

A NOTE ON THE SYSTEMATIC POSITION OF THE TWO GASTROMYZONID GENERA *PROTOMYZON* HORA AND *PARAPROTOMYZON* PELLEGRIN AND FANG (FISHES: CYPRINOIDFA).

By SUNDER LAL HORA, D.Sc., F.R.S.E., C.M.Z.S., F.R.A.S.B., F.N.I., Director, and K. C. JAYARAM, B.Sc., Assistant, Zoological Survey of India, Indian Museum, Calcutta.

In his monograph on the Homalopteridae, Hora¹ proposed a new genus *Protomyzon* to accommodate Vaillant's² *Homaloptera whiteheadi* from Mount Kina Balu, Borneo. The genus was referred to the subfamily Gastromyzoninae and was characterized by the following combination of characters:—

- i. Gill-openings of moderate size, extending to ventral surface for short distance.
- ii. Absence of any rostral groove and rostral fold.
- iii. Two pairs of rostral barbels fully exposed on ventral surface.
- iv. Snout broad and rounded and mouth slightly arched.
- v. Eleven rays in the pelvic fin.

Under the description of the genus, it was noted that—

“In general build and facies the new genus resembles certain torrent-inhabiting species of *Nemachilus*, but is distinguished from them by the possession of a large number of rays (22) in the pectoral fin. It seems to me probable that *Protomyzon* may have evolved from *Nemachilus*-like ancestors under the influence of swift currents.”

It is still a monotypic genus and the only material examined by Hora comprised of 2 large and 5 young specimens in the Paris Museum and these he found to be “very soft” and “not in a good state of preservation” The same material was re-examined by Pellegrin and Fang³ in 1935, when they described another new genus *Paraprotomyzon* from Kwai-show, Eastern Szechuan. They corrected Hora's description with regard to the extent of the gill-openings and observed (p. 102):

“Practically, *Protomyzon whiteheadi* is distinctly possessing the gill-opening, although elongate, but pertaining on the dorsal side of head. His description of *Protomyzon* as having the gill-opening extending a short distance to the ventral surface is merely based upon the injured side of one specimen of the two, now preserved in the Paris Museum.”

