VII. NOTES ON THE OCCASIONAL ABSENCE OF THE PAIRED FINS IN FRESH WATER FISHES, WITH SOME OBSERVATIONS ON THE TWO APODAL GENERA *CHANNA*, GRONOW AND *APUA*, BLYTH

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Willey[1] has recently referred to the absence of the ventral fins in a male specimen of *Amia calva* and urges the necessity of recording such observations as they are likely to throw some light on "natural mutations amongst fishes." In the course of my studies on the freshwater fishes of India, I have come across a few "mutations" of this nature and I take this opportunity of bringing them to notice.

(i) While examining a large collection of fish made in Manipur by the Manipur Survey party and myself, I found a specimen of *Barilius barila* (Ham. Buch.), in which both the ventral fins were totally absent. The abnormal specimen was captured in Khurda stream near Thanga, with a large number of normal specimens. It does not seem to have suffered any disadvantage on account of the absence of the ventrals. There is no external mark or scar to show that the condition is the result of an accident or injury. The proper place of the origin of the ventrals is completely covered with scales. Comparison of the arrangement of the scales in a normal and the abnormal specimen is shown in figure 1 (*a*).

Dissection of the body wall in the region of the pelvic fins under a high power of a binocular microscope, by stripping the different layers one by one, revealed no irregularity of arrangement and no trace of the pelvic girdle was found.

The total length of the abnormal specimen including the length of the caudal fin is 94 mm., while the average length of the species is about 125 mm.

(ii) In the Manipur collection I found another interesting specimen of a new species which I call *Barilius dogarsinghi*, in which the ventral fin of the left side was absent. The place of origin of the ventral fin is here also covered with scales. In a normal specimen there are four scales between the bases of the ventrals. They are longer than the rest and are more pointed posteriorly; they are arranged in such a way as to form a sheath on the inner side of the bases of the ventrals. In the abnormal

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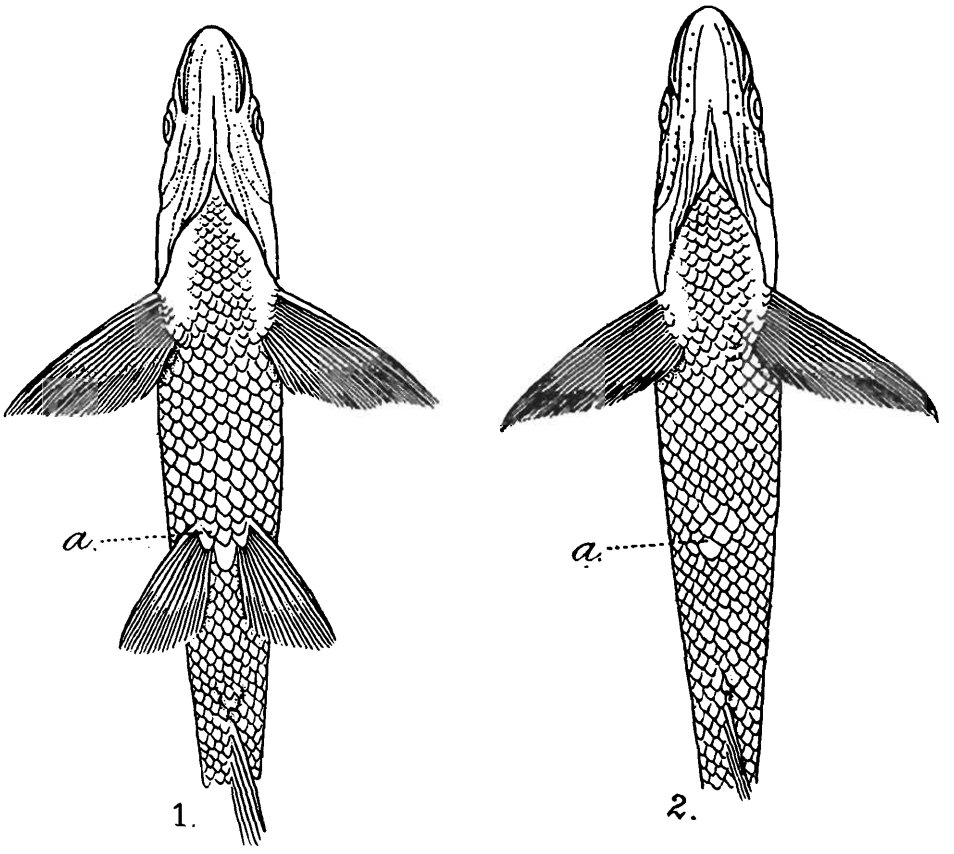
[1] Willey, *Proc. Zool. Soc. London*, pp. 89—90 (1920).

specimen there are no special scales in the region of the ventrals and the arrangement of these is not interrupted on the left side.

