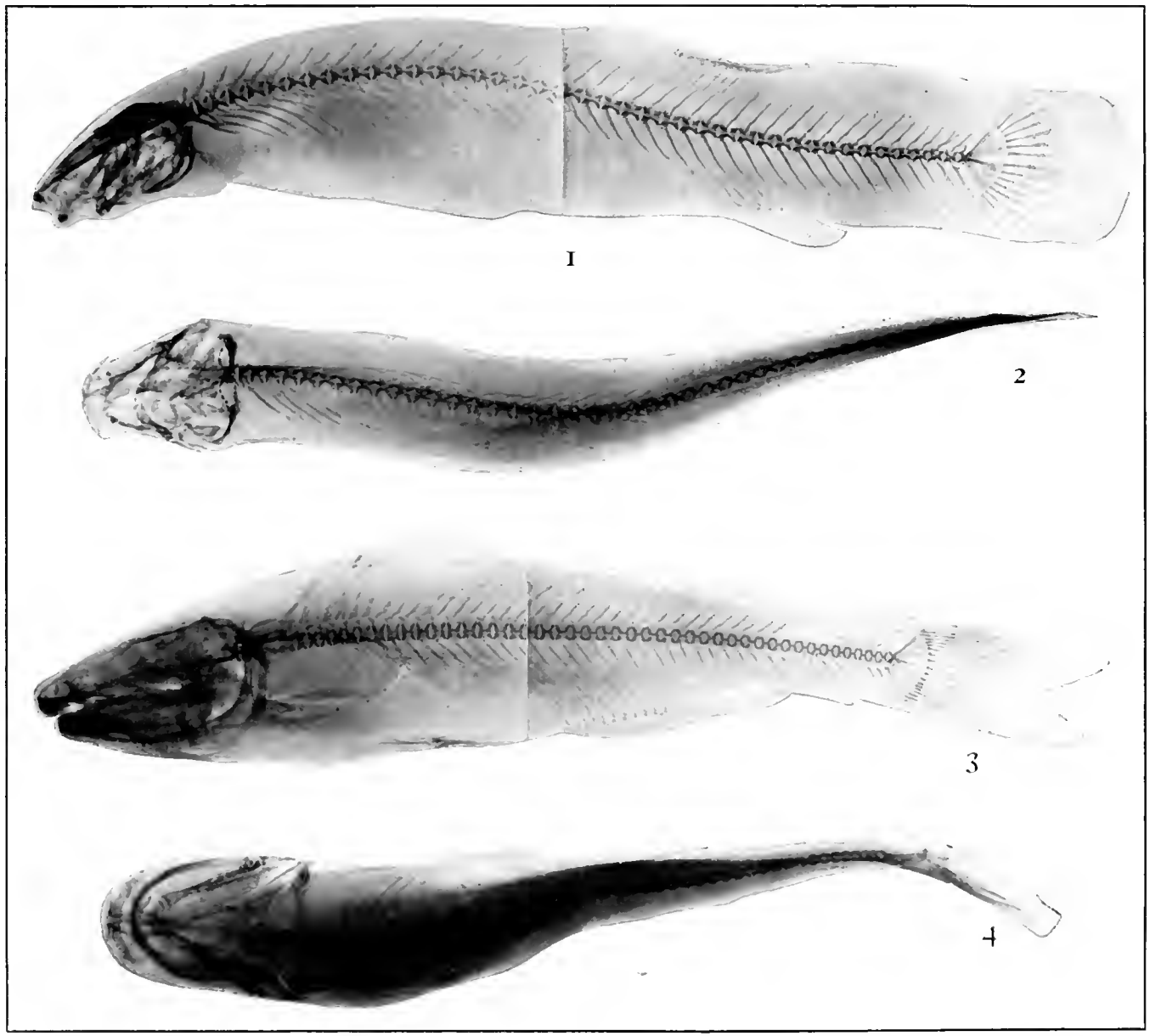
(For detailed explanation see opposite page.)

EXPLANATION OF PLATE XLI.

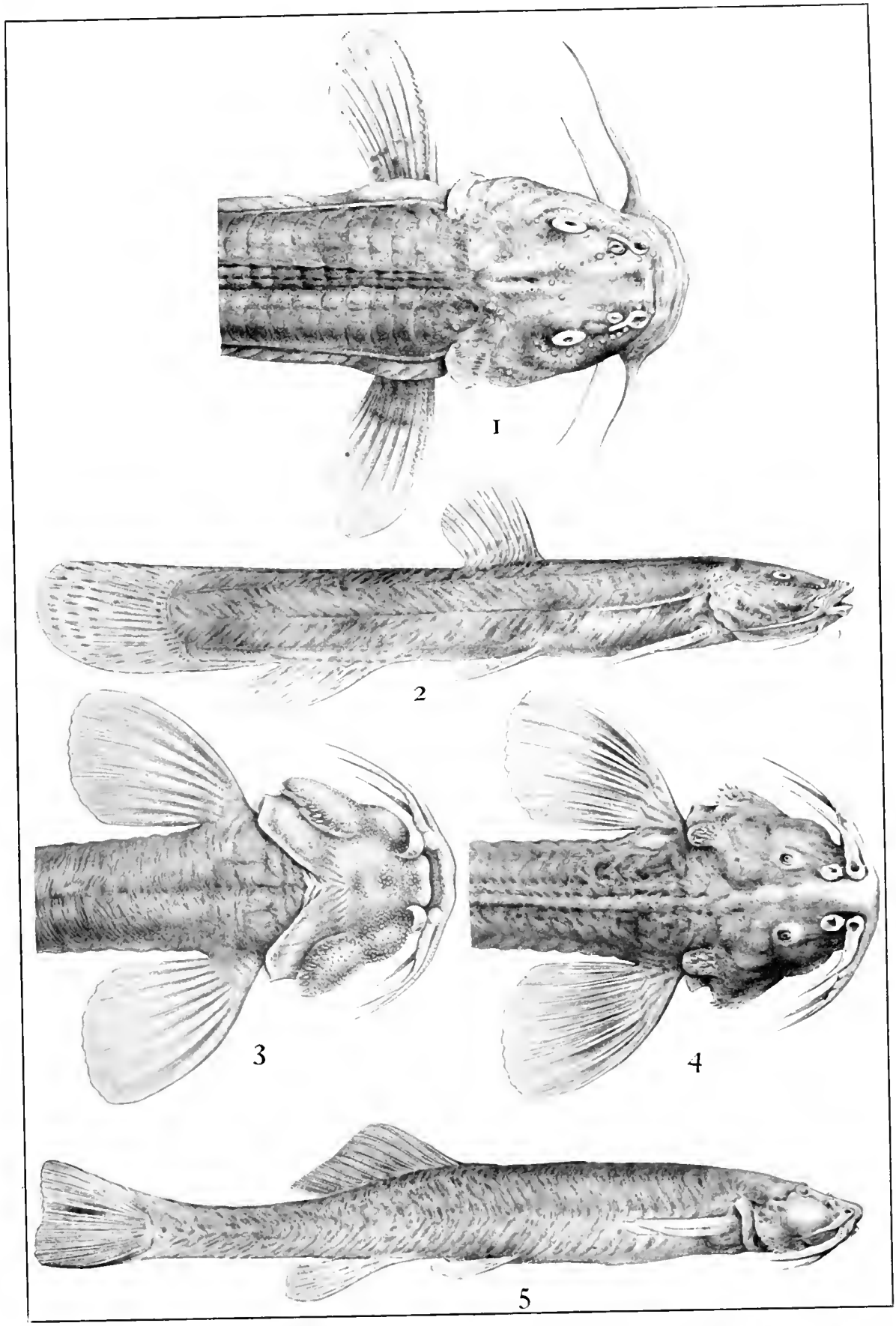
FIGS. 1–2. *Eremophilus mutisii* Humboldt. The air-bladders show faintly as two bags, one on either side of the origin of the vertebral column in fig. 2; and as a small vesicle just above the column in fig. 1. The outlines are marked with a few dots.

FIGS. 3–4. *Paracetopsis occidentalis* (Steindachner). The air-bladder shows as a large bag in fig. 3. A few points are placed in its wall to call attention to its outline.

The tails in figures 1 and 3 are from the same negatives as the rest of these figures, but have been printed heavier, as these portions are thin, and the negatives otherwise quite faint.

