NOTES ON FISHES IN THE INDIAN MUSEUM.

XXII. On a Collection of Fish from the S. Shan States and the Pegu Yomas, Burma.

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At the request of one of us Mr. V P. Sondhi of the Geological Survey of India made a small collection of fish in Burma during the field-season of 1932-33. A part of Mr. Sondhi's material was obtained in the Southern Shan States to the east of Taunggyi, but not very far from it; and the remainder from the western drainage of the Pegu Yomas. Both the areas are hilly tracts and the collection was made in small torrential streams with a rocky bed. Such streams are characterised by rapids and slow currents with pools and back-waters here and there. Some of the streams are diverted for the irrigation of " paddy " fields, and in the Southern Shan States the water is usually charged with lime to such an extent that it forms travertine dams causing small falls. Mr. Sondhi informs us that the structure of the country in the regions traversed by him is of a nature similar to that described by Annandale[1] in his account of the Inlé Lake.

The fish fauna of Burma is not well known, and our knowledge of the smaller forms, specially those inhabiting brooks, is still very imperfect. Mr. Sondhi's collection, therefore, though small, both in the number of species and individuals, is full of interesting forms, and, with its help, it has been possible to elucidate several problems of taxonomic importance. We give below a list of localities with the names of the species of fish collected therefrom.

Southern Shan States (December, 1932-April, 1933).

1. A small stream flowing out of a spring at Repiu, north of Loi-un about 6 miles from Hopong.

i. *Lepidocephalichthys berdmorei* (Blyth) . .	6 specimens.
ii. *Ophicephalus gachua* Ham. Buch. .	3 specimens.

2. A small stream at Kyouksu, 1½ miles east of Repiu.

i. *Barbus hexastichus* McClelland . .	1 specimen.
ii. *Danio (Danio) aequipinnatus* (McClelland)	1 specimen.

3. Stream below the bridge to the east of Hopong Rest House.

i. *Barbus hexastichus* McClelland	3 specimens.
ii. *Barbus sarana caudimarginatus* Blyth	1 specimen.
iii. *Nemachilus rivulicola* Hora	10 specimens.

4. Spring at mile 15¾ east of Taunggyi and 3½ miles east of Hopong.

i. *Barbus sarana sewelli* Prashad and Mukerji	1 specimen.
ii. *Danio (Brachydanio) shanensis* Hora	9 specimens.
iii. *Danio (Brachydanio) sondhii*, sp. nov.	11 specimens.

[1] Annandale, *Rec. Ind. Mus.*, XIV, pp. 4-6 (1918).

5. Stream to the west of the village of Hopong.

i. *Barbus sarana caudimarginatus* Blyth	4 specimens.

6. Tank at Pangtara.

i. *Barbus sarana caudimarginatus* Blyth	1 specimen.
ii. *Ophicephalus gachua* Ham. Buch.	1 specimen.

7. Canal issuing from a stream to the south-west of Lawksawk.

i. *Danio (Danio) aequipinnatus* (McClelland)	2 specimens.
ii. *Nemachilus rivulicola* Hora	3 specimens.

Pegu Yomas (May, 1933).

Gyobyu Chaung, west of the new dam line, western drainage of the Pegu Yomas.

i. *Amblyceps mangois* (Ham. Buch.)	1 specimen.
ii. *Clarias batrachus* (Linn.)	1 specimen.
iii. *Aoria bleekeri* (Day)	2 specimens.
iv. *Barbus sarana caudimarginatus* Blyth	1 specimen.
v. *Danio (Danio) annandalei* Chaudhuri	1 specimen.
vi. *Nemachilus multifasciatus* (Day) Vinci g.	1 specimen.
vii. *Acanthopsis choirorhynchus* (Bleeker)	1 specimen.
viii. *Ophicephalus gachua* Ham. Buch.	1 specimen.
ix. *Mastacembelus armatus* (Lacépède)	1 specimen.
x. *Ambassis ranga* (Ham. Buch.)	2 specimens.

The collection from the Pegu Yomas was made in one place by putting a dam across a small stream and allowing the bed below the dam to run dry. The fishes were picked up afterwards from underneath stones and boulders or from crevices.

In the collection dealt with here there are, as detailed above, 69 specimens, of which 57 were collected in the S. S. States area. These 57 specimens comprise representatives of 9 species and varieties, while the remaining 12 specimens from the Pegu Yomas represent 10 species. With the exception of *Barbus sarana caudimarginatus* Blyth, an endemic Burmese race of the widely distributed species, and *Ophicephalus gachua* Ham. Buch., no other species or variety is common to the two lots. The species collected in the Pegu Yomas, with the exception of *Danio annandalei* and *Acanthopsis choirorhynchus*, are fairly widely distributed both in Burma and India. Even *D. annandalei* and *A. choirorhynchus* are not endemic in the Pegu Yomas, the former was described from the base of the Dawna Hills, whereas the latter is known from Sumatra, Java, Malay Peninsula, Burma and Annam. Among the species obtained by Mr. Sondhi in the S. S. States, half the number is endemic to that region. *Danio (Brachydanio) sondhii* is a new species described here for the first time, while *Danio (Brachydanio) shanensis*, *Barbus sarana sewelli* and *Nemachilus rivulicola* are only known from the Shan States or adjacent parts of Burma.

In the following account keys are given to the species of *Danio* and *Brachydanio*. Besides the description of the new species of *Brachydanio*, the precise specific limits of *D. annandalei* are discussed and defined. From a study of extensive material it is concluded that both *Barbus caudimarginatus* Blyth and *Barbus sewelli* Prashad and Mukerji should

be regarded as varieties or subspecies of the widely distributed Indian form, *Barbus sarana*. It is also indicated that *Ophicephalus harcourt-butleri* Annandale[1] cannot be considered a distinct species from the widely distributed and variable *O. gachua*. Attention is also directed to an abnormal specimen of this species in which both the ventral fins are absent, but the basipterygia are only slightly deformed. This abnormality raises the question of the validity of the generic names *Channa* and *Ophicephalus*, but a consideration of this problem is left over for some future occasion. Further light is thrown on the variation exhibited by the Burmese and Siamese specimens of *Amblyceps mangois*.