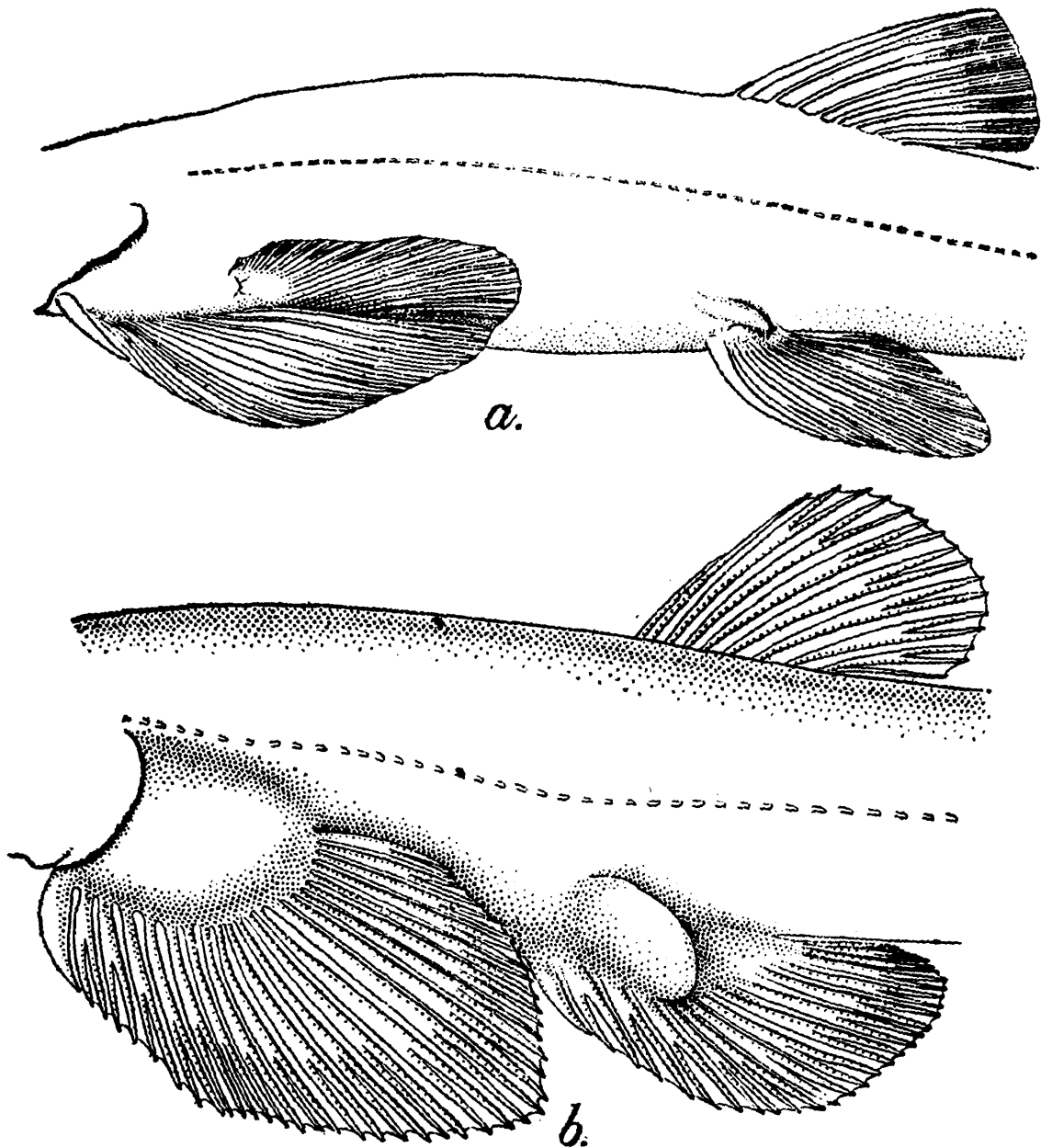
Pellegrin and Fang were correct in their account of the gill-openings of *Protomyzon*, but it must be noted that gill-openings in both *Protomyzon* and *Paraprotomyzon* are not as restricted as in *Gastromyzon*. Though they are restricted to the dorsal surface, they almost extend to the base of the pectoral fin dorsally. If Hora had evaluated this character correctly for his *Protomyzon*, he would have placed this genus in group

¹ Hora, S. L., *Mem. Ind. Mus.* XII, p. 306 (1932).

² Vaillant, M. L., *Nouv. Arch. Mus.* V, p. 92 (1893).

³ Pellegrin, J. & Fang, P. W., *Sinensia* VI, p. 99 (1935).

II of his key on page 304 along with such genera as *Pseudogastromyzon*, *Sewellia*, *Beaufortia*, *Neogastromyzon* and *Gastromyzon*. This group is aptly described by Pellegrin and Fang as the *Gastromyzonian*-group, as against the *Crossostomanian*-group of the genera *Annamia*, *Crossostoma*, *Vanmanennia*, *Formosania*, *Parhomaloptera*, etc. *Paraprotomyzon* also pertains to the *Gastromyzonian*-group, but it has been distinguished from *Protomyzon* by the extent of the pectoral fins (extending beyond bases of



TEXT-FIG. 1.—Lateral view of body, with parts of head and tail regions in *Protomyzon* Hora and *Paraprotomyzon* Pellegrin & Fang $\times 2\frac{2}{3}$.

a. *Protomyzon whiteheadi* (Vaillant).