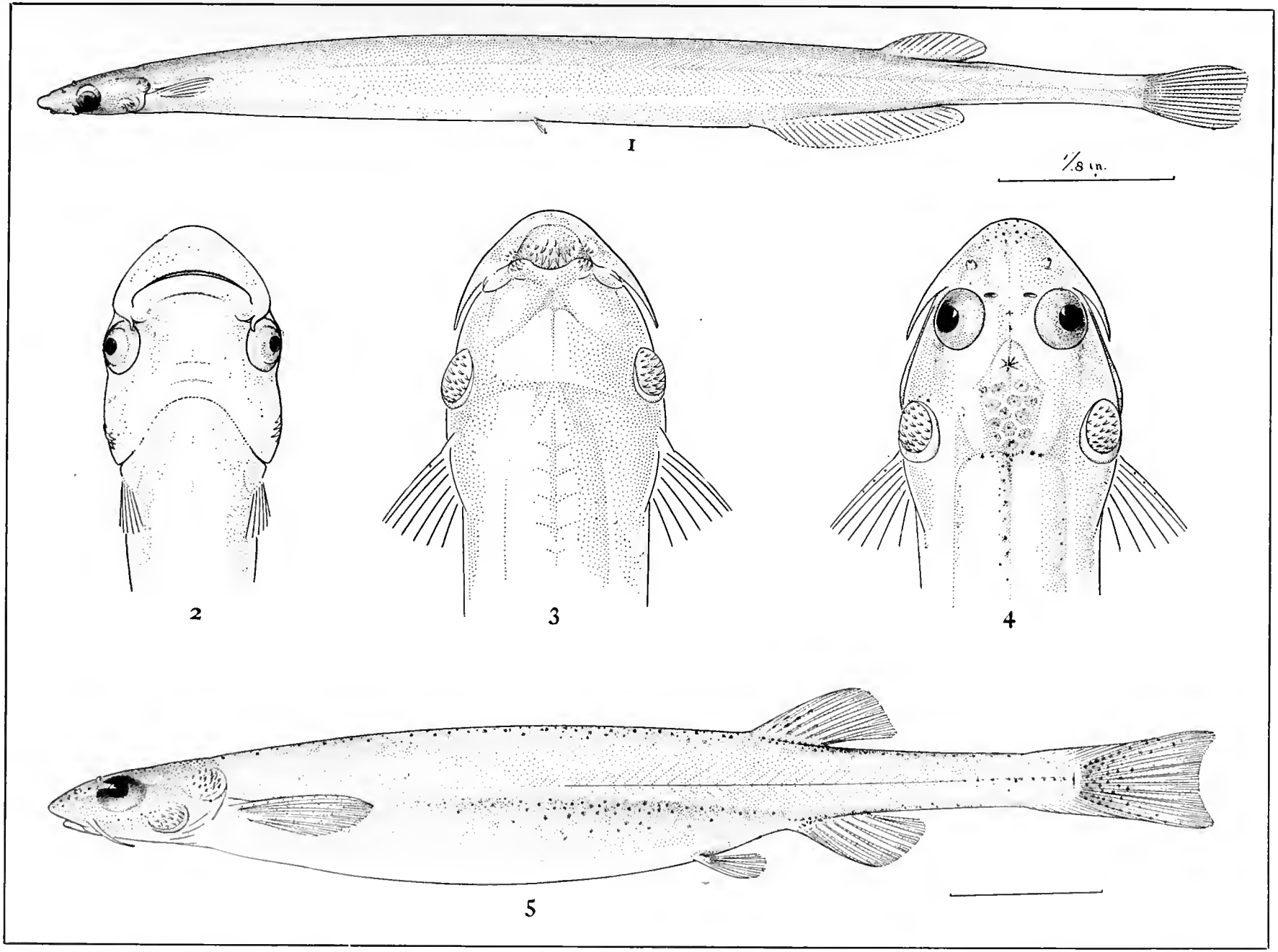


FIGS. 1–2. *Eremophilus mutisii* HUMBOLDT. FIGS. 3–4. *Paracetopsis occidentalis* (STEINDACHNER).



FIGS. 1–2. *Nematogenys inermis* (GUICHENOT). AFTER EIGENMANN. FROM NO. 9839, M. C. Z., CURICO, SANTIAGO, CHILE.

FIGS. 3–5. *Hatcheria maculata* (CUVIER & VALENCIENNES). AFTER EIGENMANN. FROM NO. 7736, M. C. Z., 92 MM. MAPOCHO, CHILE.



FIGS. 1–2. *Tridens melanops* EIGENMANN & EIGENMANN. COTYPE, 4245 I. U. M., 20 MM. IÇA. FIGS. 3–5. *Branchioica bertonii* EIGENMANN. TYPE, 13950 I. U. M., 24 MM. ASUNCIÓN.

EXPLANATION OF PLATE XLIV.

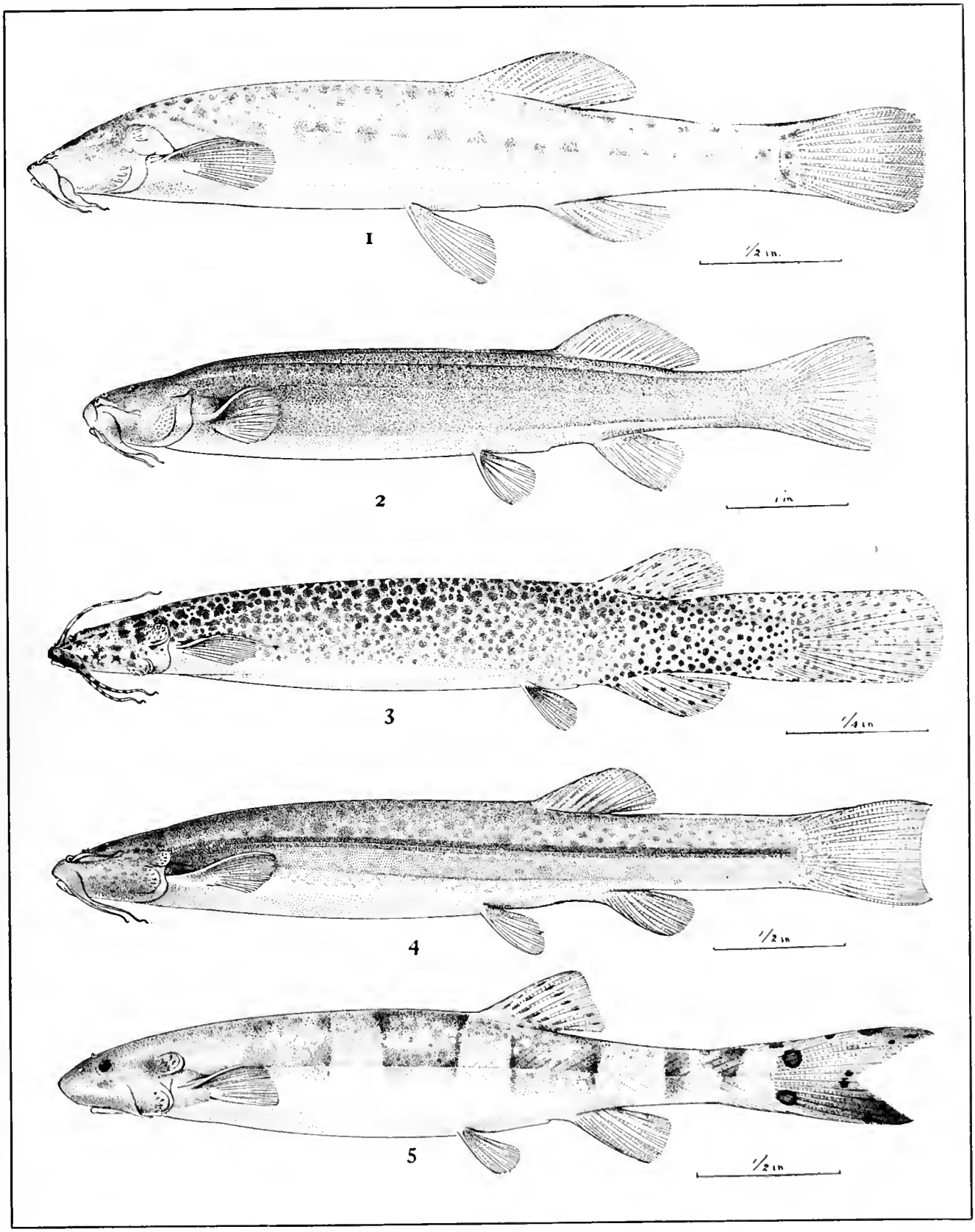
FIG. 1. *Scleronema operculatum* Eigenmann. Type, No. 7077 C. M., 79 mm., Caecquy.

FIG. 2. *Hatcheria titcombi* Eigenmann. Type, No. 11110 I. U. M., 164 mm., Arroyo Comajo.

FIG. 3. *Pygidium eichorniarum* Ribeiro. No. 7560*a*, C. M., 40 mm., San Antonio, Rio Guaporé.

FIG. 4. *Pygidium heterodontum* Eigenmann. Type, No. 13832 I. U. M., 83 mm., Rio Mendoza, Argentina.

FIG. 5. *Pseudostegophilus nemurus* (Günther). No. 7547 C. M., 78 mm., Rio Mamoré.



Scleronema, *Hatcheria*, *Pygidium*, AND *Pseudostegophilus*.
(For detailed explanation see opposite page.)

EXPLANATION OF PLATE XLV.

