The Pygidiidae.

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There is a widespread belief in parts of South America that a fish called Candirú has the vicious habit of entering the urethra of bathers. Its opercle and interopercle bear retrorse spines that are erectile. The fish, therefore, cannot be withdrawn. An operation, if not amputation, is necessary to get rid of the pest, and if it has penetrated to the bladder it causes death. This story has been told many different travelers. Some have rejected it as beyond belief, others have added to the marvelous, while still others have tried to identify the fish. The result of the latter attempt has been ludicrous at times, inasmuch as the identification would require the reverse of the well recognized principle of logic that the greater cannot enter the lesser. Some of the Candirús reach a considerable size, a length of at least a foot and a thickness of at least two inches. We will return to the Candirús.

I have finished a monograph of the family of fishes, the Pygidiidæ, of which the smaller Candirús are members, and I want to give a brief account of the different types of fishes that are included in this family. Other species of the family have well authenticated habits as remarkable as those of the Candirú, and I am figuring all the species I can get.

I find that there are nearly a hundred well defined species of the Pygidiidæ. Many of these are very rare. Forty-four are known from the types only, several have been recorded from but two localities. The types are widely scattered in the museums of North America, South America, and Europe. At one time or another I have examined practically all of the specimens in American museums, and have myself discovered nine of the nineteen genera, and forty-three of the ninety-seven species. Eight or ten of the types are in Vienna, two are in Berlin, twelve in Paris, eleven in London, one in Torino, two probably in Munich, one in Leipzig, two in Copenhagen, one in Berne, three presumably in Santiago, Chile, three in Buenos Aires, three in Rio de Janeiro, two in Cordoba, Argentine, one in the Field Museum, two in the Philadelphia

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Academy of Sciences, eight in the Museum of Comparative Zoölogy, five in Indiana University, one in Princeton University, twenty-four in the Carnegie Museum. The type of one species, the only known specimen of the species, has been lost.

A Pygidium.

The particular type of catfish underlying all of the Pygidiidæ is that of a short eel with a little barbel on the anterior nostril, twin barbels at the angle of the mouth, small teeth in bands in the jaws, bunches of spines on the margin of the preopercle and on the opercle, the first dorsal and pectoral rays not spinous, the dorsal placed behind the middle of the body and not followed by an adipose fin. The principal peculiarities are the twin barbels at the angle of the mouth, the absence of an adipose fin and the development of opercular and interopercular spines—never mind the internal economy. Nobody knows, at least I don't, why there are *twin* barbels at the angle of the mouth, or why there is no adipose fin. It is easy to see that the spines on interopercle and opercle are important. They are an adaptation to the insinuating habit and prevent an exsinuation if the fish objects to coming out.

From this basal idea of the Pygidiidæ have been developed by addition, subtraction and modification several distinct subfamilies, each with subsidiary basal ideas and a larger or smaller number of radiations. There are the Nematogenyinæ with barbels on the chin, remnants really of the more ancient, less specialized cat-fishdom, the Pygidiidæ which are the least specialized of the Pygidiidæ, and meander over all the mountains of South America, both east and west. The most that can be said of them is that there are a lot of them and that when big enough they are good to eat. Then there are the Stegophilinæ with a broad, inferior mouth with innumerable fine teeth in many rows on lips and

jaws, and some, at least, which have exaggerated the insinuating habit to the extent of becoming parasites in the gills of other fishes. Also there are the Vandelliinæ, in which the lower jaws are weak, the rami no longer meeting in the middle, the teeth largely reduced to a few pointed ones in the middle of the upper jaw, with which they make abrasions in the skins of other fishes and of an occasional bather, to drink his blood. To this crowd of disreputables belong the aforementioned Candirú. Finally there are little odds and ends tied into the Tridentinæ, minute creatures, the smallest of which is but 17 mm. long, and the largest but 27 mm. The most that we can say of them is to express the wonder that any of them were caught at all.

The Nematogenyinæ have either lost or never got opercular spines. Nematogenys is large enough to be noticed. It has received the common name "Bagre", and reaches a length of over ten inches at least.