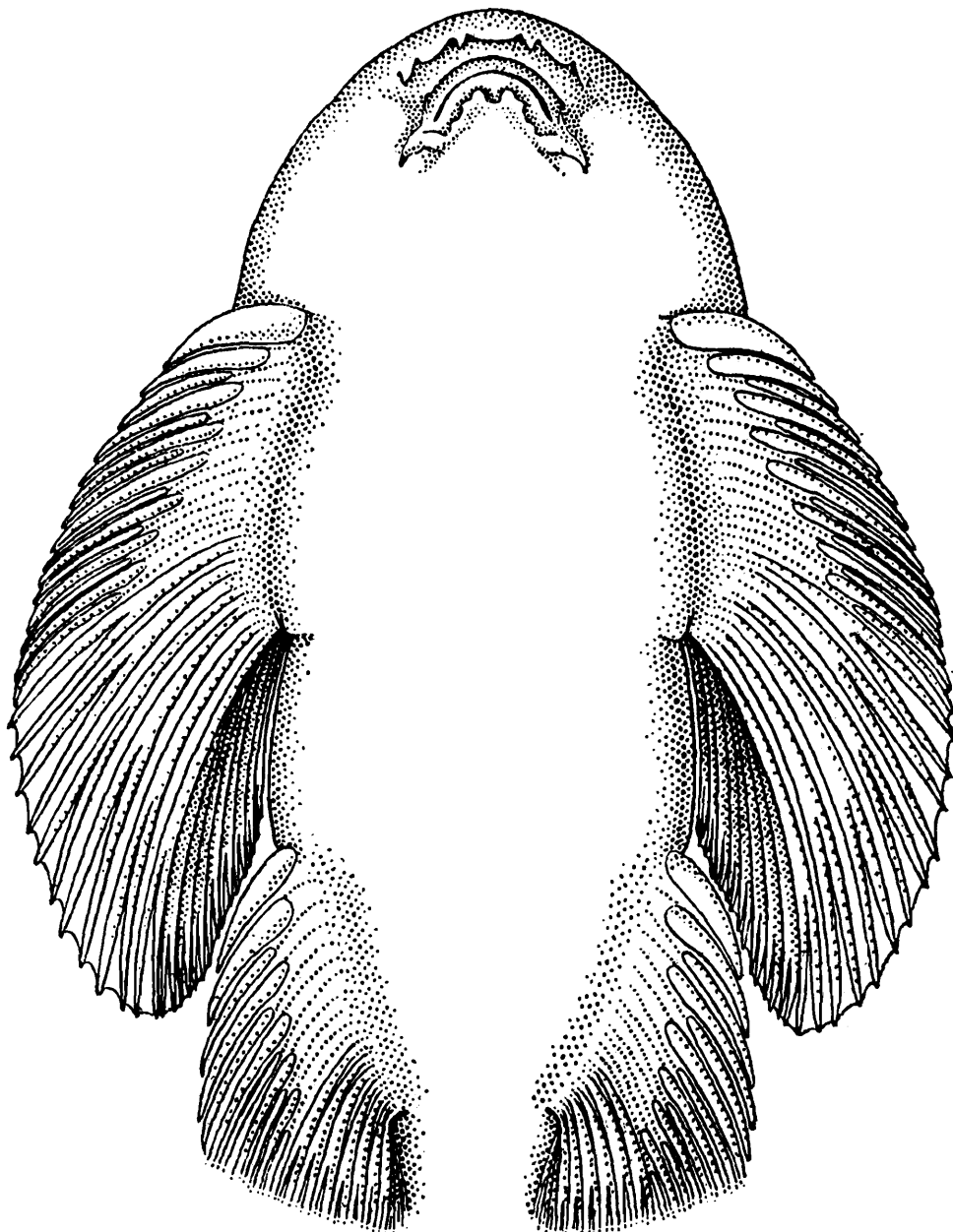
b. *Paraprotomyzon multifasciatus* Pellegrin & Fang.

Notice the similarity in the extent of the gill-openings in both and the dissimilarity in the extent of the pectoral fin in relation to the position of the pelvic fins. Special attention is also invited to the nature of the appendage at the base of the pelvic fins in the two genera.

pelvics *versus* remote from bases of pelvics), number of rays in the pelvic fins ($1/14$ *versus* $1/7$) and lepidosis (ventral surface naked before pelvics *versus* naked thorax region and a small portion behind it). Relying

mainly on the number of fin rays in the pelvic fin, and comparing in this respect their *Paraprotomyzon multifasciatus* with the known species of *Pseudogastromyzon*, they observed:

“It may be that *Paraprotomyzon* is a genus intermediate between *Protomyzon* and *Pseudogastromyzon*, or it may be a genus in parallel development with the latter and having *Protomyzon* as their common ancestor. For the first conception, it will be better to consider *Paraprotomyzon multifasciatus* as a more specialized species in the genus *Paraprotomyzon*.”



TEXT-FIG. 2.—Ventral surface of head and body of *Paraprotomyzon multifasciatus* Pellegrin & Fang $\times 3\frac{1}{2}$.