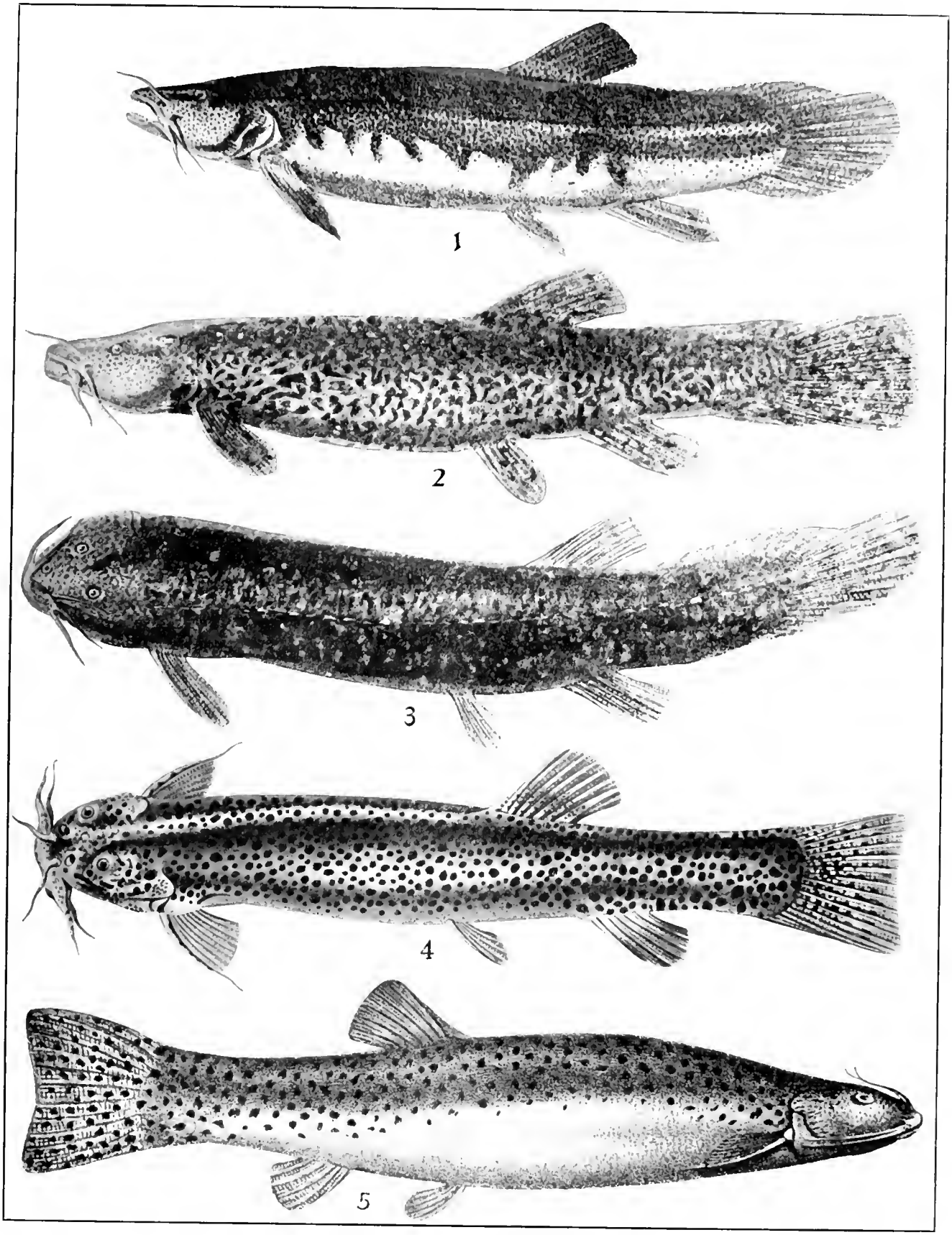
FIG. 1. *Pygidium punctatissimum* (Castelnau) after Castelnau.

FIG. 2. *Pygidium rivulatum* (Cuvier & Valenciennes). After Castelnau's figure of *Trichomycterus pentlandi*.

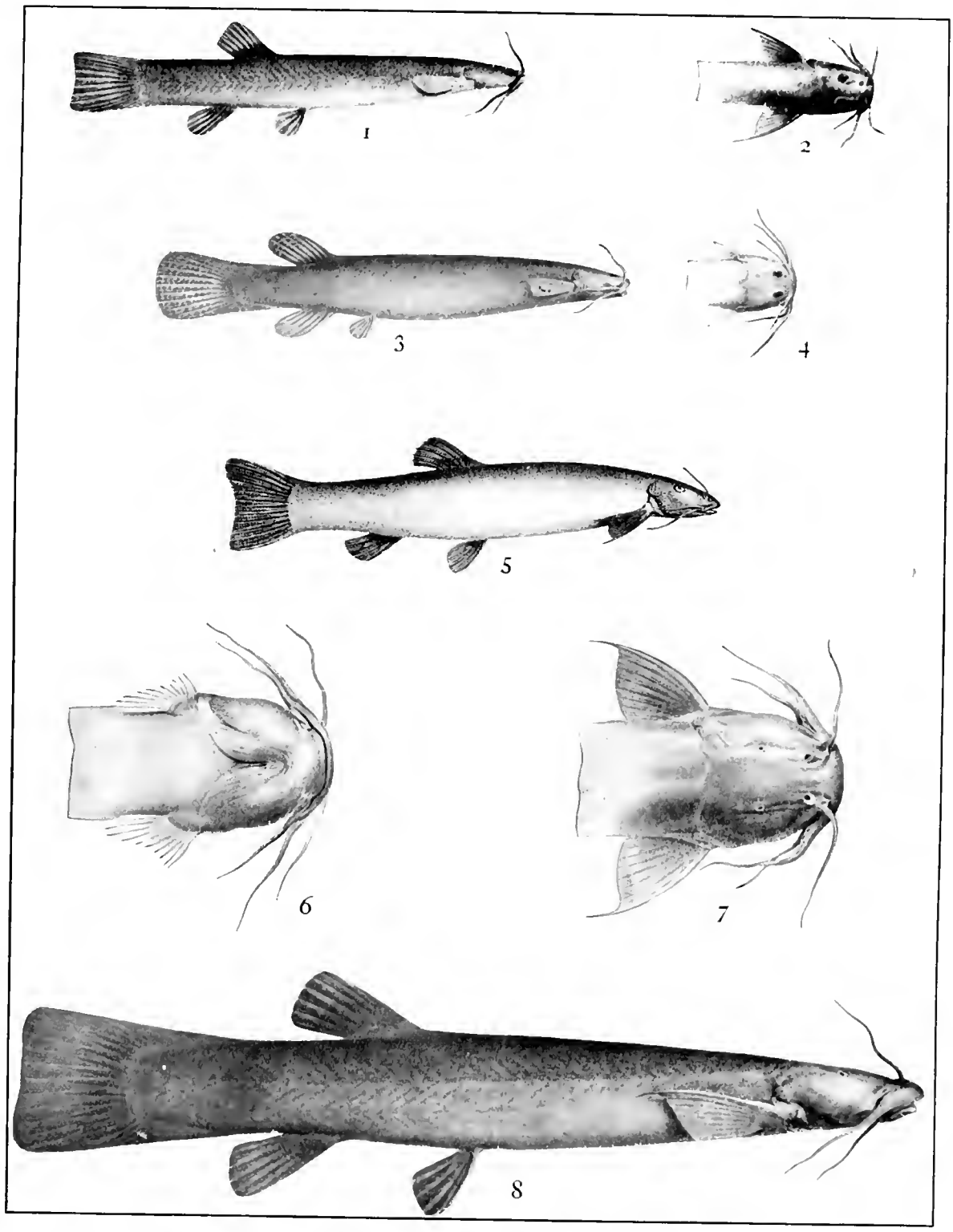
FIG. 3. *Pygidium rivulatum* (Cuvier & Valenciennes). After Castelnau's figure of *Trichomycterus pictus*.

FIG. 4. *Pygidium punctulatum* (Cuvier & Valenciennes). After Cuvier & Valenciennes.

FIG. 5. *Pygidium dispar* Tschudi. After Tschudi.



Pygidium.
(For detailed explanation see opposite page.)



FIGS. 1, 2. *Pygidium kneri* (STEINDACHNER). AFTER STEINDACHNER.

FIGS. 3, 4. *Pygidium amazonicum* (STEINDACHNER). AFTER STEINDACHNER.

FIG. 5. *Pygidium taczanowskii* (STEINDACHNER). AFTER THE MALE OF *Pygidium dispar* TSCHUDI, FAUN. PERUANA, ICHTHYOL., PL. III, LOWER FIGURE.

FIGS. 6–8. *Pygidium taczanowskii* (STEINDACHNER). AFTER STEINDACHNER.

EXPLANATION OF PLATE XLVII.

