NOTES ON FISHES IN THE INDIAN MUSEUM.

XXIII. On a Collection of Fish from the S. Shan States, Burma.

By Sunder Lal Hora, *D.Sc., F.R.S.E., F.A.S.B.*, and Dev Dev Mukerji, *M.Sc., Zoological Survey of India, Calcutta.*

During the field-season of 1933-34, Mr. V P. Sondhi of the Geological Survey of India made a traverse through the country between the Lawksawk and Kēngtūng States of the Southern Shan States in Burma. In the course of the journey, Mr. Sondhi worked in the drainage basins of three principal rivers, namely, the Irrawaddy, the Salween and the Mekong. The exigencies of his service did not permit him to devote much time to the collection and preservation of fish, but, all the same, he availed himself of this opportunity to collect some material in all the three basins. The collection is of considerable interest as in addition to the three new species from the Lawksawk canal and the Salween River at Takaw it contains specimens of several species not hitherto represented in the collections of the Indian Museum.

The country traversed by Mr. Sondhi is hilly in the main and consists of high hills and valleys. The collection was made from pools or slow-running streams and, therefore, lacks in typical torrential forms, with the exception of two species of *Garra*. We give below a list of localities with the names of the species of fish collected therefrom and a short description of each locality as supplied to us by Mr. Sondhi.

Irrawaddy Drainage System.

1. Paddy fields at Gaunphpo, Lawksawk State. November, 1933.

"The paddy fields at Gaunphpo are irrigated by water diverted from small rapid streams issuing from the hills to the west of the Gaunphpo plain. The fish were caught from fields irrigated by the Chaung Gyi stream."

i. *Lepidocephalichthys berdmorei* (Blyth) — 1 specimen.

2. Chaung Gyi stream, north-west of Gaunphpo, Lawksawk State. November, 1933.

"A moderately torrential stream with a bed of large, rounded boulders. The water is clear and devoid of vegetation. The fish were caught from a small pool with a sandy bottom after stunning them by shooting into the water."

i. *Barbus sarana caudimarginatus* Blyth — 2 specimens.
ii. *Danio (Danio) aequipinnatus* (McClelland) — 13 specimens.
iii. *Nemachilus rivulicola* Hora — 1 specimen.
iv. *Lepidocephalichthys berdmorei* (Blyth) — 1 specimen.

3. Lawksawk Canal at Lawksawk, Lawksawk State. April, 1934.

"Just south of the town of Lawksawk is a large perennial spring that gives rise to a small lake, about half a furlong across. The lake is almost chokeful of vegetation which can be clearly seen through the crystal clear water, the actual bottom of the lake is rarely seen. The discharge or overflow from the lake is diverted into a canal which runs along the eastern end of the town. As the canal is aligned and dug by local people

it is not uniformly graded throughout and has therefore pools and rapids at different points in its course. The sluggish portions are usually full of vegetation and in rapids a pebbly or coarsely sandy bottom is seen. As the spring issues from limestones, the water is highly charged with lime."

i. *Barbus tor* (Ham. Buch.) 2 specimens.
ii. *Barbus sarana caudimarginatus* Blyth 2 specimens.
iii. *Barbus shanensis*, sp. nov. 2 specimens.
iv. *Garra gravelyi* (Annandale) 2 specimens.

SALWEEN DRAINAGE SYSTEM.

4. A tributary of the Salween on the east bank at Takaw, Kēngtūng State. January, 1934.

" A torrential stream with rocky bed. The water is clear and devoid of vegetation. Only one specimen of fish was obtained by shooting into the water near the edge."

i. *Ophicephalus gachua* Ham. Buch. 1 specimen.

5. The Salween River at Takaw, Kēngtūng State. 21st January, 1934.

" The Salween river at Takaw has a strong current and a deep channel. It is difficult to catch fish in the dry months, but during the monsoon, when the water rises to cover the sloping banks, fish are extensively caught in shallow embayments formed in places. The fish were netted from a pool in the course of the river."

i. *Osteochilus sondhii*, sp. nov. [*Pa-sat*][1] 2 specimens.
ii. *Garra salweenica*, sp. nov. [*Pa-ing*] 2 specimens.

6. Stream at Hsenmawng, Kēngtūng State. 28th January, 1934.

" The stream at Hsenmawng is very torrential, and the bed consists of huge boulders of granite and coarse sand. The water is clear and devoid of vegetation. The fish were obtained by shooting into stationary water behind large boulders."

i. *Lepidocephalichthys berdmorei* (Blyth) 1 specimen.
ii. *Ophicephalus gachua* Ham. Buch. 1 specimen.

MEKONG DRAINAGE SYSTEM.

7. Kēngtūng, Kēngtūng State. Market specimens. 1st February, 1934.

i. *Cyprinus carpio intha* Annandale 1 specimen.
ii. *Mystacoleucus marginatus* (C. V.) 2 specimens.

8. Nawng Kyawk tank at Kēngtūng, Kēngtūng State. 2nd February, 1934.

" Nawng Kyawk is a small artificial lake. Its water is slightly turbid so that the bottom is not seen below a few feet."

i. *Clarias batrachus* (Linn.). [*Pa-lupp-pawn* & *Pa-lupp-lumm*] 2 specimens.
ii. *Lepidocephalichthys berdmorei* (Blyth). [*Pa-soo*] 2 specimens.
iii. *Monopterus albus* (Ziew). [*Pa-yin*] 2 specimens.
iv. *Ophicephalus striatus* Bloch. [*Pa-ko*]. 1 specimen.
v. *Trichopodus trichopterus* (Pallas). [*Pa-shep*] 2 specimens.
vi. *Betta splendens* Regan. [*Pa-kut*] 2 specimens.

[1] Names in square brackets are the local names of the species.

9. Nam MeHsai stream, Kēngtūng State. 14th and 16th February, 1934.

"Nam MeHsai is the boundary stream between the British territory and Siam. At the point at which the fish were caught the stream enters the plain and loses its torrential character. The channel is wide and shallow and in the dry months the water is confined to a narrow course in the wide bed of the stream. The water is turbid and carries lot of drift wood. The bed is covered with coarse sand and shingle."

i. *Mystus*[2] *bleekeri* (Day)	1 specimen.
ii. *Barbus puntio* (Ham. Buch.) Day	1 specimen.
iii. *Crossochilus latius* (Ham. Buch.)	1 specimen.
iv. *Mystacoleucus marginatus* (C. V.)	2 specimens.
v. *Rasbora taytayensis* Herre	2 specimens.
vi. *Lepidocephalichthys berdmorei* (Blyth)	1 specimen.
vii. *Acanthopsis choirorhynchus* (Blkr.)	1 specimen.
viii. *Ophicephalus gachua* Ham. Buch.	1 specimen.
ix. *Trichopodus trichopterus* (Pallas)	6 specimens.
x. *Betta splendens* Regan	2 specimens.
xi. *Anabas testudineus* (Bloch).	2 specimens.