Mr. Sondhi's collection has added materially to our knowledge of the fishes of Burma. It has to be remembered, however, that the collection seems to have been made in the steadier portions of the streams, and not in the course of very swift currents. Most of the forms represented here live in small pools or in back-waters in the course of hill streams. *Amblyceps* and *Nemachilus* are the only two genera, the members of which are found among pebbles at the bottom of small streams, but some specimens are likely to stray into pools.

We take this opportunity to offer our sincerest thanks to Mr. V P. Sondhi for affording us an opportunity to study such an interesting material. Mr. Sondhi's observations on the colouration of living specimens have been most helpful and are published here with due acknowledgment. To Dr. B. Prashad we are indebted for going through the manuscript. Mr. R. Bagchi made the drawings with his usual skill and care under our supervision and for this our thanks are due to him.

Clarias batrachus (Linn.).

1913. *Clarias batrachus*, Weber and Beaufort, *Fish. Indo-Austral. Archipel.*, II, p. 190, fig. 74.

There is a young specimen of *Clarias batrachus* from the Pegu Yomas in Mr. Sondhi's collection.

Aoria bleekeri (Day).

1890. *Macrones bleekeri*, Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova*, (2), IX, p. 91.

There are two fine specimens of *Aoria bleekeri* in Mr. Sondhi's collection. They were obtained by him from the Pegu Yomas, and exhibit the colouration characteristic of the Burmese examples of the species.

Amblyceps mangois (Ham. Buch.).

1933. *Amblyceps mangois*, Hora, *Rec. Ind. Mus.*, XXXV, pp. 607-621.

Mr. Sondhi collected one young specimen of *Amblyceps mangois* in the Pegu Yomas. One of us (Hora, *op. cit.*) has so recently dealt with the classification, bionomics and evolution of the fishes of this genus that we need not refer in detail to the characteristics of the species. It

[1] Annandale, *Rec. Ind. Mus.*, XIV, pp. 54, 55, pl. ii, fig. 7, pl. iv, figs. 16, 17 (1918).

may be mentioned, however, that in the specimen under report the caudal fin is deeply forked and the lobes are pointed, but are not drawn out into thread-like processes as is the case in most of the Siamese examples. The adipose fin is long and well developed. The caudal peduncle is almost as high as long. The barbels are longer than those of the Indo-Burmese specimens and in this respect the specimen agrees with the Siamese examples. The modification of the gill-opening is intermediate between the Siamese and Indo-Burmese forms. Though the species is widely known from N. India, Burma and Siam, it has been recorded only once before by Vinciguerra[1] from Lower Burma.

Since the publication of the revision of the genus by one of us, more material from Siam (19 specimens : 16 from Pak Jong, 2 from Nakon Sritamarat and 1 from Chantabun Estuary) has become available for study through the kindness of Dr. H. M. Smith. An examination of this material has shown that in the main the Siamese specimens agree with the description already given. In some examples the lobes of the caudal fin are not drawn out into thread-like processes. The adipose dorsal also exhibits a certain amount of variation. Similarly the structure of the gill-opening and the associated parts is also subject to variation. On account of these variations it is not proposed to separate the Siamese form into a separate race or a subspecies.

Barbus sarana (Ham. Buch.).

1822. *Cyprinus sarana*, Hamilton Buchanan, *Fish, Ganges*, pp. 307-310.

Barbus sarana belongs to a group of species in which there are four barbles and the last undivided dorsal ray is osseous and serrated. The serrated spine is deeply grooved along the entire posterior border ; the serrations are short and are situated along the two edges of the groove. The species is widely distributed in India, Burma and Ceylon, and the colouration is uniform with the exception of the Burmese specimen in which the caudal fin sometimes has a black upper and lower edge and a dark mark at the base of each scale. These gorgeously coloured, Burmese specimens were described by Blyth[2] as *Barbus caudimarginatus*, but Annandale[3] regarded it as a Burmese race of the typical *B. sarana*, and later workers[4] have agreed with Annandale's conclusion. Recently Prashad and Mukerji[5] described a still more gorgeously coloured species from Northern Burma as *Barbus sewelli*, but an examination of the material in the Indian Museum has convinced us that it should also be regarded as a local race of the typical form quite distinct from *caudiamarginatus*.

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[1] Vinciguerra (*Ann. Mus. Civ. Stor. Nat. Genova*, (2), IX, p. 68, 1890) recorded a single specimen from "Meetan"—lat. 16°.

[2] Blyth, *Journ. Asiat. Soc. Bengal*, XXIX, p. 157 (1860).

[3] Annandale, *Rec. Ind. Mus.*, XIV, p. 46, pl. iii, fig. 3 (1918).

[4] Hora, *Rec. Ind. Mus.*, XXII, p. 183 (1921) ; Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, p. 199 (1929).

Hora pointed out that Annandale was not justified in regarding *Barbus oatesii* Boulenger (*Ann. Mag. Nat. Hist.*, (6), XII, p. 201, 1893) as synonymous with *Barbus sarana caudimarginatus*.

[5] Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, p. 197, pl. ix, figs. 1, 1*a*, 1*b*, (1929).

It would thus appear that *Barbus sarana*, a very common carp of Indian waters, has proliferated into two subspecies in Burmese waters. It is well known that several plain-looking species of India are marked with brilliant colour bands or marks in Burma. In the case of *caudimarginatus* and *sewelli*, besides the colouration, some other structural modifications have also taken place. In typical *sarana* of India, there are 32-34 scales along the lateral line and $3\frac{1}{2}$-$4\frac{1}{2}$ scales in a transverse series. In *caudimarginatus* there are only 28-30 scales along the lateral line and $4\frac{1}{2}$ scales in a transverse series. Apart from the well marked difference in colouration, *sewelli* differs from both typical *sarana* and *caudimarginatus* in having a proportionately longer head, bigger eyes and somewhat narrower caudal peduncle. The number of scales along the lateral line is 32-34 and in a transverse series $4\frac{1}{2}$. Of the two Burmese races of *B. sarana*, *caudimarginatus* is widely distributed, having been recorded from both Upper and Lower Burma, whereas *sewelli* has only been found in the Shan States so far.