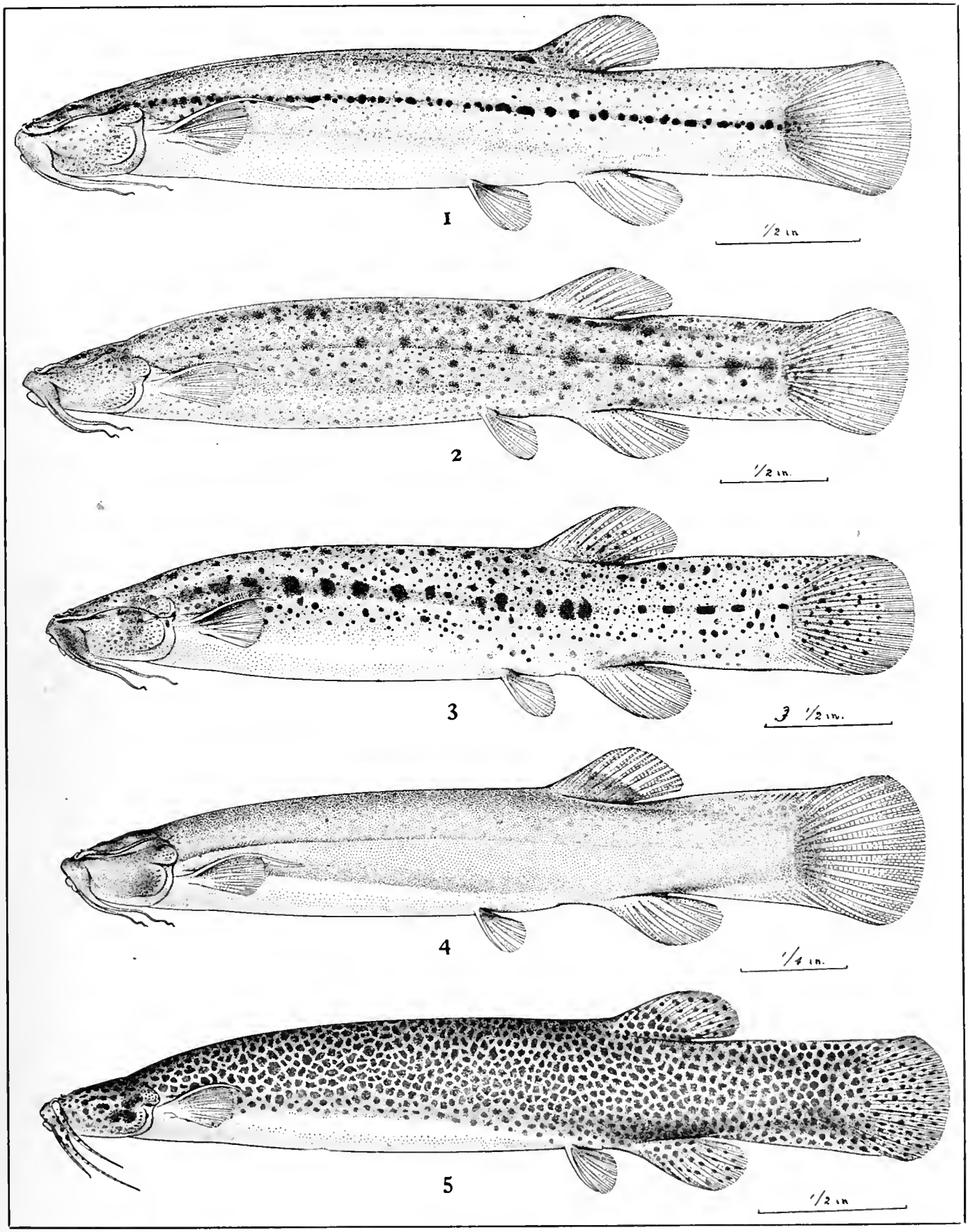
FIG. 1. *Pygidium stellatum* Eigenmann. Type, No. 7097 C. M., 78 mm., Quebrada Sargento.

FIG. 2. *Pygidium chapmani* Eigenmann. Type, No. 4817, C. M., 106 mm., Boquia.

FIG. 3. *Pygidium chapmani* Eigenmann. No. 7091 C. M., 86 mm., Rio Dagua at Caldas. Eigenmann.

FIG. 4. *Pygidium latidens* Eigenmann. Type, No. 13801, I. U. M., 53 mm., near mouth of Rio Calima, Colombia. (Head too short; it is 5.5 in the length.)

FIG. 5. *Pygidium meta* Eigenmann. Type, No. 13770, I. U. M., Barrigona.



Pygidium.
(For detailed explanation see opposite page.)

EXPLANATION OF PLATE XLVIII.

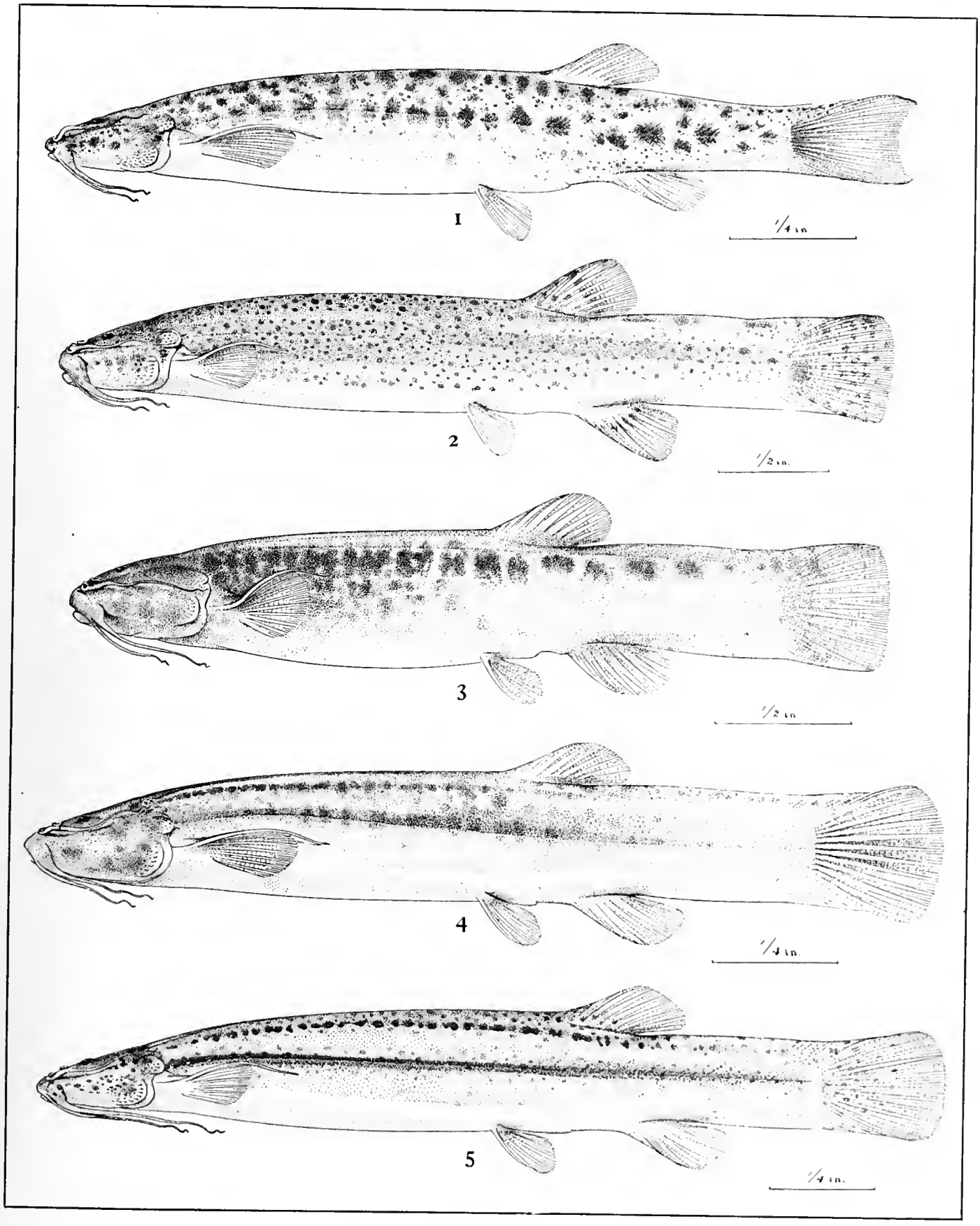
FIG. 1. *Pygidium banneaui* Eigenmann. Type, No. 4815, C. M., 43 mm., Bernal Creek.

FIG. 2. *Pygidium spilosoma* Regan. No. 7092, C. M., 97 mm., Cordova, Rio Dagua, Colombia.

FIG. 3. *Pygidium dorsostriatum* Eigenmann. Type, No. 7093*a*, C. M., 76 mm., Villavicencio.

FIG. 4. *Pygidium latistriatum* Eigenmann. Type, No. 7450, C. M., 46 mm., Quebrada de Pinchote, Santander.