In a recently published synopsis of all the known Chinese Homalopteridae, Chen and Liang¹ have included *Paraprotomyzon* in their list next to *Pseudogastromyzon* without any comments but distinguished the two genera by the number of rays in the pelvic fins (8-11 in *Pseudogastromyzon* versus 15 in *Paraprotomyzon*).

During his recent visit to the U.S.A., Hora found a big collection of fishes from Mount Kina Balu, Borneo, in the Museum of Comparative Zoology at Harvard College, Cambridge, Mass. This collection was made

¹ Chen, J. T. F. & Liang, Y., *Quart. Journ. Taiwan Mus.* II, p. 161 (1949).

by Mr. J. A. Griswold, now of the Zoological Society of Philadelphia Pa. Among these, there is a lot of about 100 specimens labelled as Homalopteridae (CMZ. Nos. 34794, 34800, 34801, 34806, 34833, 37038). On a casual examination in the Museum, they were provisionally referred by Hora to *Protomyzon whiteheadi* (Vaillant). Forty-five specimens of this lot have now become available in Calcutta for detailed study through the kindness of Dr. William C. Schroeder. Several other species of fish and some tadpoles have been found associated with *Protomyzon*. Dr. P. L. Bertin of the Museum National D'Histoire Naturelle, Paris, has very kindly sent a co-type of *Paraprotomyzon multifasciatus* in exchange. This material has enabled us not only to assess correctly the systematic position of the two genera but also to redescribe *Protomyzon whiteheadi* and to give some of the salient internal characters of the fish.

If one studies Hora's key to the genera of the *Gastromyzoninae* one will notice that the *Gastromysonian*-group is sub-divided on the basis of (i) the union or separation of the pelvic fins, (ii) form and extent of mouth, (iii) extent of the pectoral fin in relation to the pelvics and (iv) the presence or absence of the flap of skin between the bases of the pelvic and pectoral fins. Judged on these characters, both *Protomyzon* and *Paraprotomyzon* fall in the subgroup characterized by the presence of free pelvic fins, *i.e.*, not united to form a disc-like structure. In the two other genera of this subgroup, namely *Pseudogastromyzon* and *Sewellia*, the pectoral fins extend considerably beyond the origin of the pelvics. In this respect, *Paraprotomyzon* is allied to them while *Protomyzon* diverges from them. If we now examine the members of the second subgroup, in which the pelvics are united to form a disc-like structure, we get the same two divisions on the basis of the extent of the pectoral fins—*Beaufortia*, in which the pectorals extend beyond the origin of the pelvics, and *Neogastromyzon* and *Gastromyzon*, in which they do not reach the bases of the pelvics but the middle portion of the body between their bases is laterally stretched into skin flaps.

The geographical distribution of the *Gastromysonian*-group of genera also shows that the extension of the pectoral fins beyond the origin of the pelvics is characteristic of the forms found in China and Cochin China and that in all the three Bornean genera, the pectorals do not reach the pelvics. It would thus appear that the union of the pelvic fins into a disc-like structure has probably occurred independently in China (*Beaufortia*) and in Borneo (*Gastromyzon* and *Neogastromyzon*) and that there is no direct genetic affinity between the groups of genera from these distant regions.

If the above argument is tenable, it then follows that *Protomyzon*, *Neogastromyzon* and *Gastromyzon* provide one evolutionary series, whereas *Pseudogastromyzon*, *Paraprotomyzon* and *Beaufortia*, with *Sewellia* as a side branch, form another series of progressive evolution. There is no doubt that the ancestors of all these forms were *Nemachilus*-like fishes, which in stronger and stronger currents, became more and more flattened and used the anterior rays of the pectoral fins for adhesion while the posterior rays were kept in motion to expell the water entering underneath the fish as has already been observed in the case of *Balitora*

and *Hemimyzon*¹. This habit must have gradually led to an increase in the number of rays in the pectoral fins to subserve dual functions, and this is actually the case in more highly specialized genera.