In Mr. Sondhi's collection there are seven specimens of B. *sarana caudimarginatus*, and these were obtained from the following localities :—

i. One young specimen from Hopong, S. S. States.
ii. Five half-grown specimens from a stream to the west of the village of Hopong, S. S. States.
iii. One half-grown specimen from the western drainage of the Pegu Yomas.

Of *Barbus sarana sewelli* only one specimen, 78 mm. in length without the caudal, was collected by Mr. Sondhi from a spring at $15\frac{3}{4}$ miles east of Taunggyi and about $3\frac{1}{2}$ miles east of Hopong. The subspecies is recorded here from the S. Shan States for the first time.

Barbus hexastichus McClelland.

1929. *Barbus hexastichus*, Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, pp 200, 201, fig. 7.

Barbus hexastichus is represented in Mr. Sondhi's collection by four specimens. Of these, three young specimens, not exceeding 32 mm. in length without the caudal, were collected under the bridge near the Hopong Rest House. The following note on the colouration of the living specimens was made by Mr. Sondhi :

" Light brown and greenish iridescent. White metallic lustre near the eyes and upon the gill-covers. A prominent black round spot at the base of the caudal fin."

The fourth specimen is 73 mm. in length without the caudal and was obtained at Kyouksu, about $1\frac{1}{2}$ miles east of Repiu. " When fresh, it was light brown in colour with a light iridescent, ill-defined band along the sides." The species is known as " *Pa-mong* " among the Shan people.

The young specimens of this species are liable to be confused with those of *B. sarana caudimarginatus* which also have a black spot at the root of the caudal fin. The species can be readily distinguished by the nature of the dorsal spine which is smooth in *hexastichus* and denticulated in *caudimarginatus*.

Danio (Brachydanio) shanensis Hora.

1928. *Danio (Brachydanio) shanensis*, Hora, *Rec. Ind. Mus.*, XXX, p. 38, fig. 1.

Danio (Brachydanio) shanensis is represented in the collection by nine specimens which were obtained on the 27th December, 1932, from a spring about 15¾ miles east of Taunggyi or about 3½ miles east of Hopong. " The spring is perennial and must be rich in lime as it issues from limestone." These specimens are from 34 to 49 mm. in length without the caudal. Mr. Sondhi observed two colour forms in this lot. In one set of 5 specimens he found " a white metallic patch upon the gill-cover. A bluish iridescent line begins at the tail-end and ends about the middle of the body in a sharp point." In the remaining 4 specimens, which are somewhat larger in size, " the side band is made of alternate spots of dark and light towards the posterior half of the body. The darker patches are green-iridescent and lighter ones show golden colours. They tend to expand and become less defined towards the head."

The species was originally described from the Northern Shan States where it is quite common in rice fields, in pools and ditches in the bed of hill streams at Namkhan, Kutkai, Lashio and Hsipaw. Its range of distribution is extended here to the Southern Shan States.

The specimens on which the original description was based were up to 38 mm. in length excluding the caudal fin. The great variation in colouration exhibited by the species has already been indicated by one of us, and Mr. Sondhi's observations on the colouration of the species recorded above in the living specimens point to the same conclusion. Juvenile specimens are silvery, later a broad lateral band of dark colour appears which is broader anteriorly. With the growth of the fish, the anterior half of the band is broken up into a number of vertical bars with lighter spaces in between and ultimately only the narrow posterior half of the band persists.

In the specimens from the S. Shan States, the lateral line is very variable. In most of the specimens it is incomplete, terminating above or slightly behind the anal fin. In one of the specimens it is interrupted above the anal fin over three scales, but then it bends upwards and is continued to the middle of the root of the caudal fin.

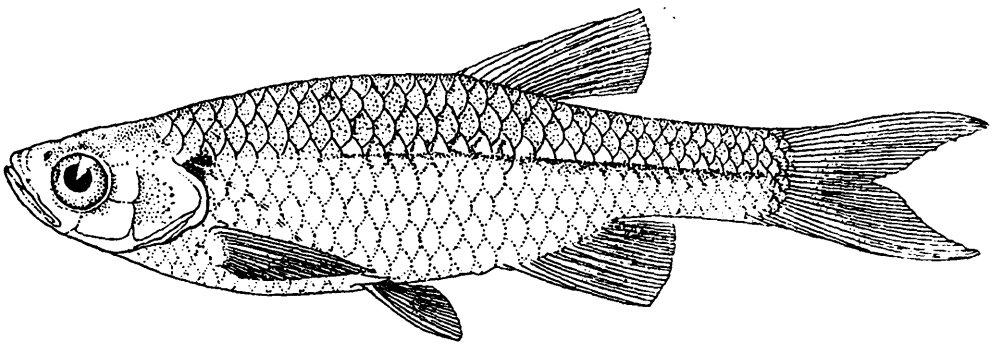
Danio (Brachydanio) sondhii, sp. nov.

D. 2/7; A. 2/10; P. 1/12-13; V. 1/7; C. 19; L l. 32-34; L, tr. 7.

With a number of specimens of the preceding species, Mr. Sondhi obtained 11 specimens of a small species of *Brachydanio*, which appears to be new to science. We have great pleasure in associating the name of this beautiful, small species with that of Mr. V. P. Sondhi. The new species may be characterised as follows :

In *Danio (Brachydanio) sondhii* the dorsal profile rises gently from the tip of the snout to the origin of the dorsal fin beyond which it slopes down to the root of the caudal fin. The ventral profile is bow-shaped. The fish is greatly compressed from side to side, specially in the posterior half, and the abdominal edge is fairly sharp. The head is small and pointed ; its length is contained from 3·6 to 4·0 times in the total length

without the caudal. The greatest width of the head is contained from 1·6 to 1·8 times and its height at occiput 1·3 times in its length. The eyes are large, dorso-lateral in position and visible from the ventral surface. The diameter of the eye is greater than the length of the snout and the interorbital width; it is contained from 2·8 to 3·2 times in the length of the head. The eye is situated almost entirely in the anterior half of the head. The interorbital space is almost flat or slightly convex.