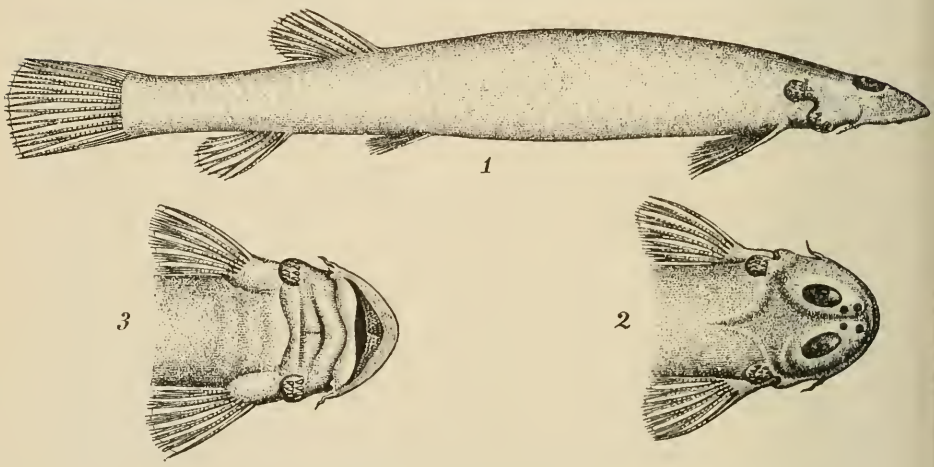
The Pygidiinæ flourish in the mountains from southern Panama to southern Patagonia, and in southeastern Brazil, also in the cataracts of Guiana. A few of them are found in the lowland, but their optimum is only reached in high altitudes, and with Astroblepus, a representative of another catfish type, they reach the highest altitudes attained by fishes in South America.

One of them, *Eremophilus mutisii*, is exceedingly abundant on the Plains of Bogotá, where its name, "El Capitan", expresses the estimation in which this Pygidiid is held. It has the habit of worming its way into the mud and into the banks of streams and lakes. "El Capitan" is speckled like a lake trout, and it is all but confined to the elevated basin in which Bogotá is situated. In the mountain brooks of Colombia many species of the genus Pygidium are found in abundance. I recall one sultry day sitting in a cool, clear, shallow brook near Honda, Colombia, leisurely raking my fingers through the sand and pebbles on the bottom. Minute fishes darted out of the sand and into it and under small rocks. I lined a dipnet with cheese-cloth and went for them, dipping up sand. gravel and all. I soon had a good number, eighty-nine to be exact, of a new species of the genus Pygidium. Mr. E. B. Williamson caught a specimen of another species, which was making its way up the vertical wall of a waterfall. The sixty-three members of the genus Pygidium range from southern Panama to Chile, Guiana and Rio Grande do Sul. Very few species are known from the lowlands, but every mountain

brook has one or more species, never many, and none of them have a wide distribution. They are abundant in Lake Titicaca, and in southern Chile are replaced by the related genus Hatcheria.

A halfway station between the Pygidiinæ with nasal barbel, free gill-membranes and ordinary fish mouth and the small commensals, parasites and disreputables without nasal barbels, with narrow gill-openings and inferior mouth, is found in Pareiodon. In shape and size Pareiodon resembles the Havanas sold to tourists in Habana for a dollar, each one put up in an individual bottle, a corkscrew furnished gratis with each cigar.

Some, at least, of the Stegophilini live in the gill-openings of other fishes. The head in the species of this group is flat below, the mouth a transverse slit, the teeth are minute and numerous, there is no nasal barbel, the gill-opening is greatly restricted, the membrane being united with the broad, flat isthmus. Some of them roam the billows free as cats, others are known to live, occasionally at least, as commensals or parasites in the gill-cavities of other fishes. Reinhardt, a Danish naturalist living for the time at Lagoa Santa, on the Rio das Velhas, a tributary of the San Francisco, was the first one to note this fact and to secure specimens. Reinhardt being told that one of the giant catfishes, *Pseudoplatystoma coruscans*, carried its young in its gills, offered a re-



Stegophilus insidiosus Reinhart.

ward for one with young. Two Platystomas were brought with young, but instead of being the young of the giant catfish, he found that the small fishes were the types of a distinct parasitic or commensal fish, which he called "Stegophilus insidiosus."

It is certain that some members of the Stegophilini live in the open, very probably on sandy beaches; in fact, while but one species is known to live part of its time, at least, in the gills of other fishes there are a number of species that have only been caught in the open. Several years ago Prof. J. D. Anisits, then living in Asuncion, Paraguay, sent me one of these little creatures, which he had caught in a brook near Sapucay. He tried to get others but sorrowfully reported that the locality was gone, the arroyo was dry. While the original member of the Stegophilini came from a medium altitude, the members of the subfamily live largely in the lower levels of the Amazon and La Plata. As it is more probable that specimens living in the open will get into the ichthyologists' bottles than those living in the gill-cavities of larger fishes, it must be left an open question whether the species living in gill-cavities are more numerous than those living in the open, and whether the same species live in the open and in gill-cavities indiscriminately, or whether they only occasionally get into gill-cavities as the result of their inborn, insinuating habit coupled with the blood-sucking specialization.