The water pumped out by the pectoral fins would flow with greater speed at the sides of the fish and would no doubt affect the pelvic fins. Usually, in most of the hillstream fishes, even when the form is subcylindrical and not greatly depressed or flattened, an appendage of varying length and form is developed in the axils of the pelvic fins so as to give the side a streamline revetment to the current. In these forms, in which the pelvics were only slightly removed from the pectorals, as must have been the case with the ancestral form of the Chinese genera, and the form became depressed for adhesion the pectorals extended over the bases of the pelvics. In such cases, the appendage became attached to the side and extended backwards to provide a streamline revetment to the current. In those forms, in which the pectorals were removed from the pelvics by a considerable distance, as must have been the case with the ancestral form of the Bornean genera, and the body form in the initial stages continued to be subcylindrical, as flattening of the ventral surface for adhesion proceeded, skin flaps developed between the two fins to prevent the scouring action of the currents produced by the pumping movements of the posterior, vertically directed rays of the pectorals.

Both from the point of view of functional morphology and geographical distribution, we are of the opinion that there is no direct relationship between *Protomyzon* of Borneo and *Paraprotomyzon* of Sze-Chuan. It is probable, however, that in both subgroups more primitive forms, linking these genera with *Nemachilus*, may yet be discovered.

As a large number of topo-types of *Protomyzon whiteheadi* are now available, it is proposed to redescribe the species so as to facilitate reference in future.

***Protomyzon whiteheadi* (Vaillant).**

1893. *Homaloptera whiteheadi*, Vaillant, *Nouv. Arch. Mus.* V, pp. 92-94.

1916. *Homaloptera whiteheadi*, Weber & de Beaufort, *Fish. Indo-Austral. Archipel.* III, p. 13.

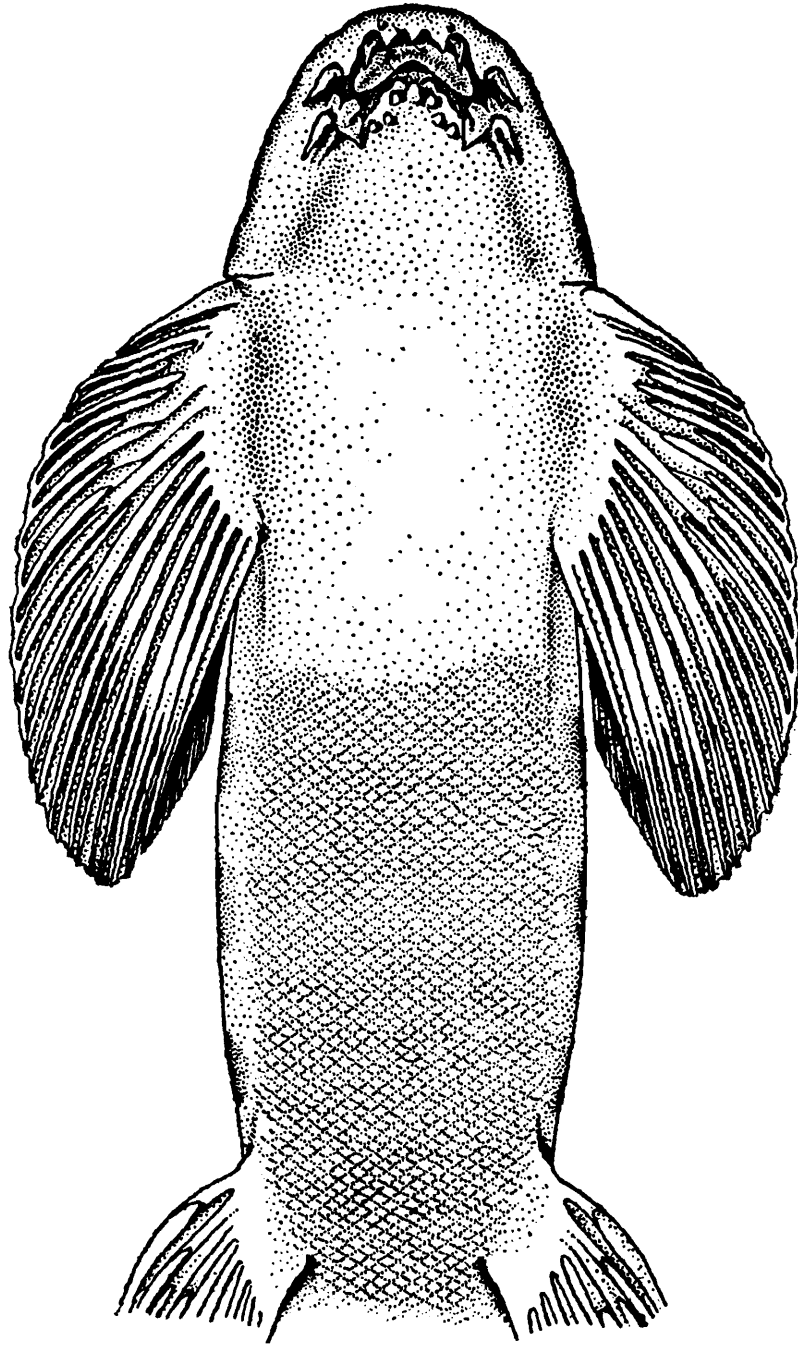
1932. *Protomyzon whiteheadi*, Hora, *Mem. Ind. Mus.* XII, p. 306.