Text-fig. 1.—Lateral view of the type-specimen of *Danio* (*Brachydanio*) *sondhii*, sp. nov. × 2½.

The mouth is directed obliquely upwards and the maxillary extends below the anterior border of the eye. Barbels are absent. No pores are noticeable on any part of the head. The depth of the body is somewhat greater than the length of the head and is contained from 3·4 to 3·7 times in the total length without the caudal. The scales are thin and firmly adherent to the body; those on the dorsal surface are fairly conspicuous, but those on the lower half of the fish are hardly distinguishable. There are 32 to 34 scales in a longitudinal series and 7 rows in a transverse series. There are 15 predorsal scales. There is a short fleshy appendage in the axil of the pectoral fin, and a thin scaly sheath at the base of the anal and caudal fins. The lateral line pierces only 8 to 10 anterior scales and is totally absent in the posterior region.

The dorsal fin commences almost in the middle of the body without the head, and its origin is 3 scales anterior to that of the anal fin; it contains two spines and seven branched rays and its height is almost equal to or slightly less than the length of the head. The pectoral fin is long and pointed; it is as long as or slightly shorter than the head and extends to the base of the ventral fin. The ventral is similar to the pectoral but is considerably shorter; it just reaches or misses the anal-opening which is situated just anterior to the anal fin. The anal fin is similar to the dorsal but it is not so deep; it is separated from the caudal fin by a considerable distance. The depth of the caudal peduncle is almost two-thirds of its length. The caudal fin is almost as long as the head; it is deeply furcate with equal pointed lobes.

Mr. Sondhi observed that in life this species is somewhat darker in colour than *D. shanensis*. The iridescent lateral band is a little broader but less defined and almost indistinguishable in the anterior part of the body. The most characteristic feature of this species is the presence of a dark spot near the upper angle of the gill-opening. The eyes are slightly metallic green in life.

In spirit specimens the edges of the scales on the back are provided with small, dark spots, whereas the sides are lightly or heavily infuscated

with small black dots. The nape is provided with a dark patch and in young specimens there is a narrow, dark band along the dorsal surface. The fins are without any colour markings.

Measurements in millimetres.

Total length without caudal .	37·0	33·0	32·0	30·0	28·0
Depth of body	10·0	9·5	8·5	8·0	7·5
Length of head	9·5	9·0	8·0	8·0	7·0
Width of head .	5·5	5·0	5·0	4·5	4·0
Height of head at occiput	7·0	6·5	6·0	6·0	5·5
Length of snout	2·0	1·75	1·75	1·5	1·5
Diameter of eye .	3·0	3·0	2·75	2·5	2·5
Interorbital width	2·5	2·5	2·5	2·25	2·0
Longest ray of dorsal	9·0	8·5	7·5	7·5	7·25
Length of pectoral	9·0	8·0	8·0	7·0	7·0
Length of ventral	6·0	5·5	5·5	5·5	5·0
Longest ray of anal	8·0	7·5	7·0	6·5	6·0
Length of caudal peduncle	6·0	6·0	5·5	5·5	5·5
Least height of caudal peduncle	4·5	4·0	4·0	4·0	3·75

Remarks.—In 1916, Weber and Beaufort[1] divided the fishes of the genus *Danio* into two subgenera as follows :—

"*a. Danio* s. str. Dorsal fin elongate, with 12-16 branched rays. Lateral line complete. Continental Asia, Ceylon.

b. Brachydanio subg. n. Dorsal fin short, with 7 branched rays only. Lateral line incomplete or absent."

During recent years several new forms of the *Brachydanio*-type have been discovered in Burma and though in all of them the dorsal fin is short, the lateral line has been found to be very variable. In the majority of forms it is either absent or extends over a few scales in the anterior region ; but there are some species in which it is fairly extensive or even complete. These small, gorgeously coloured fishes are usually found in great abundance in suitable localities and seem to be perfectly adapted for aquarium life. The Indo-Burmese species of the subgenus *Brachydanio* may be distinguished by the following key :—

Artificial key to the species of the subgenus *Brachydanio.*

I. Lateral line complete or rudimentary.

A. Lateral line complete or at least extending beyond anal fin. (Barbels absent or represented by a short maxillary pair) ; L. 1. 34 — *shanensis* Hora.

B. Lateral line incomplete, not extending to anal fin.

1. Lateral line extending beyond pectoral fin, but not reaching base of ventral. (Two pairs of well-developed barbels) ; L. 1. 31-33 — *albolineatus* (Blyth) (=*analipunctatus* Blgr.).

2. Lateral line short, not extending beyond pectoral fin.

a. Two pairs of well-developed barbels (L. 1. 28-30 ; body and caudal fin marked with four metallic blue bands) — *rerio* (Ham. Buch.).[2]

[1] Weber and Beaufort, *Fish. Indo-Austral. Archipel.*, III, p. 85 (1916).

[2] Lateral line is very variable in *D.* (*Brachydanio*) *rerio* as indicated in the remarks below the key.

b. Barbels absent.	
i. L. l. 32-34 ; a well-defined black mark near upper angle of gill-opening	*sondhii*, sp. nov.
ii. L. l. 30 ; black mark near upper angle of gill-opening absent	*acuticephala* Hora.
II. Lateral line totally absent.	
A. Two pairs of barbels.	
1. Maxillary barbels extending nearly to middle of pectoral (L. l. 28-30)	*rerio* (Ham. Buch.).
2. Maxillary barbels shorter than head (L. l. 33)	*choprae* Hora.
B. One pair of maxillary barbels (L. l. 30-32)	*nigrifasciatus* (Day).

