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A taxonomic revision of the Indo-Burmese species of
Danio Hamilton Buchanan (Pisces : Cyprinidae)

R. P. Barman

Zoological Survey of India

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A TAXONOMIC REVISION OF THE
INDO-BURMESE SPECIES OF *DANIO*
HAMILTON BUCHANAN (PISCES : CYPRINIDAE)

By

R. P. BARMAN

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सत्यमेव जयते

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PREFACE

The cyprinid fish genus *Danio* Hamilton Buchanan are of common occurrence in many watercourses of India, Pakistan, Nepal, Bangladesh, Sri Lanka, Thailand, Malaya Peninsula, Sumatra, Yunnan province in China. These small sized fishes which do not grow more than 110 mm. (4.5 inches) in total length are aquarium pets and are eaten by the poorer classes mostly in dry and salted condition. These fishes do not constitute any major fishery in Indian waters, and are only of secondary value. However, taxonomically these are mostly interesting since the extensive use of the fishes in aquarium trade has cast much confusion in nomenclature, systematics and zoogeography.

The most comprehensive classic work on the *Danio* Hamilton Buchanan and *Brachydanio* Weber & de Beaufort is by Hora and Mukerji (1934a). Subsequent to this important work not much attention seems to have been given to this group of fishes. Hora and Mukerji (1934a) gave a synopsis of the Indian and Burmese species key then known belonging to *Danio* and *Brachydanio* for the identification. Subsequent additional records of species and discovery of some more new species under the genus warrant more critical evaluation of the Indian danios as it now appears. The said synopsis lacks any illustrations, which are very essential for identification. Further the concept of species themselves and the taxonomic characters utilised have changed with the modern advanced knowledge and therefore, it is felt necessary to undertake a thorough revision of the genus *Danio* Hamilton Buchanan. The present effort is therefore, to document systematic account of the Indian *Danios* and *Brachydanios* along with suitable illustrations and descriptions and to review the general taxonomy of the Indian *Danios* and *Brachydanios* in the light of the current taxonomic development. The emphasis in this work has all through been to project a comprehensive systematic account of the fishes belonging to genera and subgenera *Danio* and *Brachydanio*, especially those inhabiting the Indian region and to advance our taxonomic knowledge of the *Danios* and *Brachydanios* of India. It may be noted that in this study, major attention has been paid to the supraorbital spine and the preorbital spinous process, branched dorsal fin rays, squamation, lateral line present or absent, complete or incomplete, which are being currently considered to be of taxonomic values.

This work has recorded 19 species under the genus *Danio* distributed throughout the Indian region. Detailed morphological features of all these 19 species are illustrated and described together with keys for identification of the species. The zoogeography of the *Danios* of the Indian region has been discussed. Most of the species are confined to India and Burma only, while there are very few species with a wide distribution. While working on these group of fishes I have described three new species belonging to the genus *Danio*, viz., *D. assamensis* from Assam, *D. manipurensis* from Manipur, and the other one *D. horai* from Arunachal Pradesh. A new distributional report of *D. neilgherriensis* (Day) which was originally described from the river of Nilgiri Hills., South India by Day (1867) has been recorded from Arunachal Pradesh (formerly NEFA), North East India by me (in Datta & Barman, 1985). Another species *feegradei* Hora, 1937b, is synonymised with *D. dangila* (Hamilton), 1822, because of its striking similarity in having 2 pairs of long barbels, complete lateral line, almost similar proportional body measurements, squamation and 9 branched dorsal fin rays.

This present study has unfolded many interesting result which enable me to correctly specify many species described by earlier workers. Under each species complete synonymy, material examined, diagnosis, description, colour in alcohol, geographical distribution, etc. have been given. Information on the type specimens of each species, as far as known has also been incorporated.