It is rather interesting to note that on dissection of this region the fin muscles and the girdle of the right side only were found to be present, while on the abnormal side no trace of either the muscles or the girdle was observed.

The abnormal specimen is 62 mm. in length and was collected in the Etok stream near Chanderkhong with eleven other normal specimens of the same species. The average length of the species is 85 mm.

(iii) In a specimen of another new species, *Nemachilus kangjupkhulensis*, the ventral fin of the right side is lacking. Even the fin on the other side is not normal. It is distorted in such a way that there appear to be two fins, one immediately behind the other. In the anterior portion of the abnormal fin there are three rays while in the posterior only four. In a normal specimen there are in all six to seven rays in the ventral fin. There is no indication that the absence of the ventral fin is due to any accident or injury The abnormal specimen was collected in a small hill stream near Bishenpur, Manipur. It is about 43 mm. in length which is the average length of the species.



TEXT-FIG. 1.—Normal and abnormal specimens of *Barilius barila* (Ham. Buch.)

1. Normal specimen × 2. 2. Abnormal specimen × 2.
a=Lepidosis in the region of the ventrals.

(iv) The most interesting specimen is that of *Rita rita* (Ham. Buch.), in which the pectoral fin of the right side is absent. The

specimen was collected by Mr. Hamid Khan in the Ravi River near Lahore. He noticed this abnormality and presented the specimen to the Government College Museum, Lahore. I am indebted to Prof. George Matthai for lending me the specimen from the above Museum and for allowing me to dissect it for study of the skeleton and the musculature of the abnormal region.

The pectoral fin in the genus *Rita* is a characteristic structure, as it is provided with a very strong spine. The spine is almost as long as the length of the pectoral girdle. The fish does not seem to have suffered as regards its size; its length including the length of the caudal fin is 32·6 cm., which is the average length of the species at Lahore.