Remarks.—All the species of *Brachydanio* described so far are very characteristic, not only with regard to the characters enumerated in the above key but also in their colouration. The colour markings of the various species appear to be specific.

Attention may here be directed to the fact that in *Danio* (*Brachydanio*) *rerio* the lateral line is very variable. Prashad and Mukerji[1] have already shown that in this species the lateral line may be distinct, piercing 2-6 anterior scales, rudimentary or totally absent. In some Burmese examples they found this structure better developed, reaching as far as the base of the ventral fin. It is due to the variation of this character that the species is included under both the main sections of the key. Apart from any other consideration, *D. rerio* can be distinguished most readily by its prominent and well marked colour bands.

Danio (Danio) aequipinnatus (McClelland).

1929. *Danio aequipinnatus*, Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, pp. 205, 206.

Mr. Sondhi's collection contains three specimens of *Danio aequipinnatus*, a widely distributed and beautiful species of the fresh waters of India and Burma. One of these was obtained in December, 1932, at Kyouksu, a village about 1½ miles east of Repiu and, when alive, was brownish in colour with " a well-defined strong band of dark blue along the sides and both above and below it are thinner-golden bands. The blue band runs along the entire length from tail to head and breaks up in a wavy line before reaching the gill-opening." The species is known as " *Nga-chhikha* " at Kyouksu, and is considered to be a larvicidal fish.

The other two specimens were collected in April, 1933, in the clear spring water of the Lawksawk Canal near the Rest House. The colouration of the smaller specimen was similar to that described above, whereas in the larger example the central blue band is broken up into three bands separated by golden lines. " The uppermost golden line is wavy but continuous, and the colour band just underneath it is greenish blue. A faint golden line extends through it for about half of its length. The lower golden line is straight and continuous."

It may not be out of place to mention here that one of us[2] has already remarked on the validity of Regan's *Danio browni*[3] from Upper Burma.

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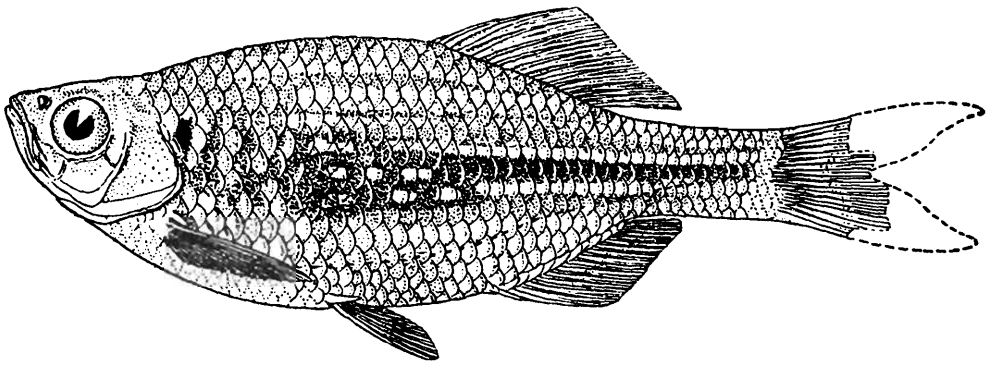
[1] Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, p. 206-208, pl. vii, fig. 5 (1929).
[2] Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVII, 1934 (in press).
[3] Regan, *Rec. Ind. Mus.*, I, p. 395 (1907).

The four typical specimens on which the description is based are preserved in the collection of the Zoological Survey of India. They are all young and agree in almost every respect with the young specimens of *Danio aequipinnatus*. We are, therefore, of opinion that *D. browni* cannot be regarded as a distinct species.

Danio (Danio) annandalei Chaudhuri.

1908. *Danio annandalei*, Chaudhuri, *Rec. Ind. Mus.*, II, pp. 125, 126.
1924. *Danio annandalei*, Myers, *Amer. Mus. Novitates*, No. 150, p. 2.

In Mr. Sondhi's collection there is a single specimen which, after a careful study, we have referred to *Danio annandalei*, a gorgeously coloured small fish described by Chaudhuri from a jungle stream near Kawkareik, at the base of the Dawna Hills in Tenasserim, Lower Burma. Chaudhuri gave a detailed description of the colour-pattern of the species which is not very different from that of *Danio dangila*. Superficially the two species appear identical, but they are easily distinguished by well-marked diagnostic characters. In discussing the affinities of *D. annandalei*, Chaudhuri attached considerable importance to the presence or absence of scaly or fleshy appendages at the bases of the paired fins, for he observed "Besides other apparent and conspicuous differences the new species differs from *D. spinosus* in possessing appendants to the pectoral fins (whereas *D. spinosus* has none), and from *D. dangila*, which possesses appendants to the ventral fins." Our observations on the various species of the genus show that in almost every case a scaly appendage is present above the base of the ventral fin and a fleshy appendage in the axil of the pectoral fin.



Text-fig. 2.—Lateral view of a type-specimen of *Danio* (*Danio*) *annandalei* Chaudhuri × 1⅓.

Mr. Sondhi's specimen is 58 mm. in total length without the caudal, and was taken in the western drainage of the Pegu Yomas (Gyobyu Chaung). The brilliant colour-pattern has faded away entirely, though with proper illumination four or five round, whitish markings could be made out. In every other respect, this specimen agrees with the two typical examples in our collection and with Chaudhuri's description of the species. As no figure of the species has so far been published, we give above a lateral view drawing of one of the type-specimens.

With the specimens of *D. annandalei*, several examples of *D. dangila* and *D.* (*Brachydanio*) *albolineatus* were collected by Dr. N. Annandale. We have indicated above that *D. annandalei* and *D. dangila* appear to

be similar superficially, but the salient characters tabulated below will help to distinguish the two species. We also give here a table of measurements of three specimens of each species to facilitate detailed comparison in future.