FIG. 5. *Pygidium regani* Eigenmann. No. 13772, I. U. M., 55 mm., Tado.



Pygidium.
(For detailed explanation see opposite page.)

EXPLANATION OF PLATE XLIX.

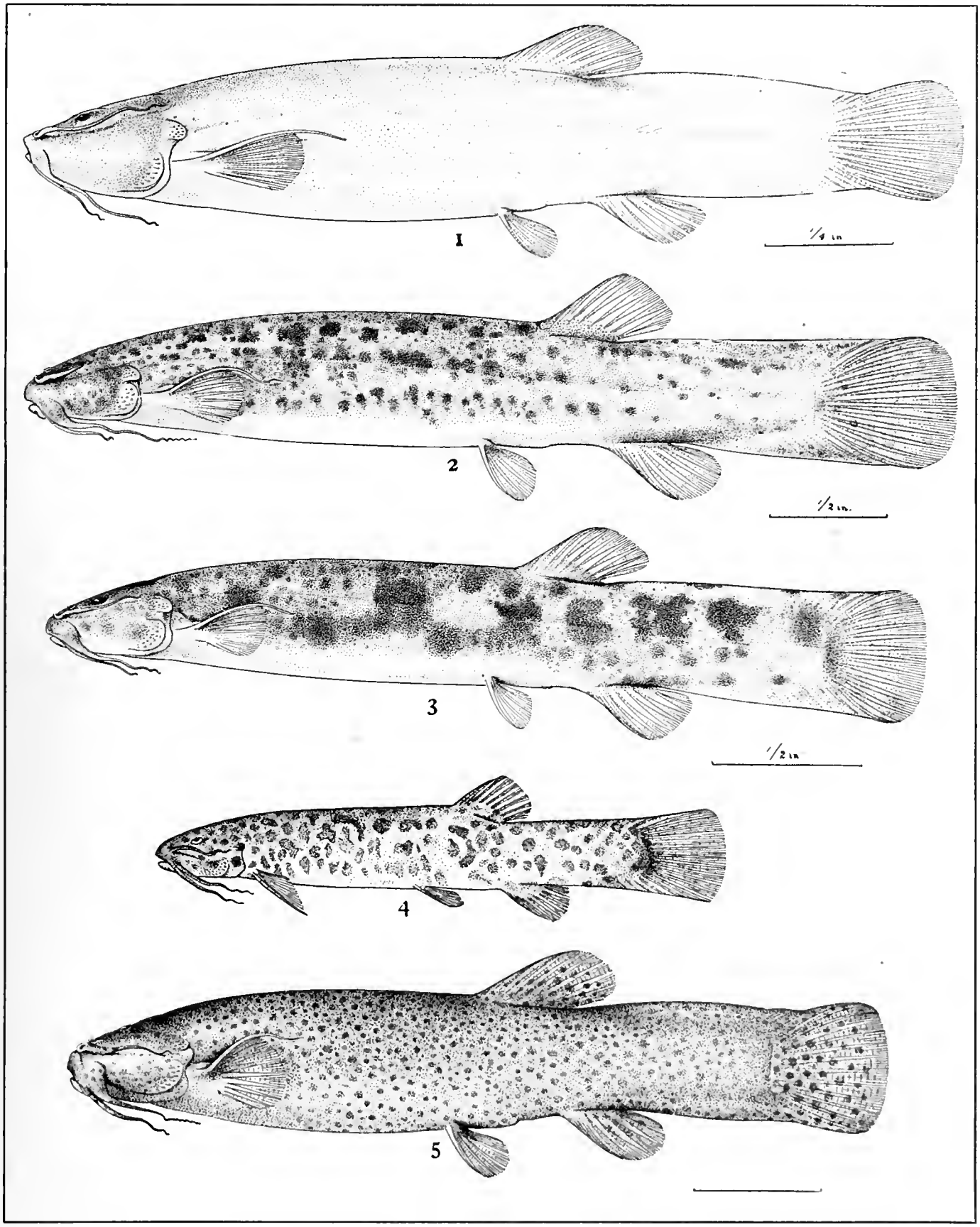
FIG. 1. *Pygidium stramineum* Eigenmann. Type, No. 7101, C. M., 46 mm., Quebrada del Mango. (The eye is farther forward than in the specimen.)

FIG. 2. *Pygidium meridæ* Regan. No. 13771, I. U. M., 99 mm., Merida, Venezuela.

FIG. 3. *Pygidium bogotense* Eigenmann. Type, No. 4820, C. M., 74 mm., Puente de Supa, near Chapinero, Plains of Bogotá.

FIG. 4. *Pygidium bogotense* Eigenmann. No. 4821*b*, C. M., 70 mm., Chapinero.

FIG. 5. *Pygidium nigromaculatum* (Boulenger). Univ. Michigan, 165 mm., San Lorenzo, Santa Marta Mountains, 4,500 ft.



Pygidium.
(For detailed explanation see opposite page.)

EXPLANATION OF PLATE L.

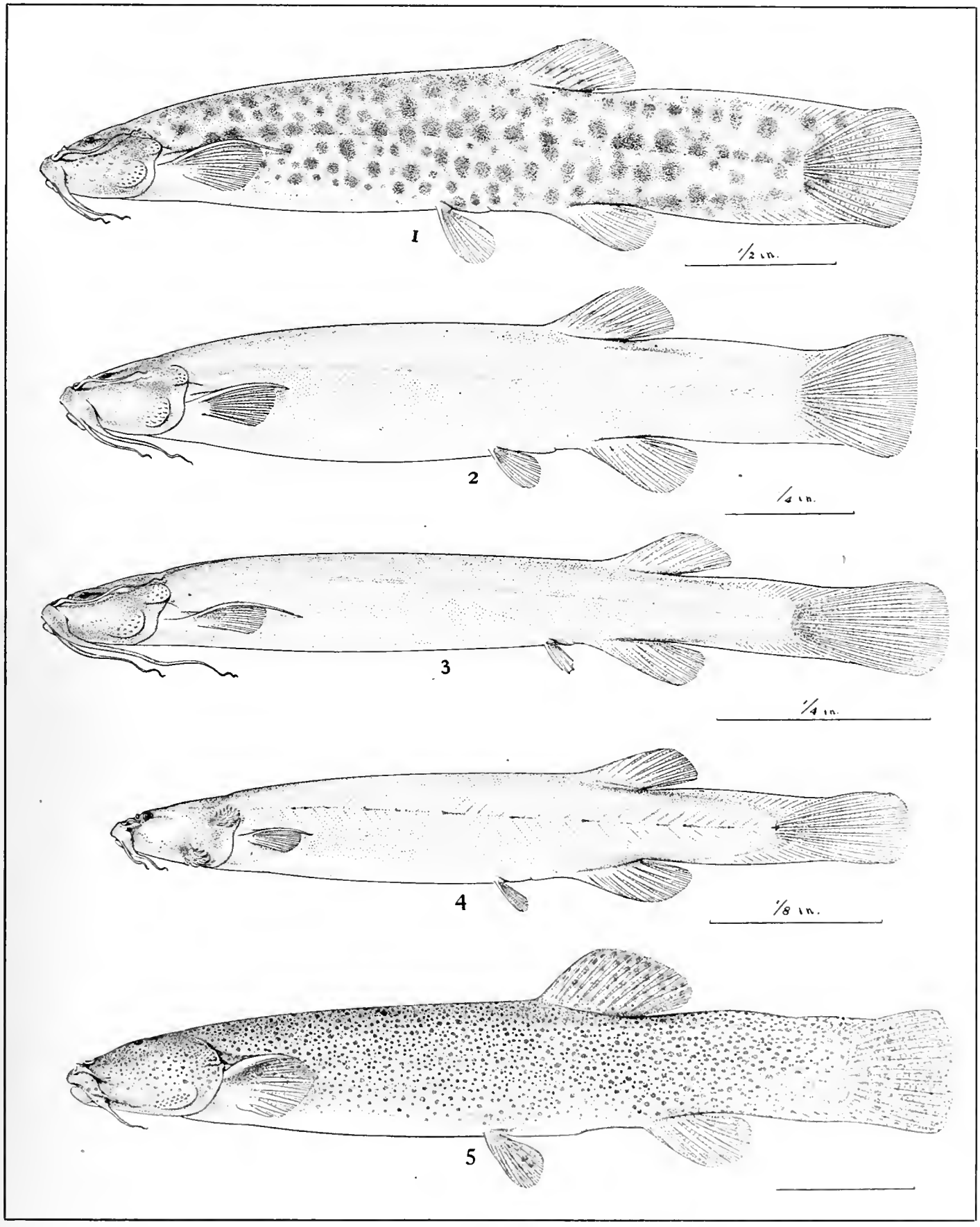
FIG. 1. *Pygidium guianense* Eigenmann. Type, No. 1003, C. M., 77 mm., Aruataima Cataract.

FIG. 2. *Pygidium conradi* Eigenmann. Type, No. 2212, C. M., 41 mm., Amatuk Cataract. (The head is a little too short.)