10. Nam Hōk stream east of Hawnglūk. 15th February, 1934.

"Nam Hōk is a large stream with a sluggish current and steep banks. The bed consists of mud and sand and is devoid of any vegetation. The water is turbid."

i. *Clarias batrachus* (Linn.)	1 specimen.
ii. *Barbus sophore* (Ham. Buch.)	2 specimens.
iii. *Ophicephalus striatus* Bloch.	1 specimen.
iv. *Trichopodus trichopterus* (Pallas)	2 specimens.
v. *Anabas testudineus* (Bloch)	1 specimen.

11. Nam Long stream a mile west of Mong Hpayak, Kēngtūng State.

"The stream is large and torrential with crystal clear water and a bed covered with large boulders and sand. There is no vegetation in the stream bed. The fish were caught by shooting into the water of a clear shallow pool which was about a foot deep. The fish were present in a thick shoal over a hot sulphur spring. The sandy bed of the pool was unbearably hot and there was a strong smell of sulphuretted hydrogen. The fish were living in warm water about eight inches above the hot sand."

i. *Barbus* spp. Juvenile	5 specimens.

4 specimens with a smooth dorsal spine and 1 with a serrated spine.

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[2] In 1919, Jordan (*Genera of Fishes*, p. 269) pointed out that the generic name *Macrones* (Dumeril 1856, orthotype *Bagrus lamarii* Cuv. & Val.) was preoccupied in Coleoptera (Newman 1841) and proposed *Aoria* to replace it. In spite of this, *Macrones* is still being used by a number of ichthyologists, both Indian and foreign, and *Aoria* has been only partially adopted. Fowler (*Journ. Bombay Nat. Hist. Soc.*, XXXII, p. 105, 1928), however, pointed out that *Aoria* Jordan was not a suitable name, as three Bleekerian generic names—*Hemibagrus*, *Hypselobagrus* and *Aspidobagrus* (*Atlas Ichthyol.*, II, pp. 54, 57, 59, 1862)—were available to replace *Macrones*. At the same time, it was indicated that *Mystus* Gronow, a much earlier name, was originally used for Bagrid fishes of the type of *Macrones* and had thus precedence over all other names. After careful consideration, we agree with Fowler and have adopted the name *Mystus* for species of the genus *Macrones*.

Mystus Gronow (*Zoophylaceum*, p. 124, 1763, type *Silurus pelusius* Solander) was introduced by Scopoli (*Introd. Hist. Nat.*, p. 451, 1777) but the name was originally used by Russell in the 1st edition of his History of Aleppo in a popular sense for a Bagrid fish, but in the 2nd edition of the work Solander designated it *Silurus pelusius* (Günther, *Cat. Fish. Brit. Mus.*, V., p. 431, 1864). One of the typical specimens from Russell's collection is described by Günther in his *Catalogue* (p. 75) and the description leaves no doubt that *Macrones* is synonymous with *Mystus*.

It may be pointed out that *Aoria* is also preoccupied among Coleoptera (Baly, *Journ. Ent.*, II, p. 49, 1863) and is, therefore, not available for fishes.

Of the 79 specimens listed above, it has not been possible to determine specifically 5 very young specimens of *Barbus* obtained from the Nam Long stream. The remaining 72 specimens are referable to 24 species, the majority of which belong to the order Cyprinoidea as is clear from the list given below :—

CLARIIDAE.

Clarias batrachus (Linn.)

BAGRIDAE.

Mystus bleekeri (Day).

COBITIDAE.

Acanthopsis choirorhynchus (Bleek.).
Lepidocephalichthys berdmorei Blyth.
Nemachilus rivulicola Hora.

CYPRINIDAE.

Rasbora taytayensis Herre.
Danio (Danio) aequipinnatus (McClell.).
Cyprinus carpio intha Annandale.
Mystacoleucus marginatus (Cuv. & Val.).
Osteochilus sondhii, sp. nov.
Barbus shanensis, sp. nov.
Barbus sarana caudimarginatus Blyth.
Barbus tor (Ham. Buch.).
Barbus puntio (Ham. Buch.) Day.
Barbus sophore (Ham. Buch.).
Crossochilus latius (Ham. Buch.).
Garra salweenica, sp. nov.
Garra gravelyi (Annandale).

SYMBRANCHIDAE.

Monopterus albus (Ziew).

OPHICEPHALIDAE.

Ophicephalus striatus Bloch.
Ophicephalus gachua Ham. Buch.

ANABANTIDAE.

Anabas testudineus (Bloch).
Betta splendens Regan.
Trichopodus trichopterus (Pallas).

With the exception of the three new forms—*Osteochilus sondhii*, *Barbus shanensis* and *Gara salweenica*—and three other species, *viz.*, *Rasbora taytayensis*, *Garra gravelyi* and *Barbus puntio*, the remaining species are quite well known and do not call for any comments. We have, however, added a short note on the colouration of *Danio aequipinnatus* to amend our recent key to the species of the subgenus *Danio*.

Very little is known about the ichthyology of Burma as a whole, and the fish of the upper reaches of the Salween River have received practically no attention so far. It is not surprising, therefore, that both the species collected by Mr. Sondhi at Takaw in the Salween River have proved to be new. The occurrence of *Rasbora taytayensis* in the Nam MeHsai stream, a tributary of the Mekong River, is remarkable as the species was so far known from the Philippines. Mr. Sondhi's small collection has added materially to our knowledge of the fishes of Burma and we are grateful to him for affording us an opportunity to investigate such an interesting material. We have to thank Dr. B. Prashad for his kindness in going through the manuscript and Mr. R. Bagchi for the drawings which he has executed with his usual skill and care under our supervision.

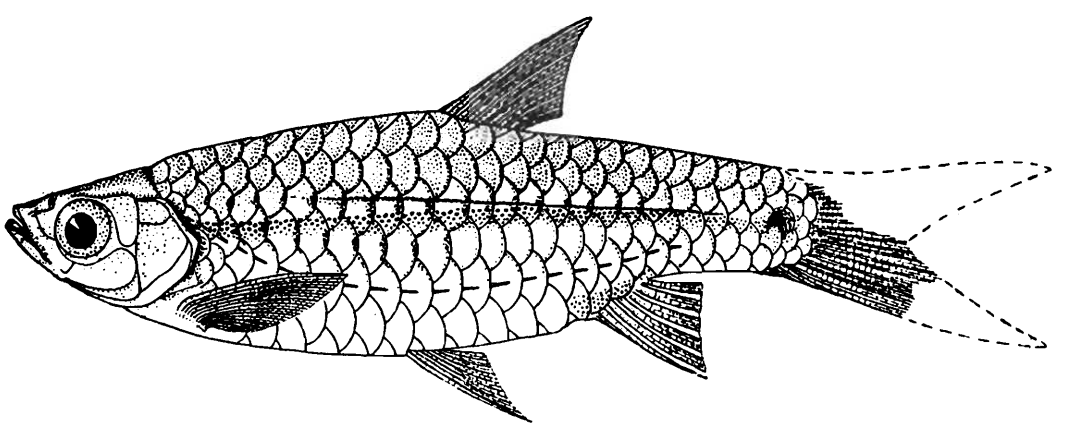
Rasbora taytayensis Herre

1924. *Rasbora taytayensis*, Herre, *Philippine Journ. Sci. Manila*, XXIV, pp. 264, 265.