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INTRODUCTION

The cyprinid fishes belonging to the genus *Danio* Hamilton Buchanan are distributed throughout India, Pakistan, Nepal, Bangladesh, Sri Lanka, Burma, Thailand, Malaya, Sumatra, Yunnan Province in China. The species are all small, attractively coloured, active fishes of watercourses like pools in the rice-field, ditches in the bed of hill-streams, springs, mountain rivulets and rivers. Our knowledge of these fishes dates back from Hamilton-Buchanan (1822), who established the genus *Danio* and described three species from the Eastern India. As is fully realised by the ichthyologists interested in the Indian fish fauna, that the specific validity of a number of species described by Hamilton Buchanan in his "Gangetic Fishes" is not finally established. Hamilton Buchanan published his monumental work in the absence of the great many of his drawings and several volumes of his manuscript notes and, as a result, the published description of many species are defective and it has been a matter of considerable difficulty to identify the species that are not figured. The lacuna have been removed partially by the publication of Hamilton's manuscript drawings by Hora (1929), but considerable work yet remains to be done for defining precisely the species limits of several species. The difficulty is augmented by the fact that Hamilton, as pointed out by Hora (1929), preserved no specimens, and in the absence of such material, his drawings are the only indications we possess of different species described by Hamilton Buchanan (1822).

Till 1916, all the danios were grouped under a single generic name *Danio*. In that year, Weber and de Beaufort proposed *Brachydanio* as a distinct subgenus of *Danio* for those having 7 branched dorsal rays and incomplete lateral line or without it, leaving *Danio* in the strict sense with 12-16 branched dorsal rays and a complete lateral line. The type species of *Brachydanio* was fixed, *albolineatus*, the pearl danio. The known species that fell within this subgenus, in 1916 were *albolineatus*, *rerio*, *nigrofasciatus* and *analipunctatus*. After 1920, there was considerable ichthyological activity in India, mostly by Dr. Sunderlal Hora of the Zoological Survey of India in Calcutta, his colleagues and students. Many new species under *Brachydanio* were discovered in India and Burma. Although in all of them the dorsal fin is short, the lateral line has been found to be very variable, in the majority of the species it is absent or

extends over a few anterior scales but there are some species in which it is fairly extensive or even complete. Hora and Mukerji's (1934a) classic paper on the danios although presents a synopsis not only of the Indian and Burmese species then known of *Danio* but also of *Brachydanio* but subsequent additional records of species warrant more critical evaluation of the Indian danios as it now appears. Moreover, the said synopsis lacks any illustrations, which are essential for identification. Further the earlier Indian workers seem to have overlooked or did not attach systematic importance to two osteological characters which have recently revealed to have significant systematic importance. One of these characters is the supraorbital forwardly directed spine (as in *D. spinosus*) and the other is the preorbital backwardly directed spinous process (as in *D. aequipinnatus*, *D. annandalei* and *D. kakhienensis*) on the anterior rim of the orbit. The latter structure had been considered of generic importance by Chu in 1935 and subgeneric importance by Fowler in 1934a. The preorbital backwardly directed spinous process in *D. aequipinnatus* was first pointed out by Vinciguerra (1889-90) and later confirmed by Myers (in Herre and Myers, 1937) that there exists the preorbital spinous process in this species as in *D. regina* Fowler. Day (1878) distinguished his Burmese species *D. spinosus* largely on the presence of "a sharp spine directed forwards above anterior superior margin of the orbit and a second broader and blunter before the centre of the eye on the preorbital" The present study shows that this character of the supraorbital spine is of only specific value in this case and the very small scales of *D. spinosus* (55-65 in the lateral line) seems to be a more important character. Hora and Mukerji (1934a) in their synopsis of *Danio* gave an erroneous scale count of 33-38 in the lateral line of *D. spinosus* and *D. devario*.