Danio annandalei.	*Danio dangila.*
1. Both pairs of barbels less than diameter of eye.	1. Both pairs of barbels at least as long as thrice diameter of eye.
2. L. tr. 15 ($11\frac{1}{2}/3\frac{1}{2}$).	2. L. tr. 9 ($6\frac{1}{2}/2\frac{1}{2}$).
3. Length of snout contained 4 times in length of head.	3. Length of snout contained 4·8-5·5 times in length of head.

Measurements in millimetres.

	D. annandalei.			*D. dangila.*		
	Upper Burma.	Dawna Hills Types.		Dawna Hills.		
Total length without caudal	58·0	55·0	56·0	61·0	57·0	45·0
Length of head	14·0	14·0	14·0	14·5	12·5	11·0
Depth of body	19·0	19·5	20·0	19·5	17·0	15·0
Width of head	8·0	8·0	8·0	9·5	8·0	6·0
Height of head at occiput	10·5	11·0	11·0	10·0	10·0	8·0
Length of snout	3·5	3·5	3·5	3·0	2·5	2·0
Diameter of eye	4·0	4·5	4·5	4·0	4·0	3·25
Interorbital width	4·0	4·0	4·5	4·5	4·0	3·0
Longest ray of dorsal	8·5	9·0	10·0	12·0	12·0	7·5
Length of pectoral	13·5	12·5	13·0	14·0	14·0	11·0
Length of ventral	8·0	8·0	8·0	10·0	9·5	6·5
Length of base of anal	12·0	11·0	11·0	12·0	11·0	9·5
Length of caudal peduncle	9·0	10·0	10·0	10·5	10·0	7·5
Least height of caudal peduncle	7·0	6·5	7·0	8·0	7·5	5·5

In 1924, Myers[1] described a new species of *Danio*, *D. strigillifer*, from Burma and gave a key to all the species of the genus *Danio*, s. str. On an examination of a large collection of Danios from India, Burma and Siam in the Indian Museum, we have found it necessary to include here an emended key of the various species. Unlike members of the subgenus *Brachydanio*, these fishes are somewhat more difficult to define, particularly as the colour-pattern is common to several of them, and the range of variation of other diagnostic features of the various species is considerable.

Artificial Key to the species of the subgenus *Danio*.

I. One or two spines along anterior margin of orbit below nostrils. [Two pairs of barbels; L. l. 33-38; L. tr. 15 ($12\frac{1}{2}/2\frac{1}{2}$)] — *spinosus* (Day).

II. Spines along anterior margin of orbit absent.

A. Barbels absent [L. l. 33-38; L. tr. 15 ($12\frac{1}{2}/2\frac{1}{2}$)] — *devario* (Ham. Buch.).

B. Barbels present.

1. A pair of short rostral barbels; maxillary barbels, if present, rudimentary.

a. L. l. 32; L. tr. 11. ("A dark line along the middle of the sides through the tail, with occasionally obscure dusky bands above and below it.") — *kakhiensis* Anderson.

[1] Myers, *Amer. Mus. Novitates*, No. 150, p. 2 (1924).

b. L. l. 35-37; L. tr. 9 (6½/2½). ("A badly marked broad, steel-blue stripe, extends from behind the eye to the caudal fin, while it is bounded above and below by a narrow yellow edging") *neilgherriensis* (Day).

2. Two pairs of well developed barbels.

a. A well-defined black mark near upper angle of gill-opening.

i. Lateral bands breaking up anteriorly to form a mottled pattern.

α. Both pairs of barbels much longer than diameter of eye [L. l. 36-42; L. tr. 9 (6½/2½)] *dangilla* (Ham. Buch.).

β. Both pairs of barbels equal to or shorter than diameter of eye.

*L. l. 37; L. tr. 10 (7½/2½). *strigillifer* Myers.

**L. l. 42-46; L. tr. 15 (11½/3½) *annandalei* Chaudhuri.

ii. Lateral bands not breaking up anteriorly to form a mottled pattern.

α. Several well marked and uniform lateral bands [D. 3/9-12; L. l. 34-36; L. tr. 10-or 11 (7½/2½ or 8½/2½)] *aequipinnatus* (McClell.) (=*browni* Regan).

β. Single lateral band well marked posteriorly [D. 3/8; L. l. 38-40; L. tr. 11 (8½/2½)] *naganensis* Chaudhuri.

b. Black mark near upper angle of gill-opening absent [middle rays of caudal fin black; barbels minute; L. l. 32-34; L. tr. 11 (8½/2½)] *malabaricus* (Jerdon).

It was pointed out by Myers (*op. cit.*) that *Danio chrysops* (Cuv. and Val.)[1] is perhaps not a *Danio*, as in this species the anal fin is stated to be entirely behind the dorsal whereas in *Danio* the hinder half of the dorsal fin is at least situated above the anal fin. We consider the position of the dorsal with relation to that of the anal a fundamental character and on this account do not regard *D. chrysops* to be congeneric with the other species. Unfortunately, from the meagre information available, it is not possible to discuss the exact systematic position of *D. chrysops*.

With the exception of *D. kakhiensis*[2] and *D. strigillifer*, we have examined the types, topotypes or a good series of specimens of all the other species.

Nemachilus rivulicola Hora.

1929. *Nemachilus rivulicola*, Hora, *Rec. Ind. Mus.*, XXXI, p. 324, pl. xv, figs. 3 and 4.

Nemachilus rivulicola was described by one of us from the clear, rocky streams in the Yawnghwe Valley and the He-Ho plain. Mr. Sondhi obtained 10 specimens from underneath the bridge near the Hopong Rest House and 3 more examples from a canal near Lawksawk Rest House. It thus appears that the species is fairly widely distributed in the Southern Shan States. The specimens in Mr. Sondhi's collection agree in almost every detail with those in the type series.

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[1] Cuvier and Valenciennes, *Hist. Nat. Poissons*, XVII, p. 308 (1844); Day, *Fish. India*, p. 596 (1878).