FIG. 3. *Pygidium graeilior* Eigenmann. Type, No. 1730, C. M., 27 mm., Erukin, British Guiana.

FIG. 4. *Pygidium hasemani* Eigenmann. Type, No. 5238, C. M., 15 mm., Santarem.

FIG. 5. *Pygidium iheringi* Eigenmann. Type, No. 10785, I. U. M., 161 mm., Santos.



Pygidium.
(For detailed explanation see opposite page.)

EXPLANATION OF PLATE LI.

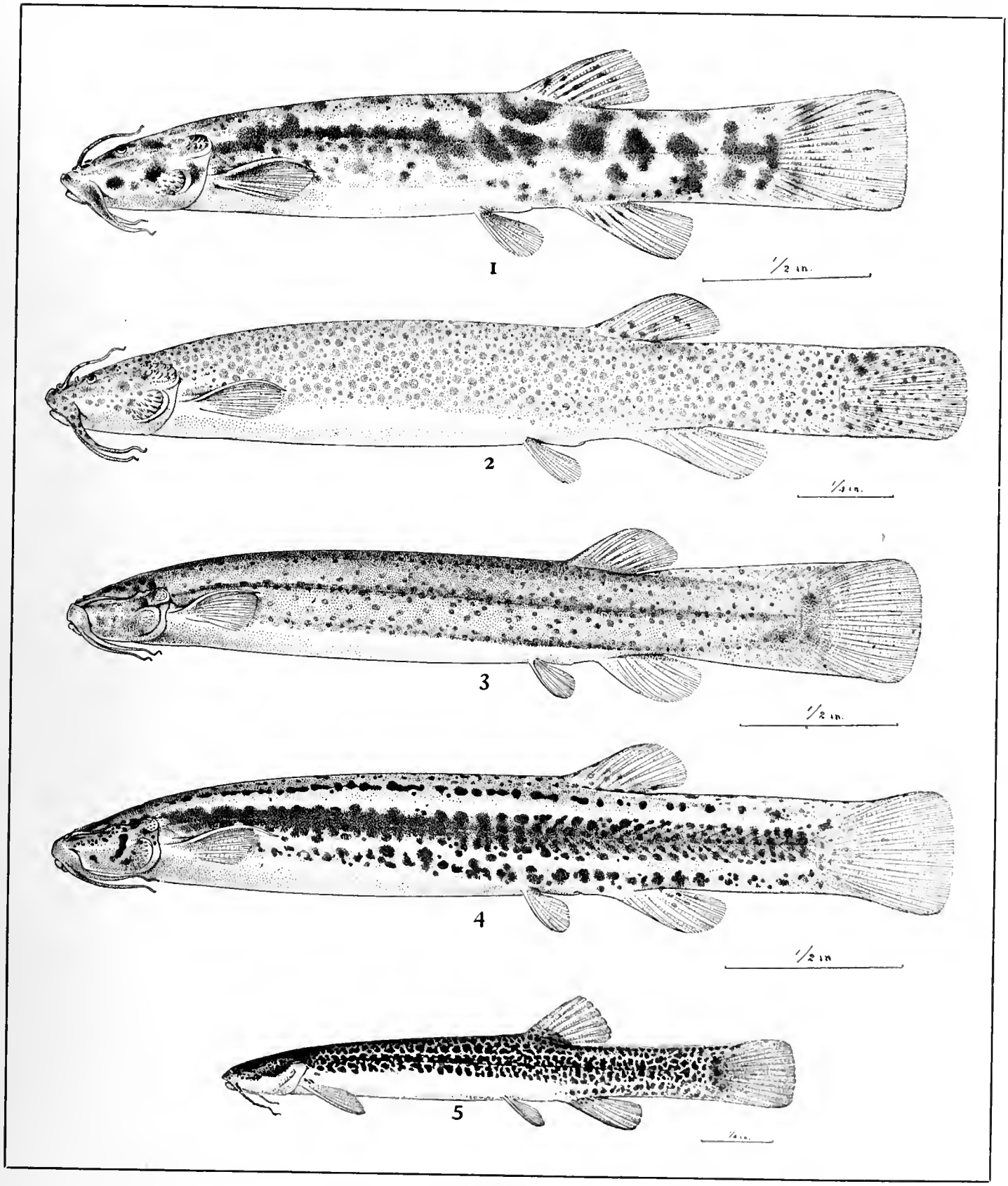
FIG. 1. *Pygidium zonatum* Eigenmann. Type, No. 7596, C. M., 62 mm., Agua Quente.

FIG. 2. *Pygidium proöps* (Ribeiro). No. 7593, C. M., 60 mm., Agua Quente.

FIG. 3. *Pygidium paolence* Eigenmann. Type, No. 7081, C. M., 68 mm., Alto da Serra, Rio Tieté, São Paulo, Brazil.

ERRATA FIG. 4. *Pygidium reinhardti* Eigenmann. Type, No. 7078, C. M., 65 mm., Burmier.

FIG. 5. *Pygidium davisi* Haseman. Type, No. 2862, C. M., 52 mm., Serrinha Paraná.



Pygidium.
(For detailed explanation see opposite page.)

EXPLANATION OF PLATE LII.

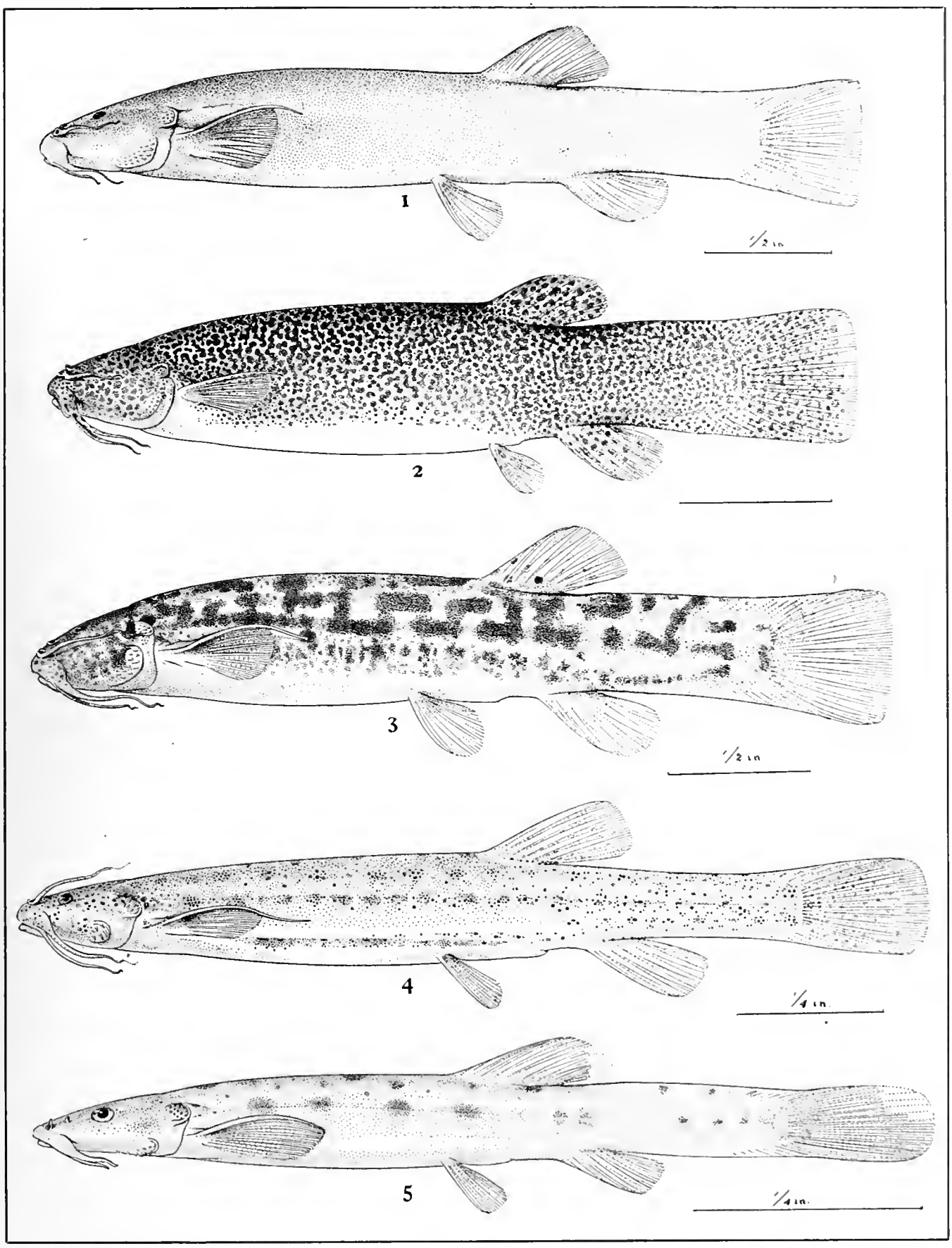
FIG. 1. *Pygidium immaculatum* Eigenmann & Eigenmann. No. 7076, C. M., 81 mm., Rio Doce.