The present effort is, therefore, to document systematic account of all the species under the genus from the Indian region along with suitable illustrations and to review general taxonomy of the Indian danios in the light of recent taxonomic developments. No comprehensive account of all the species from the Indian region is available. Day (1878) recorded 10 species under the genus from the Indian region. After Day, Chaudhuri (1908, 1912) described two new species, Hora (1921a, 1928, 1937b) and Hora and Mukerji (1934a, 1935a) described six new species under the genus. Hora (1937b) described a new species, *Danio feegradei* from Burma based on a single specimen under the genus *Danio*. On examination of the species it appears to me that it is not different from *Danio dangila* and it can also be easily distinguished as a *Danio* and not a *Brachydanio* in having 9 branched dorsal rays and complete lateral line.

Jayaram (1981) recorded 17 species under the genus from the Indian region. While working on this group I have described three new species belonging to this genus *Danio*, viz. *D. assamensis* from Assam, *D. manipurensis* from Manipur and *D. horai* from Arunachal Pradesh.

The present study, therefore, aims at description of the fishes belonging to the genus *Danio* Hamilton Buchanan. Further it is apparent now that a sharp line of distinction cannot be drawn between *Danio* and *Brachydanio* as there is considerable intergradation in the two characters on which the two genera or subgenera have been separated. In view of these existing controversies a comprehensive study of the genus is a most pertinent undertaking. Attempts have, therefore, been made to solve this problem. It may be noted that in the present study major attention has been paid to the preorbital spinous process and supraorbital spine, lateral line scales and branched dorsal rays count which are being currently considered to be of taxonomic value.

This work has recorded 19 species under the genus from Indian region. Detailed morphological characters of all the species are described together with keys for identification. The zoogeography of the Indian *Danios* have also been discussed. Some species have a very wide distribution, while majority of the species are markedly localized. Abundance in the number of species, intraspecific morphological diversities and interesting habitat, behaviour and adaptations make them subject of great biological importance.

This study, is based on the *Danios* collections in the Zoological Survey of India (ZSI), Calcutta and review of the existing literature report to occurrence of 19 species distributed in the Indian waters. These collections include a large number of specimens collected by Day, Annandale, Chaudhuri and Hora including a number of type specimens. Most of the specimens on which Hora based his studies are preserved in this institution. It is supplemented by recent collections from different localities of India. Under each species complete synonymy, material examined, diagnostic characters, description, colour in alcohol, geographical distribution and remarks etc. have been given. Information on type specimens of each species, as far as known, has also been incorporated.

In the bibliography chapter a list of the other publications consulted pertaining to the present study in addition to the publications referred/cited in the text portion has been provided for the convenience of the future workers on this group of fishes.

METHODS OF STUDY

(a) MEASUREMENTS

Measurements of various body proportions were taken with utmost care. All are straight point measurements taken with dial-reading calipers and with fine pointed dividers and recorded to the nearest one-tenth of a millimeter.

Total length (T.L.) : The greatest distance between the most anterior projecting part of the head to the posterior most tip of the caudal fin. Where the caudal fin has either of the lobes longer than the other, the maximum length is taken.

Standard length (S.L.) : The straight distance from the anterior part of the head to the posterior edge of hypural plate.

Head length : The straight measurement of the distance from the tip of the snout to the most distant point of opercular membrane.

Height of head : The perpendicular distance measured from the midline at the occiput vertically downwards to the ventral surface of the head or the breast.

Width of head : The distance straight across the head in a ventral position, if the opercles are dilated they are forced into a reasonably normal position.

Snout length : The distance from the tip of snout to the front hard margin of the orbit.

Eye diameter : The distance between the anterior and posterior margins of the orbit.

Interorbital width : The distance between the upper rim of each orbit at the nearest point.

Body depth : The vertical distance from a point in the body of the fish on its back where its height is greatest to a straight line to the ventral surface or profile excluding pelvic fin.

Predorsal distance : The distance between the tip of snout to the structural base of the first dorsal fin ray.

Prepelvic distance : The distance between the tip of snout to the structural base of the first pelvic fin ray.