[2] Anderson, *Anatomical and Zoological Researches*, etc., I, *Pisces*, p. 868 (1878).

Nemachilus multifasciatus (Day) Vinciguerra.

1890. *Nemachilus multifasciatus*, Vinciguerra, *Ann. Mus. Civ. Stor. Nat. Genova*, (2), IX, pp. 209-211.

In his revision of *Nemachilus* from Burma, Hora[1] remarked " I have not yet determined exactly the specific characters of Day's *N. multifasciatus* and have, therefore, left out of consideration Vinciguerra's specimens referred to this species" As regards the identity of Day's *multifasciatus*, the situation has not altered so far, and in spite of the extensive collections that have been made in the Darjiling Himalayas during recent years, not a single specimen of the species has been obtained. Vinciguerra's *multifasciatus* has, however, been recorded by Mukerji[2] from northern Burma and Siam, and he gives a detailed description of the species from fresh specimens. In the present state of our knowledge it is not possible to be certain whether the Burmo-Siamese form is conspecific with the Eastern Himalayan form. Until further material is obtained from the latter locality, we propose to designate the authorship of the species as noted above.

In Mr. Sondhi's collection there is only one specimen of this species obtained in the western drainage of the Pegu Yomas at Gyobyu Chaung, west of the new dam line. It is 52 mm. in total length without the caudal and is a well preserved specimen. The colouration of the body is somewhat faded, but the black vertical bar at the base of the caudal and the characteristic colour pattern on the caudal fin are well marked.

Lepidocephalichthys berdmorei (Blyth).

1929. *Lepidocephalichthys berdmorei*, Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, p. 191.

Lepidocephalichthys berdmorei is the most widely distributed loach in the Burmese waters. Six specimens of the species were obtained by Mr. Sondhi at Repiu. The fish is usually found in pools and puddles in the course of streams among debris at the bottom.

The species is known as " *Nga-tha-lay daw* " by the Guttum people.

Acanthopsis choirorhynchus (Bleeker).

1916. *Acanthopsis choirorhynchus*, Weber and Beaufort, *Fish. Indo-Austral. Archipel.* III, p. 25, figs. 8 and 9.

Acanthopsis choirorhynchus is represented by a single specimen in Mr. Sondhi's collection. It is a young specimen, 98·3 mm. in total length, and was obtained in the Pegu Yomas. Besides Burma the species is known from Malay Peninsula, Annam, Borneo, Java and Sumatra. So far it has not been recorded from India.

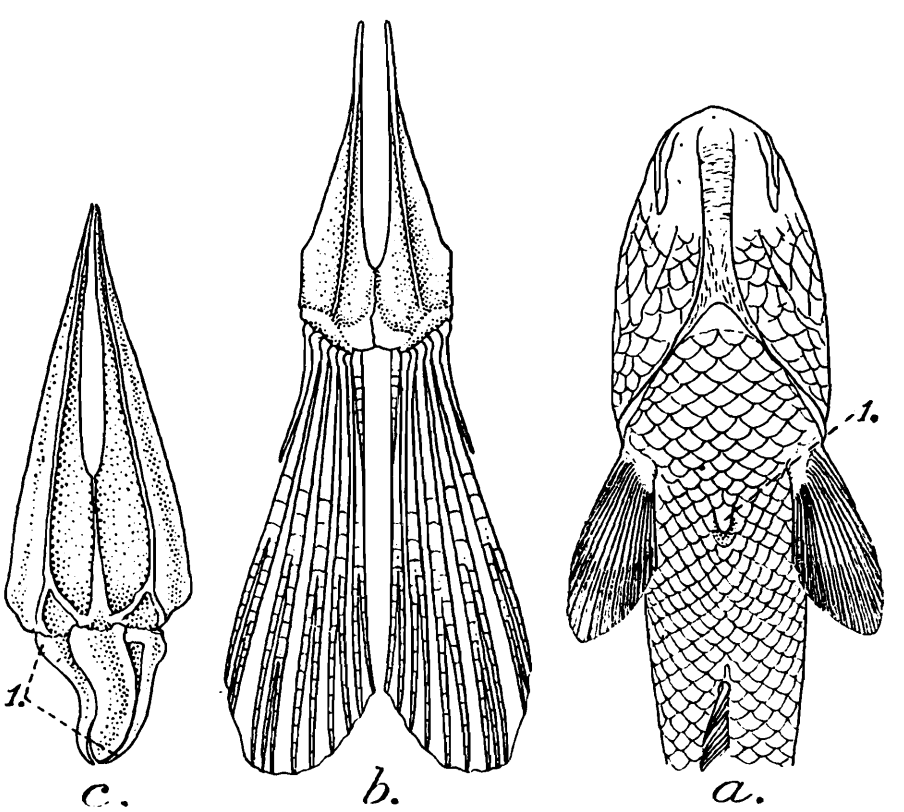
Ophicephalus gachua Ham. Buch.

1918. *Ophiocephalus harcourt-butleri*, Annandale, *Rec. Ind. Mus.*, XIV, p. 54, pl. ii, fig. 7 ; pl. iv, figs. 16, 17.
1921. *Ophiocephalus harcourt-butleri*, Hora, *Rec. Ind. Mus.*, XXII, p. 208.
1929. *Ophicephalus gachua*, Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, p. 215.

Ophicephalus gachua is a widely distributed and variable species of the Oriental Region. Its much more marked amphibious mode of

[1] Hora, *Rec. Ind. Mus.*, XXXI, p. 314 (1929).
[2] Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVII, 1934 (in press).

life is probably responsible for a certain amount of variation exhibited by the species. Moreover, during growth the fish undergoes considerable changes in proportions, etc. In 1918, Annandale (*op. cit.*) described a new species, *O. harcourt-butleri* from the Inlé Basin, S. Shan States, and remarked that it is a " small species resembling *O. gachua*, but distinguished by the smaller scales on the head, the longer, narrower, less flattened head, etc." According to Annandale this species " is abundant all over Yawnghwe and the neighbouring states. .Large numbers are sold in the local markets." One of us (Hora, *op. cit.*) recorded this species from the Manipur Valley where it was found to be abundant in marshy places. In 1893, Boulenger[1] had recorded *O. gachua* from Fort Stedman, and the belief has been growing with us that *O. harcourt-butleri* is probably conspecific with *O. gachua*. After an examination of a large number of specimens in the collection of the Zoological Survey of India from widely separated localities, we are now of opinion that the differences pointed out by Annandale lose all significance when large series of specimens are examined. Annandale's *O. harcourt-butleri* cannot, therefore, be regarded as distinct from *O. gachua*.