In Mr. Sondhi's collection there are two specimens of *Rasbora* from the Nam MeHsai stream which agree in all essential respects with *R. taytayensis* Herre from the Philippines. The only differences that we can notice are (i) the presence of two lateral bands in *R. taytayensis* and only one in the Nam MeHsai specimens, and (ii) 15-17 perforated scales in *R. taytayensis* and 18-20 in the specimens under report. These differences are not of much diagnostic value and will probably be bridged over when large series of specimens are examined from Burma and Siam. Unfortunately Herre did not publish a figure of his species, and as it is here recorded from a place widely separated from the type-locality, we describe our specimens in detail and figure one of them.

D. 3/7 ; A. 2/5 ; P. 14 ; V 8-9 ; C. 18.

In the Nam MeHsai species of *Rasbora* the dorsal profile is slightly arched while the ventral profile is deeply concave. The head is small and pointed ; its length is contained from 4·7 to 5 times in the total length



Text-fig. 1.—Lateral view of the larger specimen of *Rasbora taytayensis* Herre. ×1½.

and 3·8 times in the length without the caudal. The height of the head at the occiput is contained 1·4 times and the width from 1·9 to 2·2 times

in its length. The eyes are lateral, large and prominent ; their diameter is contained 3 times in the length of the head, from 0·7 to 0·8 times in the length of the snout and 1·2 times in the interorbital width. The interorbital space is flat and wide. The mouth, lips and jaws are as in the genus. The cleft of the mouth ascends strongly, its anterior end is almost in level with the upper border of the eye while the posterior just misses the level of the anterior border of the eye.

The commencement of the dorsal is slightly behind that of the ventral, and is nearer the base of the caudal than the tip of the snout. The longest ray of the dorsal is considerably shorter than the depth of the body below it. The pectoral fin is long and pointed but does not extend to the base of the ventral. The ventral fin is similar to the pectoral but its outer rays are prolonged and it is separated from the anal by a short distance. The anal fin is short and does not reach the base of the caudal. The caudal fin is deeply forked ; the lobes are long and pointed, the lower lobe is slightly longer than the upper.

The depth of the body is contained from 3·8 to 4·6 times in the total length and from 3·1 to 3·5 times in the length without the caudal. The larger specimen is proportionately much deeper. The caudal fin is contained 4·4 times in the total length. The body is covered with large and well-marked scales. There are about 25 to 26 scales in a longitudinal series between the upper angle of the operculum and the base of the caudal fin. There are 10 to 12 predorsal scales and 12 round the caudal peduncle. The lateral line is concave and incomplete ; the number of perforated scales varies from 18 to 20 and the lateral line does not seem to extend to the caudal peduncle. There are $4\frac{1}{2}$ or 5 rows of scales between the lateral line and the base of the dorsal and 1 or $1\frac{1}{2}$ rows between it and the base of the ventral. Anteriorly the lateral line organs are continued above the eyes. The bases of the ventrals and anal fins are provided with scaly sheaths. In one of the specimens there are scaly appendages in the axils of the ventral fins. The least height of the caudal peduncle is contained from 1·4 to 2 times in its length. The caudal peduncle of the smaller specimen is long and slender.

The fish has a silvery sheen, the upper half is somewhat darker than the lower. There is a broad, faint band along the middle of the body which ends in front of the caudal in an oblong, black mark. The head and body are marked with small black dots which are aggregated along the margins of the scales. An aggregation of black spots at the base of the anal forms a narrow band. There is a black streak along the dorsal surface.

Locality.—Nam MeHsai stream forming the boundary between the British Territory and Siam.

Remarks.—*Rasbora taytayensis* belongs to the group of species in which the lateral line is incomplete, and the origin of dorsal is behind that of ventral. According to Rendahl [1], its close ally is *R. vegae* from the Island of Labuan.

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[1] Rendahl, *Arkiv. f. Zoologi*, XVIII B, No. 13, p. 113 (1926).

Measurements in millimetres.

Total length including caudal	48·6	58·2
Length of caudal	11·0	12·1
Depth of body	10·5	15·0
Length of head	9·7	12·3
Height of head at occiput	7·0	9·0
Width of head	4·3	6·5
Length of snout	2·3	3·4
Diameter of eye	3·3	4·1
Interorbital width	4·0	5·0
Length of pectoral	8·4	10·6
Length of ventral	8·4	9·0
Longest ray of dorsal	9·0	11·7
Longest ray of anal	8·5	8·8
Length of caudal peduncle	9·0	10·0
Least height of caudal peduncle	4·3	7·2

Danio (Danio) aequipinnatus (McClelland)

1934. *Danio (Danio) aequipinnatus*, Hora & Mukerji, *Rec. Ind. Mus.*, XXXVI, p. 131.

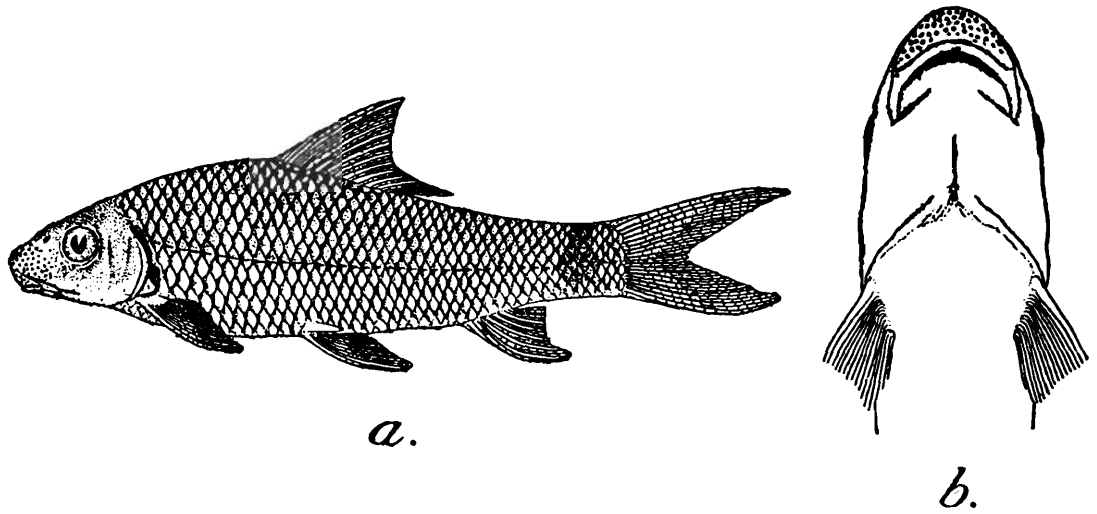
In our recent key to the species of the subgenus *Danio*, *D. aequipinnatus* was included among a group of species with "A well-defined black mark near upper angle of gill-opening." Some of the specimens collected by Mr. Sondhi in the Chaung Gyi stream near Gaunphpo do not bear this mark, but the species can be readily recognised by the characteristic colouration of the body.