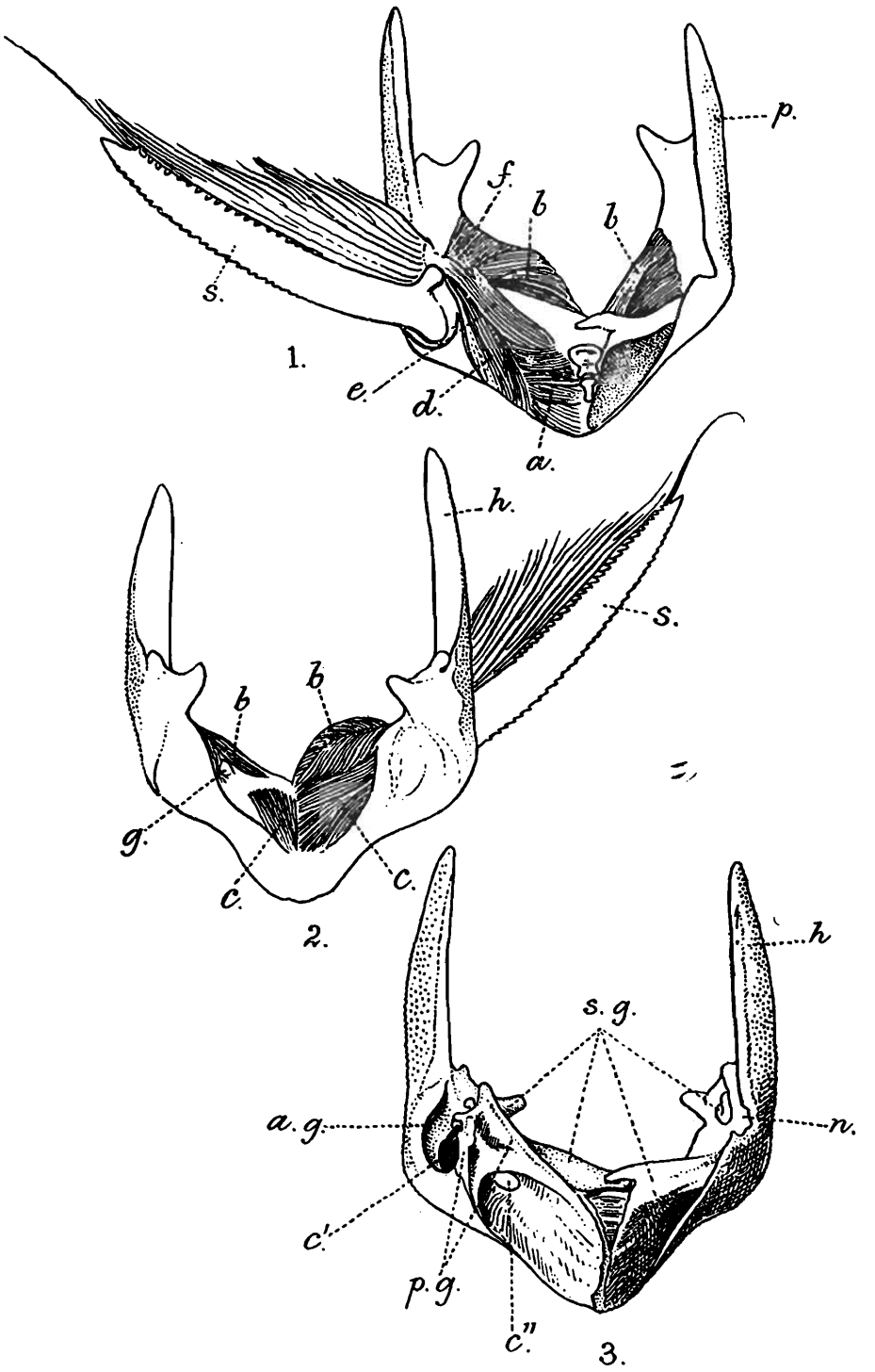
Correlated with the absence of the fin, the various muscles, associated with it are either absent or have undergone considerable degeneration. The abductor and adductor muscles (*e*, *f*) are totally absent. Of the muscles (*a*, *b*, *c*, *d*), which control the movements of the spine, *a* and *d* are not represented, while the other two, *b* and *c*, are greatly reduced. An accessory nodule of bone was found in the course of the greatly reduced muscle of the abnormal side. I am unable to understand its significance as the structure is not represented in the muscle of the opposite side or in other normal specimens.

The shoulder girdle of the abnormal side is considerably shorter in width than that of the opposite side. The primary girdle (*p.g.*), consisting mainly of the scapular and coracoid bones, is either altogether absent on the abnormal side or has so fused with the secondary investing bones of the girdle as to be quite indistinguishable from them. Consequently the canals (*c'*, *c''*) for the passage of the muscles of the spine are wanting, and this to a certain extent may account for the absence or degeneration of the muscles. The deep groove (*a.g.*), for the articulation of the condyle at the base of the spine, formed by the cubito-humeral process (*h*) and the clavicular element (*s.g.*) is represented on the abnormal side only by a notch (*n*) in the cubito-humeral process.

The degeneration of the muscles of the right side and the abnormalities in the skeleton of this region indicate that the absence of the fin is not due to any recent accident or injury. It seems quite probable that all the abnormalities noticed above are the direct or indirect result of the absence of the primary shoulder-girdle of the abnormal side; this will also account for the absence of the right fin. The musculature was probably affected secondarily, while the reduction in the secondary girdle is chiefly due to the disuse of the associated structures.

In almost all such abnormalities, it has been pointed out that the growth of the fish is not effected by them. It is only after careful examination that these abnomal forms can be separated from normal specimens netted with them.

Abnormalities of this nature have been regarded as congenital variations. Willey (*op. cit.*) regards them as mutations and comes to the conclusion " that the presence or absence of such deep-



TEXT-FIG. 2.—Musculature and skeleton of the pectoral girdle in an abnormal specimen of *Rita rita* (Ham. Buch.).