TEXT-FIG. 3.—*Ophicephalus gachua* Ham. Buch.

a. Ventral surface of head and anterior part of body of an abnormal specimen showing absence of ventral fins × $\frac{4}{5}$.

b. Skeleton of the rudiment of the pelvic fins and the basipterygia of the above × $4\frac{4}{5}$.

c. Skeleton of the pelvic fins and the basipeterygia of a normal specimen × 4.

1 = Rudiment of the pelvic fins.

Five specimens of *O. gachua* were collected by Mr. Sondhi, 4 from the S. Shan States and 1 from the Pegu Yomas. The specimen collected at Pangtara, about 145 mm. in total length without the caudal, is of special interest as it is deficient in both the pelvic fins. According

[1] Boulenger, *Ann. Mag. Nat. Hist.* (6), XII, pp. 198-203 (1893).

to Day[1] " It is not uncommon in India to find specimens of *Ophiocephalus gachua* having a ventral fin deficient but I have never observed both wanting." With the exception of the specimen under report, we have not come across any example of *O. gachua* lacking one or both the ventral fins. In the abnormal specimen the region of the origin of the pelvic fins is marked by the presence of a large scale, which on dissection proved to be a bony structure representing the two lost fins. The pelvic girdle or the basipterygia are of the normal type, except that they lie closer together and have coalesced in the basal region to form a single structure. The basipterygia are further fused with the scale-like structure noted above. The latter was partly imbedded in the skin but was free distally. It is thus seen that the remnants of the pelvic fins and their supporting bones have become fused to form a single bony mass. For convenience of reference, we reproduce (Text.-fig. 3) a drawing of the pelvic fins and the basipterygia of the normal specimen of *O. gachua* for comparison with the abnormal structure illustrated here.

In April, 1932, we received three specimens of *Channa orientalis* and three of *Ophicephalus gachua* from the Colombo Museum. We were informed that the specimens of both the species had been taken together. One of these specimens of *C. orientalis* was dissected very carefully to see if there was any rudiment left of the pelvic fins or the basipterygia, but we were unable to find any trace of either. This shows that in *Channa* the pelvic fins are totally absent, whereas in the abnormal specimen of *O. gachua*, the absence of the pelvic fins has to be regarded as a mere deformity due to some injury or pathogenic condition. On previous occasions we[2] have referred to the absence of paired fins in fishes and discussed the significance of this phenomenon in the taxonomy of the forms concerned. As regards the systematic position of *Channa* and *Ophicephalus*, Myers and Shapovalov[3] have recently given some evidence to show that *Channa* probably comprises series of anomalous specimens hardly distinguishable from species of *Ophicephalus* except on the character of the pelvic fins. We also feel that there is a great deal to be said for this view, for an examination of the material of both the genera in the Indian Museum has shown that if the absence of the pelvic fins is ignored it is very difficult to distinguish species of *Channa* from certain species of *Ophicephalus*. As an example it may be noted that we have not been able to find any distinctive feature in the type-specimens of *Channa burmanica* Chaudhuri[4] by which the species can be distinguished from the common form, *O. gachua*. The abnormal specimen reported here raises several questions of interest, but we refrain from discussing the problem as Deraniyagala[5] proposes to make an intensive study of *C. orientalis* and *O. gachua* with a view to elucidate the systematic position of the two genera.

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[1] Day, *Fish. India*, p. 368 (1878).

[2] Hora, *Rec. Ind. Mus.*, XXII, pp. 27-32, figs. 1 and 2 (1921); *Nature*, London, CXXVI, pp. 435, 436, fig. 1 (1930).
Mukerji, *Annot. Zool. Japon.*, XIII, No. 5, pp. 441-444 (1932); *Journ. Bombay Nat. Hist. Soc.*, XXXVII, 1934 (in press).

[3] Myers and Shapovalov, *Peking Nat. Hist. Bull.*, VI, pt. ii. pp. 32-37 (1931-32).

[4] Chaudhuri, *Rec. Ind. Mus.*, XVI, pp. 284-286, pl. xxii, figs. 4, 4*a*, 4*b* (1919).

[5] Deraniyagala, *Spol. Zeylanica*, XVII, pt. i. pp. 40, 41 (1932).

Mastacembelus armatus (Lacépède).

1929. *Mastacembelus armatus*, Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, pp. 213, 214.

A young specimen of *Mastacembelus armatus*, 140 mm. in total length was obtained by Mr. Sondhi in the western drainage of the Pegu Yomas. The colouration of the specimen is somewhat different from the normal type. There are two short bands in the posterior portion of the head forming a cross on the nape. A black band along the dorsal surface at the sides of the spines runs in an undulating course and the second is a much narrower band that runs along the lateral line. A still lighter and narrower band runs along the middle of the lower half of the body and is continued forwards on the gill-cover. Behind the vent all these bands break up and form the reticulated pattern characteristic of the species. In the anterior region the fish is marked with 3 lateral stripes decreasing in width from above downwards.

Ambassis ranga (Ham. Buch.).

1929. *Ambassis ranga*, Prashad and Mukerji, *Rec. Ind. Mus.*, XXXI, pp. 210, 211.

There are two young specimens of *Ambassis ranga* in the collection. They were obtained by Mr. Sondhi in the Pegu Yomas.

MGIPC—M—III-8-16—4-4-34—510.