FIG. 2. *Pygidium vermiculatum* Eigenmann. Type, No. 7074, C. M., 131 mm., Juiz de Fora.

FIG. 3. *Pygidium alternatum* Eigenmann. Type, No. 7079*a*, C. M., 79 mm., Rio Doce.

FIG. 4. *Pygidium triguttatum* Eigenmann. Type, No. 7600*a*, C. M., 36 mm., Jacarehy.

FIG. 5. *Pygidium santæ-ritæ* Eigenmann. Type, No. 7599, C. M., 24 mm., Santa Rita.



Pygidium.

(For detailed explanation of Plate see opposite page.)

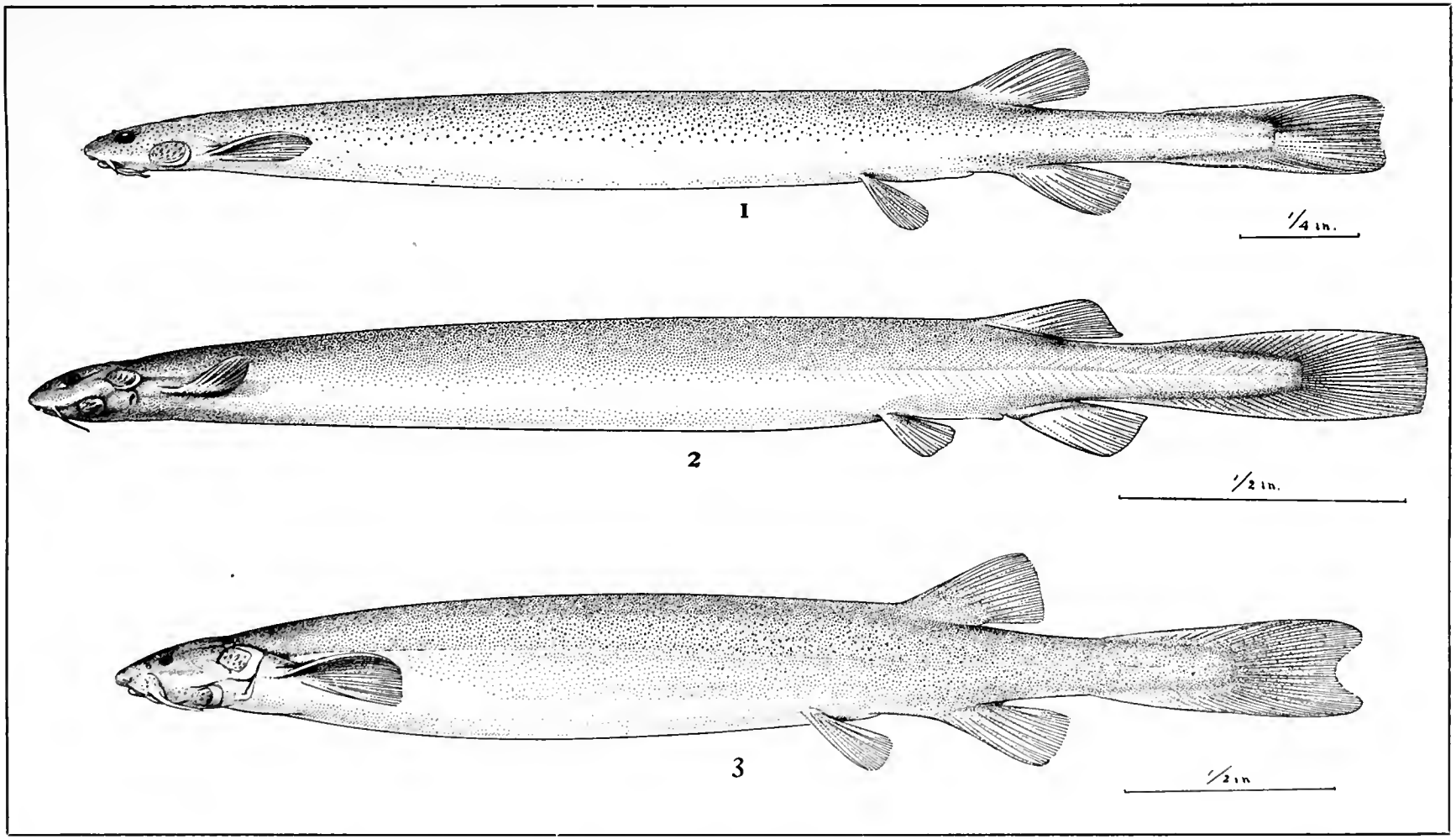


FIG. 1. *Vandellia plazai* CASTELNAU. No. 7541, C. M., 66 MM., SANTAREM.
FIG. 2. *Vandellia sanguinea* EIGENMANN. TYPE, No. 7082, C. M., 62 MM., SAN ANTONIO DE RIO MADEIRA.
FIG. 3. *Vandellia hasemani* EIGENMANN. TYPE, No. 7542, C. M., 72 MM., RIO MAMORÉ.