1. Muscles of the pectoral fin seen from above.
2. Muscles of the pectoral fin seen from below.
3. Skeleton of the pectoral arch seen from below.

a = muscle attached above the base of the condyle of the spine. This pulls the spine outwards thus expanding the fin ; *b* = muscle that pulls the spine inwards, thus folding the fin ; *c* = pulls the spine outwards ; *d* = folds the fin ; *e* = abductor muscle ; *f* = adductor muscle ; *g* = nodule of bone ; *h* = cubito-humeral process ; *a.g.* = articular groove ; *p.g.* = primary shoulder girdle ; *s.g.* = secondary shoulder girdle ; *n* = notch in the cubito-humeral process ; *s* = spine ; *c'*, *c''* = canals for the passage of muscles.

seated characters is linked up with their use or disuse, and that they do not necessarily dwindle away to vanishing point, but may simply drop out of the factorial system." Eigenmann and Cox,[1] who have recorded the absence of the ventrals in *Ameiurus natalis*, consider this character as a prepotent variation and suggest that "it is possible that some of the genera of fishes without ventrals have arisen from such prepotent variants, . . " Brindley,[2] who noticed the absence of the ventrals in a specimen of the White Bream (*Abramis blicca*, Bloch.) observed "that the defect is congenital and not the result of accidental injury. . . " Too much importance seems to have been attached to the variations in the germ-plasm especially when dealing with such cases of abnormalities. Dr. N. Annandale suggests, and I agree with him, that such abnormalities may be the result of some injury to the anlagen of the ventral or the pectoral fins in the developing embryo. There is, however, very little material available at present to come to any satisfactory conclusion.

I will now briefly deal with the two Indian genera of freshwater fishes that are distinguished from their nearest relatives by the absence of the ventral fins. These are *Channa*, Gronov. and *Apua*, Blyth. The genus *Channa*, which was hitherto known from Ceylon, the Philippines, China and Japan, has recently been recorded from Burma by Chaudhuri.[3] According to both Günther[4] and Day[5] this genus is distinguished from *Ophiocephalus*, Bloch., by the absence of the ventral fins and the pyloric or coecal appendages. In the original description of the genus by Gronovius[6] the only significant phrase is "*Ventrales nullæ.*" I have examined two species of *Channa*, one described by Chaudhuri (*op. cit.*) and the other contained in Dr. N. Annandale's Chinese collection. In both these species pyloric appendages similar to those of *Ophiocephalus* are present. The only character, therefore, that distinguishes *Channa* from *Ophiocephalus* is the absence of the ventral fins. The occasional absence of the ventrals has been regarded in other genera as an abnormality or a case of genital variation; but in *Channa* this character seems to have become permanent, for large series of specimens with the ventrals absent have been collected from the same locality. Moreover, no species of *Channa* has been described having the same specific characters as any known species of *Ophiocephalus*. Some people attribute the absence of the ventrals to the habits of these fishes, but how far this is true I have no evidence to judge at present.

It is otherwise in the case of the second genus, *Apua*, which was described from two specimens and has not been recorded since. Vinciguerra[7] doubted the existence of *Apua* and referred his spe-

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1 Eigenmann and Cox, *Amer. Naturalist*, XXXV p. 33 (1901).
2 Brindley, *Proc. Zool. Soc. London*, pp. 108—109, pl. x (1891).
3 Chaudhuri, *Rec. Ind. Mus.* XVI, p. 284 (1919).
4 Günther, *Cat. Brit. Mus. Fishes* III, pp. 468 and 483.
5 Day, *Fishes of India*, II, p. 368.
6 *Catalogue of Fish in the British Museum*, p. 99 (1854).
7 Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova*, XXIX, pp. 348-49 (1889).

cimens to *Acanthophthalmus* from which Blyth's genus is distinguished chiefly by the absence of the ventral fins. I have carefully examined the two unique type-specimens preserved in the Indian Museum and a large series of fresh specimens of *Acanthophthalmus pangia* from Manipur. I do not find any trace of the ventrals or of accidental injury in the former. Moreover, I cannot distinguish Blyth's specimen from *Acanthophthalmus pangia* except by the absence of the ventrals. I am, therefore, led to believe that the specimens of *Apua* were abnormal and that the genus *Apua* cannot stand distinct from *Acanthophthalmus*.

I conclude, therefore, that the cases of *Apua* and *Channa* are not to be considered parallel. *Channa* has been found by numerous collectors at many different places over a very wide area and the ventrals are invariably absent. *Apua*, on the other hand, has only once been collected and only two individuals were then found.

I have carefully dissected a specimen of *Channa burmanica*, Chaudhuri, and have not been able to find any trace of the pelvic girdle.