Osteochilus sondhii, sp. nov.

D. 4/12; A. 3/5; P. 17; V 9; C. 19.

In *Osteochilus sondhii* both the profiles are considerably arched; the dorsal profile rises from the tip of the snout to the commencement of the dorsal fin with a gradual, but steep, gradient, behind which it slopes gradually to the base of the caudal fin. The ventral profile is more evenly arched and in the region of the caudal peduncle is straight and horizontal. The body is considerably compressed, though somewhat flat on the ventral surface in front of the ventral fins. The head is short, thick and broadly pointed; its length is contained from 4·4 to 4·6 times in the total length without the caudal. The height of the head at the occiput is contained from 1·2 to 1·3 times and its width from 1·4 to 1·7 times in its length. The eye is placed in the upper half of the head and is just visible from the ventral surface; its greater part is situated in the posterior half of the head. The diameter of the eye is contained from 3·5 to 3·9 times in the length of the head; from 1·3 to 1·6 times in the length of the snout and from 1·4 to 1·8 times in the interorbital width. The nostrils are situated in front of the eyes at a distance of half its diameter. The snout is covered with sharp tubercles which extend backward to the front margin of the eyes. The mouth is distinctly inferior, horizontal and crescent-shaped; it is as wide as the length of the snout and is bordered by fleshy lips. The anterior lip is slightly fimbriated, but the

posterior one is distinctly papillated. Both the jaws are covered with a horny substance, that of the posterior jaw forms a sharp edge anteriorly.



TEXT-FIG. 2.—*Osteochilus sondhii*, sp. nov.
a Lateral view of the type-specimen. ×½.
b. Ventral surface of head and anterior part of body of the type-specimen. Nat. size.

The maxilla extends to just below the anterior margin of the eye. The maxillary groove is deep and contains a small maxillary barbel which is not visible from outside. There are no rostral barbels. The labial groove is broadly interrupted in the middle. The gill-opening is mostly restricted to the side and extends to the ventral surface only for a short distance. The operculum is provided with a broad membranous flap.

The commencement of the dorsal fin is opposite the 12th perforated scale and is much nearer to the tip of the snout than to the base of the caudal; it is in advance of the ventrals. The last spine of the dorsal fin is as long as the head and considerably longer than the base of the fin. The pectoral fin is shorter than the head; its outer rays are the longest and the fin is separated from the ventral by a distance greater than the diameter of the eye. The ventral fin is similar to the pectoral and does not extend to the anal-opening. The anal fin, when laid flat, does not reach the base of the caudal. The caudal fin is slightly longer than the head and is deeply forked with both the lobes pointed. The upper lobe is longer than the lower.

The depth of the body is contained from 3·4 to 3·7 times in the total length without the caudal. The scales are closely set and adhere firmly; there are 39 to 40 perforated scales along the lateral line, seven rows above it to the base of the dorsal fin and 5 rows below it to the base of the ventral fin. There are about 22 scales round the caudal peduncle and 16 scales in front of the dorsal fin. The least height of the caudal peduncle is contained from 1·4 to 1·7 times in its length.

In preserved specimens the dorsal surface and the sides are grayish while the ventral surface is much lighter. Every scale on the sides and the dorsal surface is provided with a black mark at its base, thus longitudinal rows of spots are formed. In the posterior region the entire border of each scale is darker, imparting a very characteristic colouration

to the species. A dull round spot near the root of the caudal fin is visible in both the specimens, while the smaller specimen is marked with a vertical patch of dull colour extending above and below the lateral line in the region of the 5th and 6th perforated scales. There is a broad, black mark behind the gill-opening. The caudal and the dorsal fins are tipped with black.

Mr. Sondhi noted that the colouration in the living specimens was "Light yellowish pink, sides pearly with a splash of orange dots. A shade of pink in the tail and keel fins."

Local name.—Pa-sat.

Locality.—Two specimens of the species were netted by Mr. Sondhi from the Salween River at Takaw in the Kēngtūng State on the 21st January, 1934.

Type specimen.—F. 11600/1, *Zoological Survey of India, Indian Museum, Calcutta.*

Remarks.—Osteochilus sondhii differs from all the seventeen species included by Weber and Beaufort in their account of the fishes of the Indo-Australian Archipelago (Vol. III, p. 124, 1916) by the following combination of characters:—

(i) There are 39 to 40 scales along the lateral line; 7 rows above it to the base of the dorsal fin and 5 rows below it to the base of the ventral fin.
(ii) The snout is covered with a large number of tubercles.
(iii) There are only two short, maxillary barbels.
(iv) There are only 12 branched rays in the dorsal fin.
(v) The caudal peduncle is surrounded by 22 scales.
(vi) Colouration.

The above characters also separate the new species from the three Burmese species of *Osteochilus* described by Day in his *Fishes of India* (pp. 545, 546). *O. chalybeatus* from the Irrawaddi and Salween Rivers possesses 54 scales along the lateral line and 8 rows above it to the base of the dorsal fin. The number of branched rays in the dorsal fin is 18, and there are four barbels. *O. neilli* from "Sittoung and Billing" possesses 15-16 branched rays in the dorsal fin, four barbels and only 34 scales along the lateral line. The systematic position of *O. cephalus* from Pegu is somewhat doubtful, but presuming that Day had examined the type-specimen before he wrote his description, it is clear that the new species agrees with *O. cephalus* in having fewer rays in the dorsal fin, 40 scales along the lateral line, many pores on the snout and one short pair of maxillary barbels. The two species, however, differ in the relative position of the fins and proportions. In *O. cephalus* "the dorsal commences midway between the snout and the base of the caudal", whereas in *O. sondhii* the commencement of the dorsal is distinctly nearer to the tip of the snout than to the base of the caudal. In the former "The anal laid flat reaches the caudal," while in the latter the two fins are separated by a considerable distance. In *O. cephalus*, the eye is "1/5 of length of head, 2 diameters from end of snout," while in *O. sondhii*, the eye is contained from 3·5 to 3·9 times in the length of the head and from 1·3 to 1·6 times in the length of the snout. Judging from Cuvier and Valen-

cienne's figure of *O. cephalus* (pl. 487), the two species appear to be abundantly distinct in their general facies.

The species of *Osteochilus* recently described, *O. prosemion* Fowler [1] from Cheing Mai, Upper Siam, *O. salsburyi* Nichols and Pope [2] from Hainan and *O. kükenthali* Ahl [3] from Borneo, possess 4 barbels and differ from the new species either in proportions, colouration, number of rays in the dorsal fin or in the number of scales along the lateral line.