D. 1/7 ; A. 1/6-7 ; P. 1/21-22 ; V 1/9-10 ; C. 15-16.

Protomyzon whiteheadi is a loach-like fish with the head and the anterior part of the body depressed and ventrally flattened. The dorsal profile is but little arched. The length of the head is contained 5.5 to 6 times in the total length and its height is slightly less than that of the length of the snout. The snout is broad and rounded and is free from any tubercles. In some young and badly preserved specimens, the snout is a bit sharp and angular towards the tip. The eyes are placed dorso-laterally and are small. They are in the middle of the head and are not visible from the ventral surface ; they are contained 2.5 to 3 times

¹ Hora, S. L. *Mem. Ind. Mus.* XII, p. 323 (1932).

from the tip of the snout and are 2 to 2.5 diameters apart. The nostrils are placed just in front of the eyes. The mouth is placed on the ventral surface and is bordered by fleshy lips; the upper lip is curved. The lower lip is beset with ten small papillae, which are not so clear in some young specimens. The rostral fold is produced into small fleshy prolongations. There are 2 pairs of rostral barbels and a pair of maxillary barbels, all of which are very small. At each angle of the mouth, there

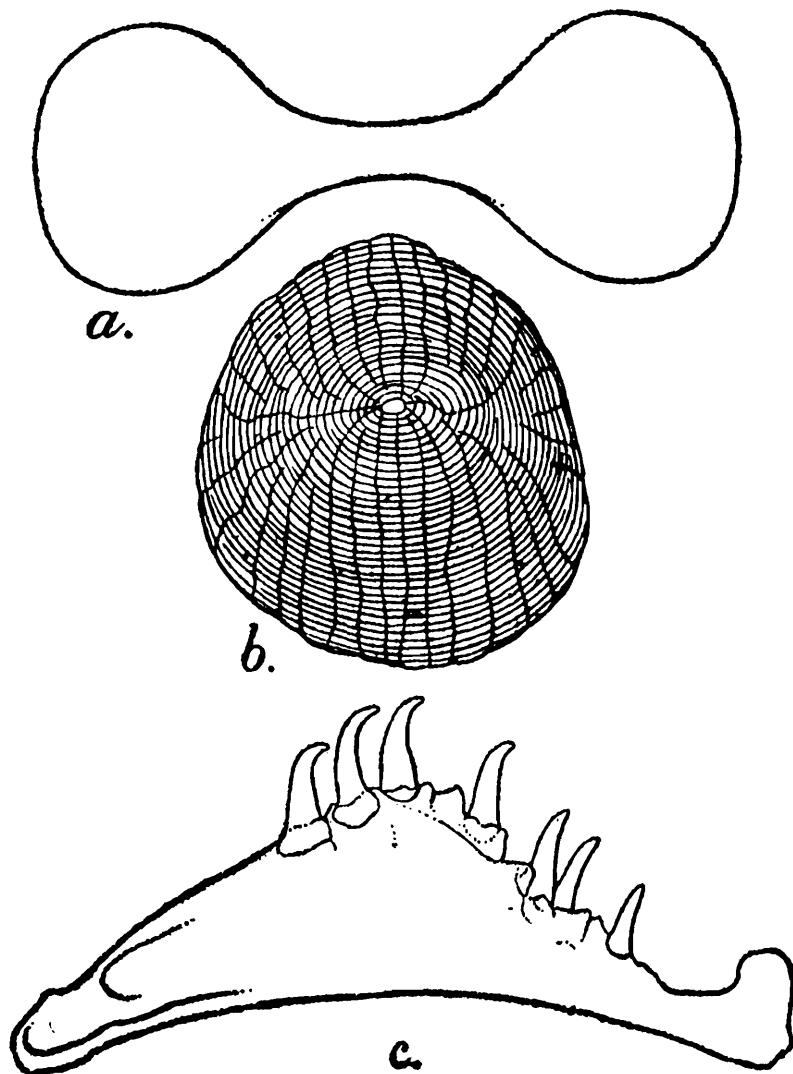


TEXT-FIG. 3.—Ventral surface of head and body of *Protomyzon whiteheadi* (Vaillant. $\times 3\frac{1}{2}$)

are small fleshy prolongations, papilla-like in appearance. The gill-openings are small and do not extend to the ventral surface.

The origin of the dorsal fin is usually just above the origin of the insertion of the pelvics, and is nearer to the base of the caudal fin than to the tip of the snout. The pectoral fins are horizontally inserted and are provided with muscular bases; the inner rays being longer than the outer ones. Each fin possesses only one undivided ray. The outer rays are provided with pads on the ventral surface for adhesion while

the inner rays are directed upwards for pumping out the leakage water from underneath the ventral surface of the fish. The pelvics are also horizontally placed and do not reach the anal fin ; each fin is provided with about 9 to 10 rays of which one outer ray is simple. As in the case of the pectoral fins, some of the outer rays are padded for