Length of caudal peduncle : The distance from the last point of contact of anal fin posteriorly to the end of the vertebral column or the flexure line of the body.

Least height of caudal peduncle : The distance from dorsal to ventral profile at the narrowest part of the caudal peduncle.

Height of dorsal fin : The greatest distance measured of the height of the longest dorsal fin ray.

Height of anal fin : The maximum distance measured of the height of longest anal fin ray.

Length of pectoral fin : The distance measured between its origin or place of insertion into the body to the extreme tip.

Length of pelvic fin : The distance measured of the length of the longest pelvic fin ray.

Caudal fin length : The distance measured as length of the longest caudal fin ray.

Detailed measurements of all available materials were taken. The characters considered important are those shown below :

Head length	...	in standard length
Body depth	...	in standard length
Predorsal distance	..	in standard length
Prepelvic distance	...	in standard length
Least height of caudal peduncle	...	in standard length
Least height of caudal peduncle	...	in its own length
Caudal peduncle length	...	in standard length
Height of head	...	in head length
Width of head	...	in head length
Snout length	...	in head length
Snout length	...	in interorbital width
Eye diameter	...	in head length
Eye diameter	...	in interorbital width
Height of dorsal fin	...	in standard length

Height of anal fin	...	in standard length
Length of pectoral fin	...	in standard length
Length of pelvic fin	...	in standard length
Length of caudal fin	...	in standard length

(b) MERISTIC COUNTS

Meristic characters of most *Danios* are highly conservative and show little variations, observations were made, therefore, with great care to avoid errors, as error of one or more counts would usually result in a specimen being referred to the wrong species. The number of unbranched simple rays and branched rays of the fins have been shown separately and in the caudal fin only branched rays on both lobes are counted.

Scale counts of lateral line are between the upper angle of the operculum and the level of posterior edge of the hypural plate along the normal course of lateral line in this genus. The lateral transverse rows of scales are taken from the origin of dorsal fin, vertically downwards. Scales between the lateral line and base of pelvic fin are counted from below upwards and forwards from base of pelvic to lateral line. Predorsal scales are counted in the median line from the commencement of dorsal fin forward as far as they exist. Circumpeduncular scales are counted around the least depth of caudal peduncle.

(c) PROCEDURES IN THIS STUDY

The diagnosis and description of species are arranged according to alphabetical order of sequence. In cases, where the description is based upon more than one specimen, the values shown outside the brackets are the arithmetic mean and the values included within the brackets are the arithmetic ranges.

Synonymies have been given as completely as possible. Keys to the species known from the Indian region dealt within the present work are provided. All the keys are artificial.

(d) EVALUATION OF SYSTEMATIC CHARACTERS

There has been a great deal of confusion in the taxonomy of danios because of the remarkable individual variations among the species even in series from the same locality. A detailed comparative morphological study and the taxonomic assessment of the characters used in separating

the species by earlier workers have, however, shown that the squamation, the presence or absence of barbels, the number of branched dorsal and anal fin rays and the presence or absence of lateral line are the most dependable characters in this group of fishes. The presence of two important features which are found in some species of this genus shows relationships among the species possessing it, one of these features is the anteriorly directed supraorbital spine of *Danio spinosus* Day and the other is the preorbital posteriorly directed spinous process of *Danio aequipinnatus* (McClelland), *Danio annandalei* Chaudhuri and *Danio kakhienensis* Anderson. These two important structures seem to have been overlooked or were not given importance by the earlier Indian workers; which are recently considered to have utmost systematic importance. This preorbital spinous process had been considered to be of subgeneric importance by Fowler in 1934 and generic importance by Chu in 1935. The preorbital spinous structure is also present in *Danio assamensis* Barman.

Caution has to be exercised specially in using the lateral line as incomplete or absent totally and body colouration, as these characters are found to be highly variable in the members of same species. The length of head and caudal fin, body depth and eye diameter, however, are not so much variable. Fin structures and composition in majority of danios are highly conservative and show little variations. The meristic characters are of particular value in species differentiation and in assessing the phylogenetic interrelationships of various species.