Osteochilus sondhii is the 5th species to be recorded from the Burmese waters. Besides the three species mentioned by Day, Mukerji [4] recorded *O. vittatus* from the Mergui District, Lower Burma. It seems probable that with an extension of our knowledge of the ichthyology of Burma, more species of this interesting genus will be discovered. The range of the genus does not extend to India proper.

Measurements in millimetres.

Total length without caudal	106·6	121·2
Length of caudal	damaged	27·0
Depth of body	29·0	35·7
Length of head	23·8	26·3
Height of head at occiput	18·2	22·0
Width of head	14·0	18·0
Length of snout	8·0	12·0
Diameter of eye	6·0	7·5
Interorbital width	8·8	13·8
Length of pectoral	20·5	24·7
Length of ventral	18·0	23·0
Longest ray of dorsal	23·6	26·8
Length of anal spine	18·0	20·0
Length of caudal peduncle	16·4	23·0
Least height of caudal peduncle	12·5	15·7

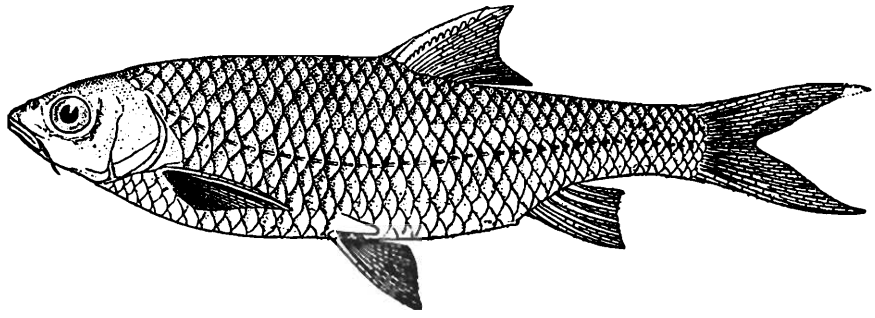
Barbus shanensis, sp. nov.

D. 4/8 ; A. 3/5 ; P. 15-16 ; V. 8-9 ; C. 19.

In *Barbus shanensis* the dorsal profile rises gradually from the tip of the snout to the commencement of the dorsal fin ; in the region of the base of the dorsal it falls down abruptly but beyond the dorsal it slopes down gradually to the base of the caudal fin. The ventral profile is deeply, but evenly, arched throughout. The body is greatly compressed and the back between the dorsal fin and the head is ridge-like. The head is short and almost pointed at the tip ; its length is contained from 4·2 to 4·6 times in the total length without the caudal. The height of the head at the occiput is contained from 1·1 to 1·3 times and the width from 1·6 to 1·8 times in its length. The eyes are moderately

[1] Fowler, *Proc. Acad. Nat. Sci. Philadelphia,* LXXXVI, p. 116 (1934).
[2] Nichols & Pope, *Bull. Amer. Mus. Nat. Hist.,* LIV, p. 348 (1927).
[3] Ahl, *Sitzungsber. Gesell. Nat. Freunde Berlin,* p. 33 (1924).
[4] Mukerji, *Rec. Ind. Mus.,* XXXIV, p. 286 (1932).

large and lateral in position; their diameter is contained from 3 to 3·5 times in the length of the head, from 1 to 1·1 times in the length of the snout and from 1·2 to 1·3 times in the interorbital width. The interorbital space is broad and almost flat. The snout is smooth. The mouth is deeply arched and the maxillary bone just extends to below the anterior border of the eye. The upper jaw projects in front of the lower so that the mouth is subinferior in position. There are four barbels; the maxillary barbels are as long as the diameter of the eye while the rostrals are somewhat shorter.



Text-fig. 3.—Lateral view of the type-specimen of *Barbus shanensis*, sp. nov. ×½.

The depth of the body is contained from 3 to 3·3 times in the length without the caudal. The height of the caudal peduncle is contained from 1·5 to 1·6 times in its length. The scales are thin and adhere to the body firmly; there are 36 to 38 perforated scales along the lateral line and 6 or 6½ series between it and the commencement of the dorsal fin. There are 3 or 3½ series of scales between the lateral line and the base of the ventral fin. The number of predorsal scales varies from 15 to 16 and there are about 16 scales round the caudal peduncle. The scales on the ventral surface are somewhat smaller.

The commencement of the dorsal fin is considerably nearer to the base of the caudal than to the tip of the snout; it is almost equidistant between the middle of the eye and the base of the caudal fin. The last dorsal spine is strong and denticulated; the length of its bony portion is contained from 1·2 to 1·4 times in the length of the head. There are 16 pairs of teeth along the posterior border of the spine, and, with the exception of the last two, they are graded. The upper teeth are more widely spaced than the lower ones. The longest ray of the dorsal fin is considerably shorter than the depth of the body below it. The pectoral fin is long, narrow and sickle-shaped; it is separated from the ventral by a considerable distance. The ventral fin is more extensive than the pectoral. The anal opening is situated just in front of the base of the anal fin, which is short and does not reach the base of the caudal fin. The caudal fin is longer than the head and is deeply bifurcate. The lobes are sharp and pointed.

The colouration of the spirit specimens is silvery gray above and silvery below. In the smaller specimen, the edges of the scales along the lateral line and of those above it are shot with small black dots which produce longitudinal series of black markings. These markings are most prominent along the lateral line. The distal half of the caudal fin, especially

of the lower lobe, and of the anal fin is dark. The dorsal fin is tipped with black. The distal half of the ventral fin is also grayish. The snout, behind the tip, is marked with a black patch.

Type-specimen.—F. 11625/1, *Zoological Survey of India, Indian Museum, Calcutta.*

Locality.—Lawksawk Canal at Lawksawk, S. Shan States, Burma.

Remarks.—As a result of recent researches on the ichthyology of Yunnan [1] and Upper Burma [2] a number of interesting species of the genus *Barbus* with 4 barbels and strong, serrated dorsal spine have been discovered. Unfortunately some of these have not been figured and their descriptions also are inadequate.

Barbus shanensis, differs from all the species hitherto described by the following combination of characters :—

(*i*) Length of head 4·2-4·6 times in length without caudal.

(*ii*) Eye 3–3·5 times in length of head and almost equal to length of snout.

(*iii*) Interorbital width 2·4-2·6 times in length of head.

(*iv*) 36-38 perforated scales along lateral line ; 6 or $6\frac{1}{2}$ above it to base of dorsal and 3 or $3\frac{1}{2}$ below it to base of ventral.

(*v*) 15-16 predorsal scales.

(*vi*) Commencement of dorsal considerably nearer base of caudal than tip of snout.

(*vii*) Strong dorsal spine with coarse and widely spaced teeth.