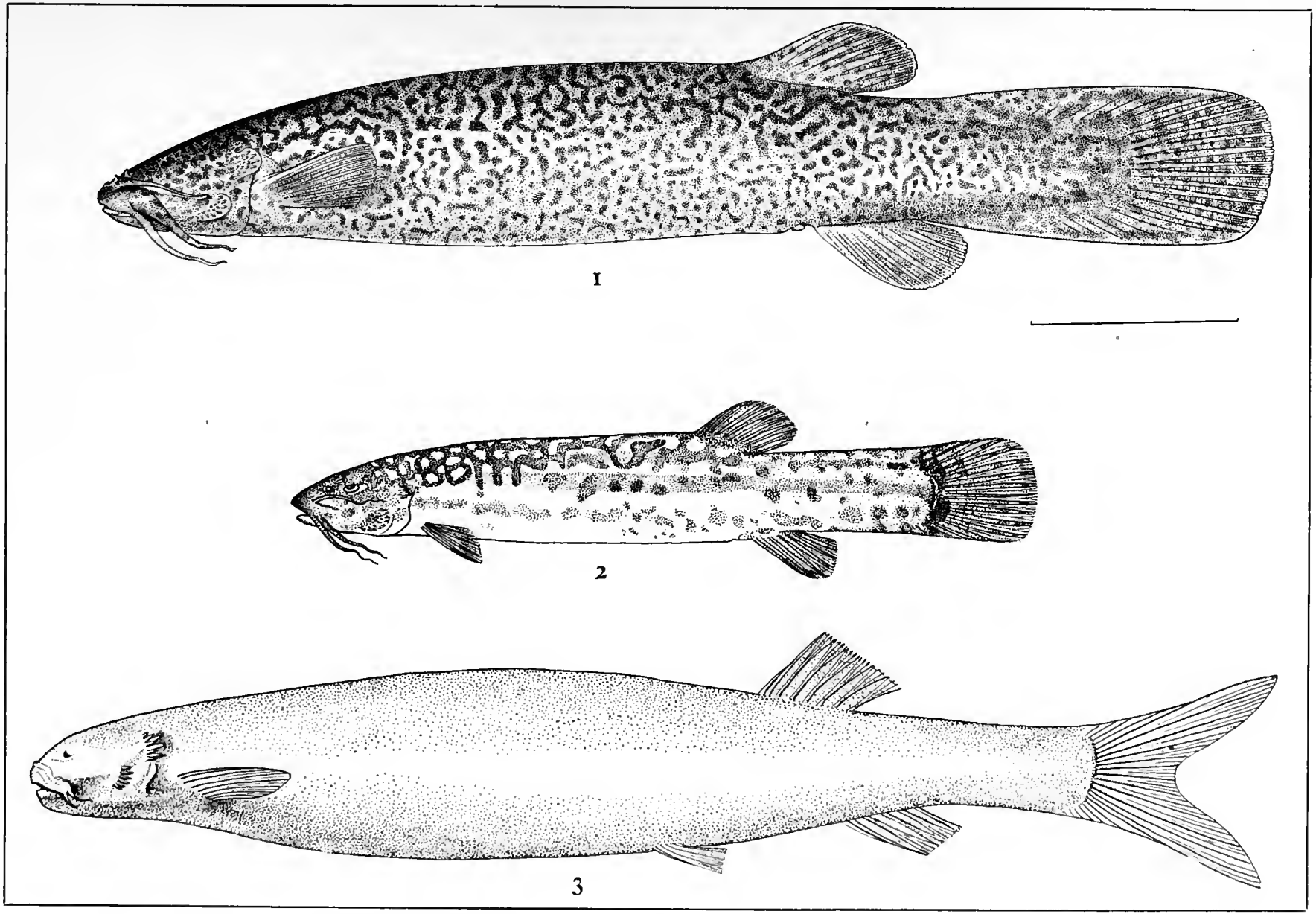
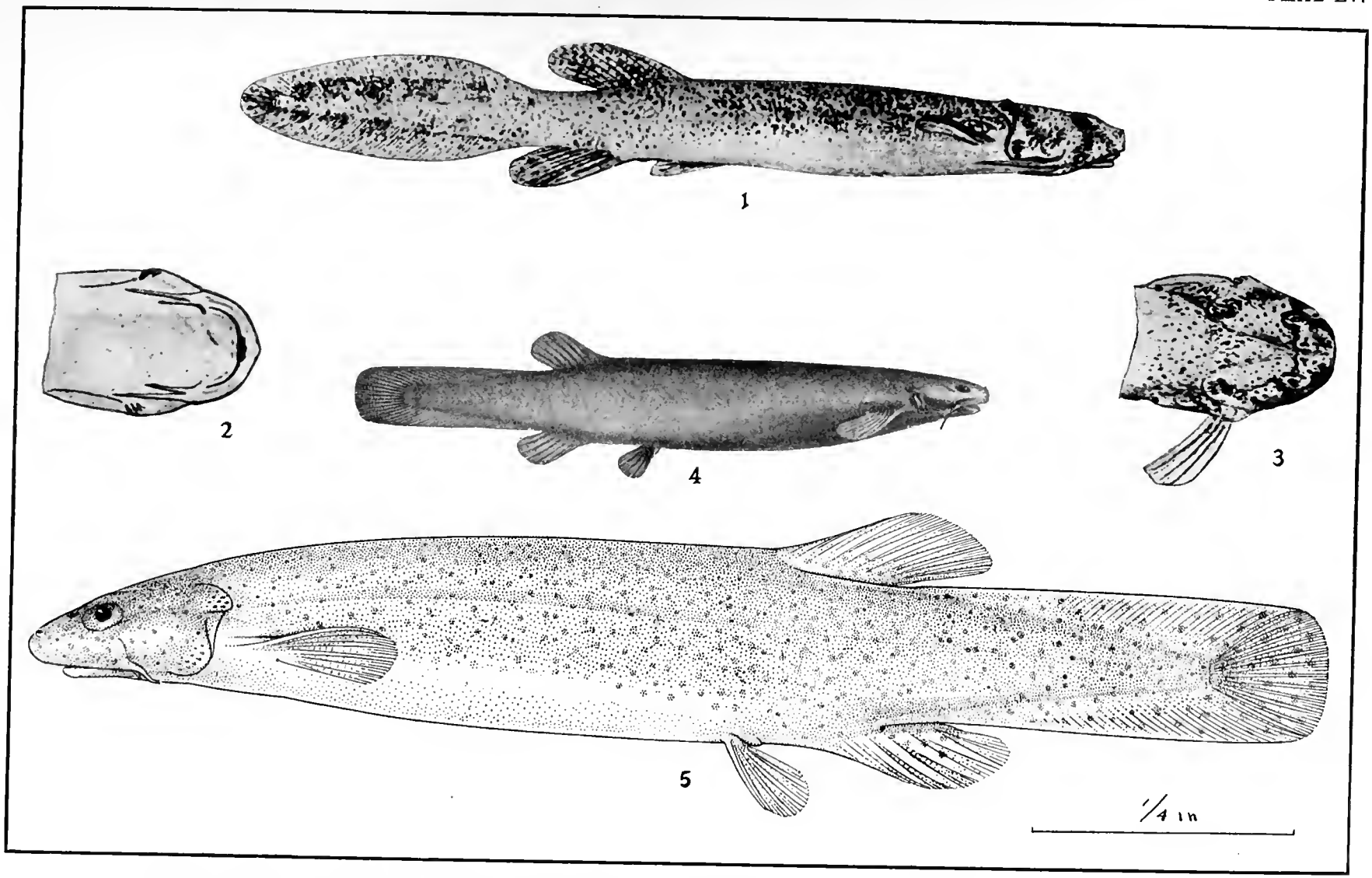
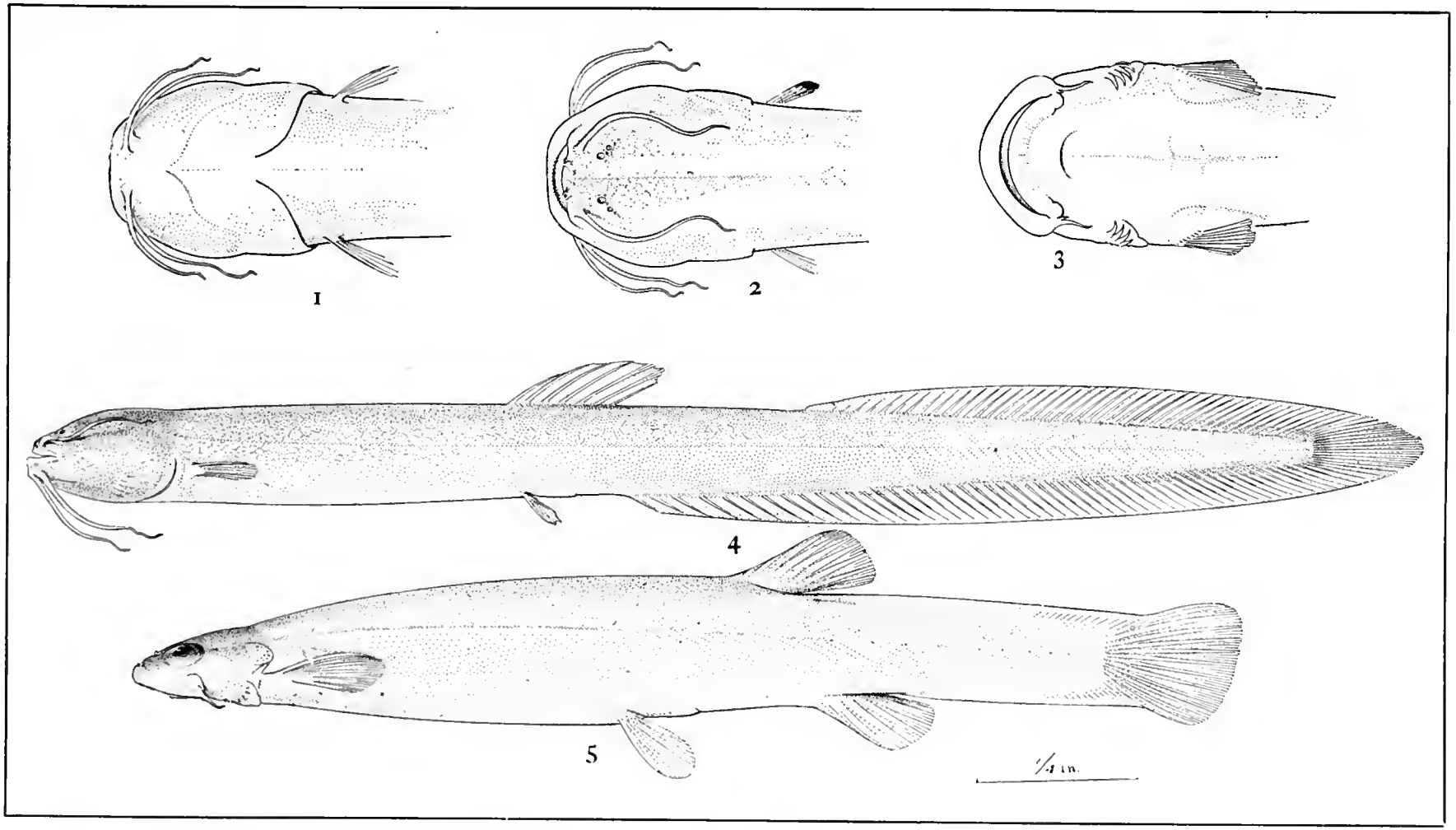


FIG. 1. *Eremophilus mutisii* HUMBOLDT. 146 MM. NEAR BOGOTÁ.
FIG. 2. *Eremophilus mutisii* HUMBOLDT. 85 MM. NEAR BOGOTÁ. SHOWING COLOR-PATTERN IN YOUNG.
FIG. 3. *Pareiodon microps* KNER. 145 MM., SPECIMEN IN ACAD. NAT. SCI. PHILADELPHIA.



FIGS. 1–3. *Ochmacanthus batrachostoma* (RIBEIRO). AFTER RIBEIRO.
FIG. 4. *Ochmacanthus reinhardti* (STEINDACHNER). AFTER STEINDACHNER.
FIG. 5. *Ochmacanthus flabelliferus* EIGENMANN. TYPE, NO. 1729, C. M., 31 MM., KONAWARUK, BRITISH GUIANA.



FIGS. 1, 2, 4. *Phreatobius cisternarum* GOELDI. No. 7603, C. M., 40.5 MM. MARAJO.
FIGS. 3, 5. *Homodiætus anisitsi* EIGENMANN & WARD. TYPE, No. 10155, I. U. M., 73 MM., VILLA RICA, PARAGUAY.

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