HISTORICAL ACCOUNT AND CLASSIFICATION OF THE DANIOS

Hamilton Buchanan (1822) established the genus *Danio* and described three species under the genus, viz., *D. dangila*, *D. devario* and *D. rerio* from India. The type species of the genus is *Cyprinus dangila* (= *Danio dangila*) which was described from the mountain streams of Monghyr, Bihar. McClelland (1839) described one species, *D. aequipinnatus* from Assam under the genus. Blyth (1860) described another species, *D. albo-lineatus* from Tenasserim, Lower Burma. Day (1867, 1869b) described three more species under the genus, one species, *D. neilgherriensis* from India and the other two species, *D. spinosus* and *D. nigrofasciatus* from Burma. Day (1878) included all the species then known including his own described three species under the genus *Danio*. Anderson (1878) described *D. kakhienensis* from Nampoung river, Western Yunnan in China. Chaudhuri (1908, 1912) described two species under the genus, viz., *D. annandalei* from Dawna Hills, Tenasserim, lower Burma and the other species, *D. naganensis* from Lungting River, Naga Hills, Nagaland. Weber

and de Beaufort (1916) created the subgenus *Brachydanio* under the genus *Danio* for those species with 7 branched dorsal fin rays and incomplete or without a lateral line, leaving *Danio* in the strict sense for the species possessing 12 to 16 branched dorsal fin rays and complete lateral line. The type species of *Brachydanio* was fixed *D. albolineatus*. The then known species that fell within this subgenus were *D. albolineatus*, *D. rerio*, *D. nigrofasciatus* and *D. analipunctatus*. Hora (1921a, 1928, 1937b) and Hora and Mukerji (1934a, 1935a) described 6 species under the genus, one of the six species, *D. fraseri* was described from Deolali, Nasik district, Maharashtra under the subgenus *Danio* and the other 5 species belonging to the subgenus *Brachydanio*, viz., *D. acuticephala* from Manipur, *D. shanensis* from North Shan States, Upper Burma, *D. choprai* from Myitkyina district, Upper Burma, *D. sondhii* from South Shan States, Lower Burma and *D. feegradei* from Burma. Myers (1924) while working on the fishes of Burma, described one species, *D. strigillifer* under the subgenus *Danio*. Myers (1924) in his review of the genus *Danio* from the Indian region included all the species into a single genus *Danio*. The included species are *D. chrysops*, *D. spinosus*, *D. annandalei*, *D. dangila*, *D. strigillifer*, *D. neilgherriensis*, *D. devario*, *D. naganensis*, *D. browni*, *D. kakhienensis*, *D. aequipinnatus* and *D. malabaricus*. Smith (1931) described two species, viz. *D. kerri* and *D. pulcher* from Thailand under the subgenus *Brachydanio*.

Hora and Mukerji (1934a) published a synopsis of the then known Indian and Burmese species belonging to subgenera *Danio* and *Brachydanio*. The authors included 17 species under the subgenus *Danio*, viz. *D. spinosus*, *D. devario*, *D. kakhienensis*, *D. neilgherriensis*, *D. dangila*, *D. strigillifer*, *D. annandalei*, *D. aequipinnatus* (= *D. browni*), *D. naganensis* and *D. malabaricus* and 7 species were included under the subgenus *Brachydanio*, viz. *D. shanensis*, *D. albolineatus* (= *D. analipunctatus*), *D. rerio*, *D. sondhii*, *D. acuticephala*, *D. choprai* and *D. nigrofasciatus*.