Judged by these characters, the new species comes very close to *Barbus gregorii* Norman. We have examined a co-type of the latter species almost as long as the type of *B. shanensis*, and from the general facies the two species appear to be quite distinct. Morphologically the differences lie in the size of the head and the eyes. In *B. gregorii* the length of the head is contained $3\frac{1}{2}$-4 times in the length and the diameter of the eye $3\frac{1}{2}$-$4\frac{1}{4}$ in the length of the head. Of the species known from the Southern Shan States and the adjacent parts of Upper Burma, *B. catesii* Boulenger is closely allied to *B. shanensis*, but differs from it in having the commencement of the dorsal fin equidistant between the tip of the snout. and the base of the caudal fin, 12-13 predorsal scales and 29-33 scales along the lateral line.

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[1] Anderson, *Zoological Results of the Two Expeditions to Western Yunnan in 1868 and 1875*, p. 868, pl. lxxix, fig 1, 1878 (*Barbus margarianus*) : Regan, *Ann. Mag. Nat. Hist.* (7) XIII, pp. 190 & 191, 1904 (*B. grahami* and *B. yunnanensis*) : Chaudhuri, *Rec. Ind. Mus.*, VI, p. 16, 1911 *B. cogginii*) : Norman, *Ann. Mag. Nat. Hist.* (9) XI, p. 562, 1923 (*B. gregorii*).

[2] Boulenger, *Ann. Mag. Nat. Hist.* (6) XII, p. 201, 1893 (*Barbus catesii* and *B. schanicus*) : Annandale, *Rec. Ind. Mus.*, XIV, pl. iii, figs. 3 & 4, 1918 (*Barbus sarana caudimarginatus* Blyth and *B. schanicus* Boulenger) ; Prashad & Mukerji, *Rec. Ind. Mus.*, XXXI, pp. 195-200, pl. ix, 1929 [*B. chagunio* (H. B.); *B. sewelli : B. myitkyinae* and *B. sarana caudimarginatus* Blyth]; Hora & Mukerji, *Rec. Ind. Mus.*, XXXVI, p. 126, 1934 (*B. sarana* and its subspecies *caudimarginatus* and *sewelli*) : Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVII, pp. 64-68, 1934 [*B. curatus lurtoni*, *B. chagunio* (H. B.) *B. chola* (H. B.) and *B. sarana caudimarginatus* Blyth].

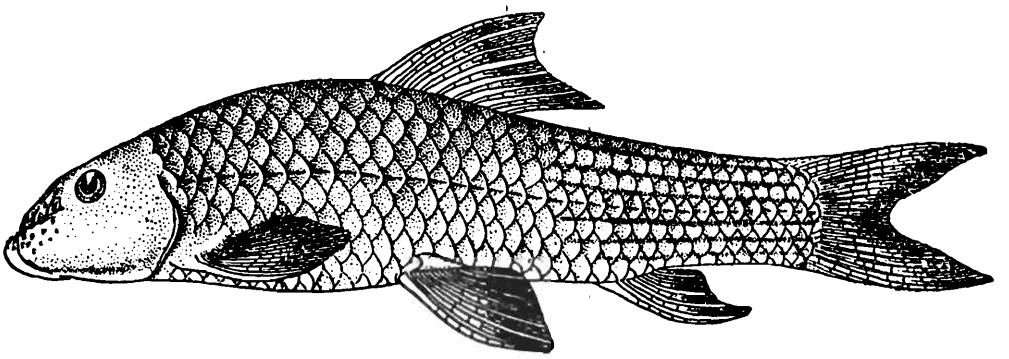
Measurements in millimetres.

Total length without caudal	104·6	128·5
Depth of body	34·8	38·3
Length of head	22·5	30·3
Length of snout	7·5	9·5
Diameter of eye	7·5	8·5
Interorbital width	9·4	11·3
Width of head	14·0	16·7
Height of head at occiput	20·0	23·4
Length of pectoral	22·3	27·0
Length of ventral	20·2	24·0
Length of bony portion of dorsal spine	18·7	21·3
Length of 1st branched ray of dorsal	20·0	23·3
Longest ray of anal	18·5	20·2
Length of caudal peduncle	19·3	20·3
Least height of caudal peduncle	12·0	13·3

Garra salweenica, sp. nov.

D. 3/8 ; A. 1/5 ; P. 16 ; V 8 ; C. 19.

Garra salweenica is a stoutish species in which the dorsal profile rises abruptly from the tip of the snout to the dorsal fin. The ventral profile is almost horizontal and straight throughout. The body is depressed anteriorly but is moderately compressed in the posterior region. The head is flattish and tapers anteriorly ; its length is contained 3·9 times in the total length without the caudal. The width of the head is contained 1·3 times and the height at occiput 1·4 times in its length. The eyes are small and situated in the posterior half of the head ; their diameter is contained 6·2 times in the length of the head, 3·4 times in the length of the snout and 2·6 times in the interorbital width. The interorbital space is slightly convex and the eyes, though dorso-lateral in position, are considerably below the dorsal profile of the head. The snout

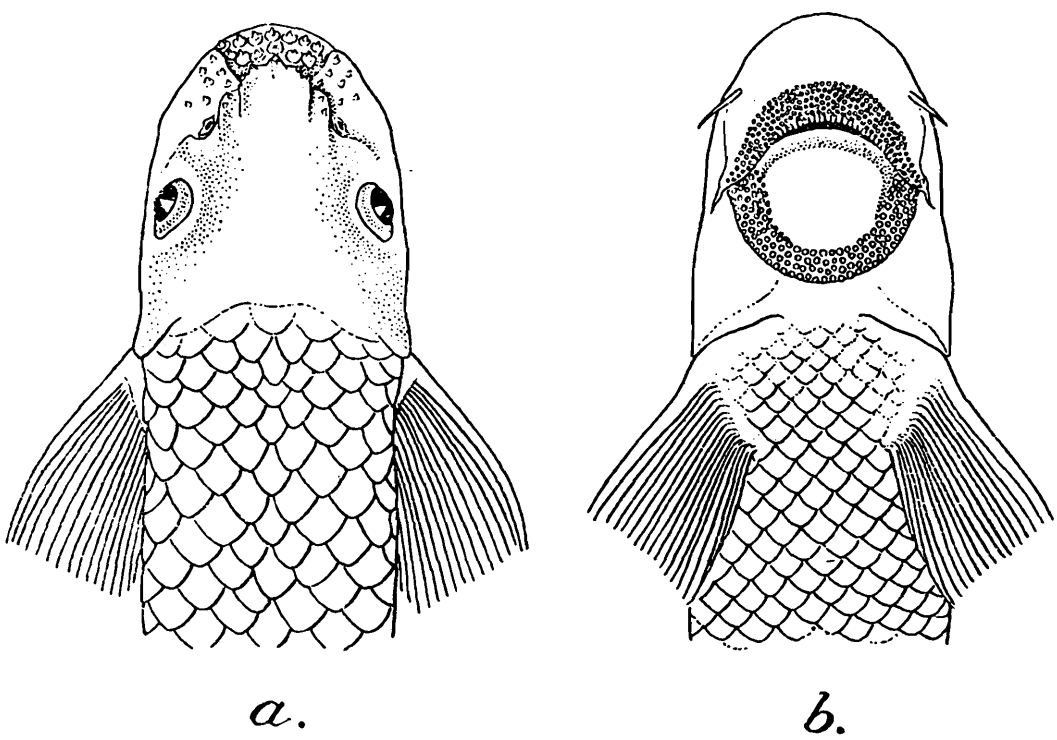


Text-fig. 4.—Lateral view of the type-specimen of *Garra salweenica*, sp. nov. × ¾.