The three known species of the Tridentinæ, all collected during the Thayer Expedition, in the Amazon Basin near the boundary between Brazil and Peru, were described by my wife and myself in 1898. One of them, *Miuroglanis platycephalus*, captured in 1866 by the combined efforts of James, Thayer and Talisman, in the Jutahy, is or was only seventeen millimeters long. A recent effort to locate the specimen has failed. The same fate seems to have befallen the specimen of *Tridens brevis*. It was but twenty-one millimeters long, and caught in 1866 by Bourget at Tabatinga. The third and last of this group is *Tridens melanops*. In 1866 the future philosopher, William James, caught twenty-seven of them at Iça, the largest only twenty-seven millimeters long. In 1891 the Museum of Comparative Zoölogy sent me one of these, which has just been figured for my monograph. The Tridentinæ are fishes with a greatly depressed head and a large eye placed on the edge of the head; in one, at least, they look down rather than up.

One of the Vandelliini, *Branchioica bertoni*, lives in the gill-cavities

of a large Characin. Several years ago Mr. Bertoni sent me one of these, and it seems that I at once described it with much gusto. Later Mr. Bertoni sent me another lot of minute fishes, and this summer I discovered that two of these were taken from the gills of a Characin. I again described them, of course, as a new genus and species. Still later I found the totally forgotten original specimen and description carefully laid away.

Ribeiro, of the National Museum of Rio de Janeiro, caught another very similar member of a related genus, Paravandellia, among the weeds of the stream near San Louis de Caceres in the upper Paraguay Basin.

With fishes as rare as these and as small as these, the question sometimes arises whether the differences are due to the fact that one worker uses a hand lens and the other a binocular dissecting microscope with an arc spotlight. The results of the two instruments are comparable to the effects produced by an old-fashioned cannon and a modern forty-two-centimeter howitzer.

Two species I have just described with the three previously known, brings the number of Vandellias up to five—maybe. I used a howitzer, and my distinguished predecessors, Pellegrin, Castelnau, Valenciennes and Cuvier used hand lenses. The Vandellias are long, slender, eel-like in shape. There are really two genera in the genus Vandellia, but I don't yet know which one of these Valenciennes had when he named the genus. The other is, for the present, without a legitimate name. When we know which one can legitimately lay claim to the name Vandellia the other one can be baptized as Urinophilus. One of these, possibly two of them if they are different, *Vandellia haseman*i and *Vandellia wieneri*, is or are too large to enter the urethra of man when it is or they are fully grown. On the other hand, *Vandellia cirrhosa*, *sanguinea*, and *plazai* could, as far as their size is concerned, enter the urethra. Do they?

Pellegrin, who has written on this subject, quotes Dr. Jobert who collected fishes in Brazil for the Jardin des Plantes. Jobert tells that a highly reputable physician of Belem, Para, Dr. Castro, told him he had taken a Candirú from the urethra of a negress.

Boulenger (Proc. Zool. Soc. London, 1897, p. 901) says of Vandellia cirrhosa:

"The 'Candirú', 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 the genitalia by means of a sheath formed of a cocoanut-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 'Candirú' 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, while this evidence is quite circumstantial, it is only circumstantial. Dr. Bach did not himself operate or help to operate or remove the Candirú, and a much simpler operation than amputation would have been sufficient to remove it.

Pellegrin (Bull. Soc. Philom. de Paris, (11), I, 1909, pp. 5-8) further quoting Jobert's account, says that at Para there are two species of Candirús, only one of which penetrates the urethra, the other, the horse Candirú, attaches itself to any part of the body and also attacks horses. Dr. Jobert himself, who went in bathing near Para, was attacked within less than five minutes and found scratches in a group five to six inches long and a centimeter or more wide. He did not secure the creature which attacked him.

In "Die Natur", XIX, p. 180, Müller, in reporting on the travels of Gustav Wallis, says that Wallis noted a fish in the Huallaga called the Candirú, which is as much feared in the water as mosquitoes and ants on land. This Candirú attaches to any portion of the body like a leech and spreads retrorse hooks in the wound so that it is only with considerable pain that it can be removed. It prefers the most secret parts of the body and it was reported to him that the consequent operation sometimes causes death. One specimen of this Candirú was given to Leukart and by him to Lütken, who described it as *Acanthopoma annectens*. It probably belongs to the Stegophilini.

That a fish, or several species of fishes, found in the Amazon Valley

and called Candirú is or are a nuisance is certain. Whether the widely distributed belief that the Candirús are tropic to urine and consequently have a tendency to enter the urethra, or whether the candirú's tendency to burrow leads them 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 urethra of aquatic mammals and large fishes. Further study may demonstrate that some species of Candirús have become parasitic in the bladder of large fishes and aquatic mammals. These are all questions that may legitimately be taken up by the expeditions that will, I hope, result from this article.