Fowler (1934b) described one species under the genus, viz. *D. regina* from Nakon Sritamarat, Peninsular Thailand and to accommodate this species, the author proposed a new subgenus *Rambaibarnia* largely depending on the preorbital spinous process at the anterior rim of the orbit. Chu (1935) in an excellent and important study of the pharyngeal teeth and scales of the Chinese Cyprinidae, created a new genus *Danioides* with *kakhienensis* Anderson, from the Western Yunnan, China as the type species. His description based on material in the British Museum, is as follows, "This genus is quite distinct from *Danio* of Hamilton (the type of which is *Cyprinus dangila*, as restricted by Bleeker) in having the preorbital

with a prominent bony process at its inner lower margin, the outer margin of mandibles entire and triangularly produced and the first sub-orbital very broad, completely covering the anterior portion of the cheek and the scales with peculiar "vertical breaks" connecting the apical radii. *Danio micronema* Bleeker, known from Sri Lanka and Indian Peninsula; *Danio browni* Regan, from upper Burma; *Leuciscus lineolatus* Blyth, from Sikkim, all possessing the aforesaid characters, should therefore, be also referred to the present new genus" It will be noted that, of the three species other than *D. kakhienensis* referred to *Danioides* by Chu, all are currently synonymised with other species of *Danio*. *Danio micronema* is placed by Day (1878) in the synonymy of *Danio malabaricus* (Jerdon). Hora and Nair (1941) synonymised *D. malabaricus* and *D. strigillifer* with *D. aequipinnatus* and *Leuciscus lineolatus* is placed by Day (1878) in the synonymy of *D. aequipinnatus*. Finally, Mukerji (1934) synonymised *D. browni* with *D. aequipinnatus*. Fowler (1939) described another species under the subgenus *Danio*, viz. *D. suvatti* from Koh Chong, near Trang, Peninsular Thailand.

Smith (1945) described two more species under the genus, viz. *D. peninsulae* from Thailand under the subgenus *Danio* and *D. ponticulus* from Chiangmai, Meping, Northern Thailand and to accommodate this species, the author proposed a new subgenus *Allodanio* for the forms with 7 branched dorsal fin rays and a complete lateral line. Smith (1945) remarked that this species, *Danio (Allodanio) ponticulus*, the type of the new subgenus *Allodanio*, bridges the gap between *Danio* and *Brachydanio*, in having 7 branched dorsal fin rays and a complete lateral line. Myers (1953) remarked that careful examination of Smith's figure and description of *D. ponticulus* indicates that this fish is not a *Danio* at all, it is a species of *Barilius*, closely related to *Barilius bernatziki* Kaumans and *Barilius nanensis* Smith. The faint cross-bars shown on the figure but not mentioned in the description, are very characteristic of most *Barilius* but never of *Danio*. Moreover, every character given in the description and the general shape of the fish, fits *Barilius* better than *Danio*. Smith (1945) described another species, *Daniops myersi* from Northern Thailand and to accommodate this species, the author created a new genus *Daniops* very closely related to *Danio* of Hamilton. The new genus *Daniops* was established mainly depending on the nature of pharyngeal teeth, less number of branched dorsal fin rays (ii/8) and the preorbital spinous process directed backwards from the lachrymal bone. These characters are not significant enough to describe a new genus because the presence of the preorbital spinous process and reduced number of dorsal branched fin rays are not uncommon in the genus of *Danio* of Hamilton. Smith (1945)