has a prominent proboscis which is trilobed and free anteriorly ; the lateral lobes are small but well defined. The area in front of the proboscis and two smaller areas at the sides of it are covered with 3 to 4 rows of large, spiny tubercles while there are a few similar tubercles on all the three lobes of the proboscis. The nostrils are situated at the base of the proboscis and are separated from each other by a membranous flap.

The rostral barbel is smaller than the diameter of the eye while the mandibular barbel is hidden in the labial groove and is hardly visible on the surface. The mental disk is well developed ; its central, callous portion is large and prominent. The gill-openings extend to the ventral surface for a short distance and the distance between them is slightly greater than 2·5 times the diameter of the eye.

The dorsal fin commences in advance of the ventral and is distinctly nearer to the tip of the snout than to the base of the caudal ; its last undivided ray is longer than the head but is shorter than the depth of the body. The paired fins are horizontally placed and their outer rays are provided with adhesive pads on the ventral surface ; the pectoral fin is slightly shorter than the head and is pointed in the middle. The commencement of the ventral is almost equidistant between the tip of the snout and the base of the caudal ; the ventrals extend beyond the anal opening and are separated from the anal by a distance equal to the diameter of the eye. The anal fin, when laid flat, does not reach the base of the caudal. The caudal fin is deeply forked ; the lobes are pointed, the lower lobe being somewhat better developed and slightly longer than the upper lobe.



TEXT-FIG. 5.—*Garra salweenica*, sp. nov. × 1⅛.
a. Dorsal surface of head and anterior part of body.
b. Ventral surface of head and anterior part of body.

The depth of the body is contained 3·8 times in the total length without the caudal. The scales are large and adhere firmly to the surface ; there are about 33-34 perforated scales along the lateral line, 3½ rows above it to the base of the dorsal, 3 rows below it to the base of the ventral fin. There are about 9 predorsal scales and 16 scales round the caudal peduncle. The scales on the ventral surface are reduced and those between the bases of the pectoral fins are very small. The scaly appendage in the axil of the ventral fin is well developed. The length of the caudal peduncle is 1·2 times its least height.

The species of *Garra* possess, more or less, a similar type of colour pattern, but in this species the dorsal surface is much more gray than is usually the case. The dorsal surface of the outer rays of the paired fins, especially of the pectorals, is deep black, and the lower lobe of the caudal fin with the exception of a small distal portion and a small part of the upper lobe are infuscated with gray. The branched rays of the dorsal fin and the inner rays of the anal fin are also black. The black mark, usually present in species of *Garra*, near the upper angle of the gill-opening is absent ; but a series of spots at the base of the dorsal fin and longitudinal streaks of gray colour along the sides of the body, especially in the tail region, are present.

Type-specimen.—F. 11602/1, *Zoological Survey of India, Indian Museum, Calcutta.*

Locality.—The Salween River at Takaw Kēngtūng State, Southern Shan States, Burma.

Local Name.—Pa-ing.

Remarks.—The above description is based on the type-specimen, but there is another specimen, 71·7 mm. in total length without the caudal, from the type-locality which we also refer to *G. salweenica.* In the young example, the proboscis is not well developed and there is just a faint indication of its three-lobed condition. The colouration is similar to that of the type-specimen but its proportions are different. The depth of the body is contained 4·2 times and the length of the head 4·8 times in the total length without the caudal. The width of head is contained 1·1 times and the height at occiput 1·2 times in its length. The diameter of the eye is contained 4·9 times in the length of the head, 2·6 times in the length of the snout and 2·4 times in the interorbital distance. The least height of the caudal peduncle is contained 1·3 times in its length. Both the pectorals and the last undivided ray of the dorsal are considerably longer than the head. These differences from the type-specimen are due, in our opinion, to the immaturity of the second specimen, otherwise the two are conspecific.

Relationships.—Of the large number of species of *Garra* known to us from India and other neighbouring countries, there is no form in which the proboscis is trilobed in the way described above for *G. salweenica.* The trilobed condition in *G. bicornuta* Rao [1] is due to the development of two horn-like structures in front of the eyes and above the nostrils. The only species in which the structure of the proboscis is similar to that of *G. salweenica* is *G. arabica* Hora.[2] Unfortunately the colouration of the latter species is not known, but the two forms seem to differ in general facies and proportions. In several respects, *G. salweenica* approaches *G. fuliginosa*, a species recently described by Fowler [3] from N. Siam (Metang River, 35 miles north of Chieng Mai) and *G. schismatorhyncha* Nichols and Pope [4] from Hainan ; but differs from them in the character of the proboscis and proportions. Judging from Fowler's figure of his species, the two forms seem to differ greatly in physiognomy.

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[1] Rao, *Ann. Mag. Nat. Hist.* (9) VI, p. 57, pl. i (1920).
[2] Hora, *Rec. Ind. Mus.*, XXII, p. 677, text-fig. 5 (1921).
[3] Fowler, *Proc. Acad. Nat. Sci. Philadelphia*, LXXXVI, p. 139, figs. 108-111 (1934).
[4] Nichols and Pope, *Bull. Amer. Mus. Nat. Hist.*, LIV, p. 358, fig. 25 (1927).

Attention may here be directed to *Garra lamta* (*sensu lato*) recorded by one of us[1] from N. Burma. In this form the proboscis is broad and extensive, but not trilobed. The lateral tubercular areas were mistaken for the lateral lobes of the proboscis. The body is greatly depressed and the dorsal profile is only slightly arched.

So far as we are aware, *G. salweenica* is the first species of the genus to be described from the Salween River system.

Measurements in millimetres.

Total length excluding caudal	71·7	99·3
Depth of body	17·0	26·0
Length of head	14·8	25·5
Width of head	13·3	19·7
Height of head at occiput	11·6	18·0
Diameter of eye	3·0	4·0
Length of snout	8·0	13·8
Interorbital width	7·3	10·7
Length of pectoral	16·2	24·7
Length of ventral	14·9	23·0
Longest ray of dorsal	15·2	23·6
Longest ray of anal	12·7	21·5
Length of caudal peduncle	12·7	18·4
Least height of caudal peduncle	9·8	15·6

Garra gravelyi (Annandale)

1918. *Discognathus lamta*, Annandale (*nec* Hamilton), *Rec. Ind. Mus.*, XIV, p. 45.