adhesion. The pelvics extend beyond the anal opening and are not united. In the axil of the pelvics, there is a small scaly appendage. The length of the pelvic fin is nearly equal to that of the longest ray of the dorsal fin. The anal fin is small and is inserted a short distance from the pelvics ; it just reaches the base of the caudal fin. The longest ray of the anal fin is 3 times the length of its base. There is no anal papilla. The



TEXT-FIG. 4.—Air-bladder, scale and pharyngeal teeth of *Protomyzon whiteheadi* (Vaillant).
 a. Air-bladder $\times 22$; b. Scale from below the dorsal fin $\times 57$; c. Pharyngeal bone and teeth $\times 44$.

least height of the caudal peduncle is about $1\frac{1}{2}$ times its length. The caudal fin is emarginate with the lower lobe slightly longer.

The body is loach-like, its depth is contained about 8 times in the total length. The body is covered with small scales, except on the ventral surface as far as the anal opening. The lateral line is complete.

A scale from below base of dorsal fin is oval and marked with numerous circuli and radii. The nucleus is eccentric and disorganised. There are sixteen complete circuli, and seventeen radii all round the scale. The base of the scale is lobed and the top is broad,

In spirit specimens, the colour is dark brown marked with some irregular white patches in some specimens. The ventral surface is brownish. The dorsal and the caudal fins are brown or greyish, the base of the anal fin being provided with a dark spot.

The air bladder is bilobed and the two lobes are connected by a transverse tube. All the structures are enclosed by bone.

Measurements in millimetres.

Standard length	..	..	80	73	55	49	46	42	32
Length of head	..	..	12	12	10	9	8	8	7
Height of head at occiput	..	..	6	7	5	4	4	4	4
Width of head	..	..	10	11	8	7	7	6	5
Length of snout	..	..	6	6	5	5	5	4	3
Diameter of eye	..	..	2	2	2	2	2	2	1
Interorbital width	..	..	5	5	4	4	4	3	3
Depth of body	..	..	11	9	7	6	6	6	5
Length of caudal peduncle	..	..	7	7	5	4	5	5	2
Least height of caudal peduncle			5	5	4	4	3	4	3
Longest ray of dorsal fin	..	..	11	12	8	8	7	7	6
Length of pectoral fin			18	18	17	12	11	10	9
Length of pelvic fin	..	..	12	11	8	7	6	7	6
Longest ray of anal fin	..	..	9	9	6	6	6	6	4
Length of base of anal fin		..	3	3	2	2	2	2	2