1919. *Discognathus gravelyi*, Annandale, *Rec. Ind. Mus.*, XVI, p. 133, pl. ii, figs. 3, 3*a*.

1921. *Garra gravelyi*, Hora, *Rec. Ind. Mus.*, XXII, p. 654.

Five specimens, ranging in length from 63 mm. to 96 mm. without the caudal, were collected by the late Dr. N. Annandale in the Inlé Basin and referred by him to the composite species *G. lamta* Ham. Buch. He remarked at the time that one individual from the He-Ho stream " represents a distinct and apparently undescribed species." In the following year, Annandale described this specimen as a new species and remarked : " It is distinguished from *D. lamta* by the different shape and the larger size of its mental disk, by the different shape of the head, by its larger scales and apparently also by difference in the formulae of the fin-rays." In 1921, one of us pointed out that the differences noted by Annandale could be correlated with difference in the sexes of the specimens and referred all the specimens from the Inlé Basin to *G. gravelyi*. In Mr. Sondhi's collection, there are two large, male specimens which we refer to *G. gravelyi* and give below a table of measurements to show differences in proportions from the typical specimens which are of a much smaller size. Mr. Sondhi obtained his examples from a paddy field at Gaunphpo, Lawksawk State (Southern Shan States), which received its supply of water from a small, torrential stream Chaung Gyi.

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[1] Mukerji, *Journ. Bombay Nat. Hist. Soc.*, XXXVII, p. 48, text-figs. 4, 5 (1934).

The males of *Garra gravelyi* are characterized by the possession of 4 barbels, by the eyes being situated wholly in the posterior half of the head, by the presence of an ill-defined proboscis without lateral lobes and by the fact that the last spine of the dorsal fin is longer than the head. The mental disk is of a large size in this species.

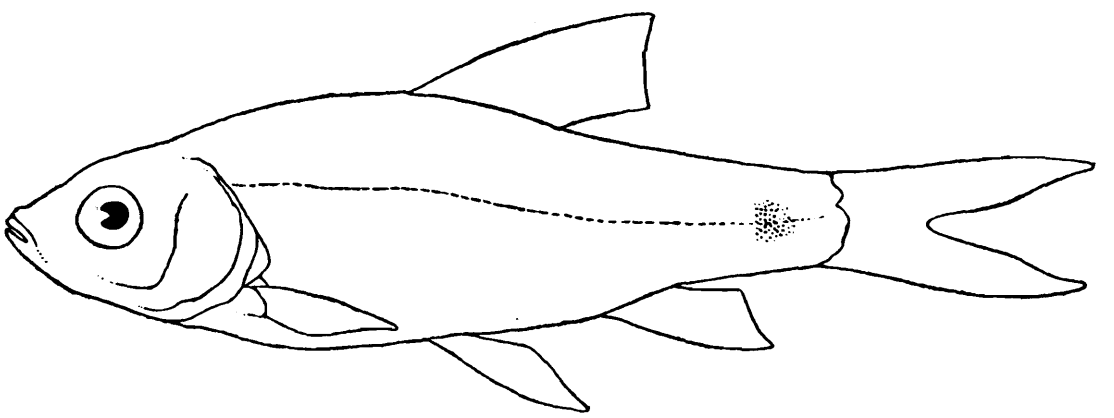
Measurements in millimetres.

Total length including caudal	142·0	146·0
Length of caudal	31·6	29·0
Depth of body	26·0	27·0
Length of head	24·0	24·5
Width of head	17·2	17·5
Height of head at occiput	18·2	18·0
Diameter of eye	5·2	6·0
Length of snout	12·0	12·0
Interorbital distance	10·8	10·2
Length of pectoral	25·5	25·0
Length of ventral	24·0	24·2
Longest ray of dorsal	25·0	26·0
Longest ray of anal	21·0	20·5
Length of caudal peduncle	20·0	22·5
Least height of caudal peduncle	13·5	14·5

Barbus puntio (Ham. Buch.) Day

1870. *Barbus (Puntius) puntio*, Day, *Proc. Zool. Soc. London*, p. 100.
1878. *Barbus puntio*, Day, *Fish. India*, p. 582, pl. cxlv, fig. 6.

In Mr. Sondhi's collection, there is a small specimen, 34 mm. in length excluding the caudal, which agrees in all essential respects with Day's descriptions of *Barbus puntio*; it was obtained from the Nam MeHsai stream in the Kēngtūng State.



Text-fig. 6.—Lateral view of the Nam MeHsai specimen of *Barbus puntio* (Ham. Buch.) Day. × 2½.

In the example under report, the commencement of the dorsal fin is almost midway between the tip of the snout and the base of the caudal fin. The last dorsal spine is smooth, osseous and entire though weak. The caudal fin is bifurcate and longer than the head. The length of the head is contained 3·5 times and the depth of the body 3·25 times in the total length without the caudal. The head is slightly longer than high.

The eyes are large and prominent; the diameter of the eye is contained 2·5 times in the length of the head, 0·5 times in the length of the snout and 0·75 times in the interorbital width. There are about 22 scales along the lateral line and 3 rows of scales below it to the base of the ventral fin. The lateral line is prominent on the first 9 to 10 scales and then it becomes indistinct or is absent. The colour is silvery, darker above and lighter below. There is a distinct black blotch at the base of the caudal; the dorsal and the anal fins are tipped with black. The body is covered with small, black spots which are packed more closely along the edges of the scales.

Under the name *Cyprinus puntio*, Hamilton [1] described a small species from the " ponds and ditches of the southern parts of Bengal," and a reference to his ' Original Notes ' shows that the species was obtained by him at ' Luckipur ' and Calcutta. Unfortunately it has never been taken from Bengal since Hamilton's time, and the original description is very meagre and inadequate. No illustration of the species exists in Hamilton's published or manuscript drawings. In the circumstances it is very difficult to be certain of the identity of Hamilton's *puntio* and the species must be regarded as a *species inquirendum.*

In 1870, Day redescribed Hamilton's *puntio* from 5 specimens obtained at " Sittoung " in Burma and remarked " I have redescribed the species, as its existence has been doubted, apparently not having been taken since Hamilton Buchanan's time." Day appears to have been influenced by the markings in front of the caudal fin and large scales in associating his Burmese examples with *puntio.* There is no other indication that the two forms are conspecific. For this reason we have indicated the authorship of the species as given above. In Day's figure of the species, the dorsal profile is shown as greatly arched, but this is not so in the specimen before us. Day's original of the figure preserved in the collection of the Indian Museum, is greatly damaged and it is not possible, therefore, to elucidate exactly the specific characters of his species.

Barbus terio is closely allied to Day's *puntio,* but the two species differ in certain body proportions, colouration and the extent of the lateral line.

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[1] Hamilton, *Fish. Ganges,* pp. 318, 319 (1822).

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