divided the Thailand species of the genus *Danio* into three groups or subgenera, viz. *Danio*, *Brachydanio* and *Allodanio* (new genus proposed), as follows, *Danio* : in the strict sense for species having lateral line complete, branched dorsal fin rays 8 to 17, branched anal fin rays 11 to 17, barbels present (maxillary and rostral or only maxillary) or absent, a preorbital spine present or absent. Under the subgenus *Danio*, *D. regina*, *D. aequipinnatus*, *D. peninsulae* and *D. suvatti* were included. *Brachydanio* : for the species with lateral line absent or incomplete, branched dorsal fin rays 6 or 7, branched anal fin rays 10 to 13, barbels present or absent, no preorbital spine. *D. shanensis*, *D. albolineatus*, *D. kerri* and *D. pulcher* were included under the subgenus *Brachydanio*. *Allodanio* : for the species with lateral line complete, branched dorsal fin rays 7, branched anal fin rays 10, barbels (rostral and maxillary) present, no preorbital spine. The only species included under the subgenus was *D. ponticulus*. Myers (1953) gave a classification of the *Danios*, dividing all the species of the genus into three genera, viz. *Danio*, *Daniops* and *Brachydanio* as follows, "*Danio* : Pharyngeal teeth in three rows so far known. Dorsal fin with 9 or more (up to 17 or 18) branched rays. Lateral line complete. Some species have frontal spines or a preorbital process or both. Eggs adhesive. *Daniops* : Pharyngeal teeth in two rows. Dorsal fin with 8 to 12 branched rays. Lateral line complete. A preorbital process present. Eggs not known. *Daniops myersi* is the only species included under the the genus. *Brachydanio* : Pharyngeal teeth presumably in three rows in all species. Dorsal fin with 6 to 7 branched rays. Lateral line absent or incomplete (reaching as above the pelvic and anal fin on occasion). No preorbital or frontal spines. Eggs non-adhesive.

Chu (1981) published a synopsis of the Chinese species of the cyprinid genus *Danio* and included 6 species under a single genus merging *Brachydanio* with *Danio*, since the limitations of the two subgenera *Danio* and *Brachydanio* are getting vague with the discovery of intermediate forms. The author also synonymised *Danioides* Chu and *Daniops* Smith with *Danio* Hamilton. Chu (1981) also described in the same publication, 2 new species under the genus, viz., *D. apogon* and *D. chrysotaeniatus* from China and along with these he also has recorded 4 other species, viz. *D. aequipinnatus*, *D. kakhienensis*, *D. myersi* and *D. interrupta*.

Jayaram (1981) recorded 17 species under the genus *Danio* based on earlier workers specially Day (1878, 1889), Hora (1921a, 1928, 1937b) and Hora and Mukerji (1934a, 1935a). The author included 9 species under the subgenus *Danio*, viz. *D. aequipinnatus*, *D. annandalei*, *D. dangila*, *D. devario*, *D. fraseri*, *D. kakhienensis*, *D. naganensis*, *D. neilgherriensis*

and *D. spinosus* and 8 species under the subgenus *Brachydanio* viz. *D. acuticephala*, *D. albolineatus*, *D. choprai*, *D. feegradei*, *D. nigrofasciatus*, *D. rerio*, *D. shanensis* and *D. sondhii*.

The present author has described 3 new species, viz. *D. assamensis*, *D. manipurensis* and *D. horai* under the genus *Danio*

GENERAL ACCOUNT OF EXTERNAL MORPHOLOGY OF DANIOS OF THE INDIAN REGION

Body elongated or oblong and laterally compressed. Abdomen rounded. Head moderate, blunt or conical. Snout obtuse. Mouth terminal, cleft of mouth shallow not protractile, obliquely directed upward. Lower jaw longer than upper jaw and lower jaw provided with a knob at the symphysis, fitting into a more or less superficial emargination at the upper jaw. Pharyngeal teeth hooked.

Barbels generally 2 pairs (one pair rostral and the other pair maxillary at the corner of mouth) or 1 pair (as in *D. kakhienensis*, *D. devario*, *D. nigrofasciatus* and *D. shanensis*) or absent (as in *D. sondhii*, *D. acuticephala*, *D. devario*, *D. shanensis* and *D. horai*).

Eyes large, anterior or centrally placed not visible from below surface. Eyes in some species (as in *D. aequipinnatus*, *D. amandalei*, *D. kakhienensis* and *D. assamensis*) are provided with a backward projecting spinous process at the anterior rim of the orbit. One species, viz. *D. spinosus* is provided with an anteriorly directed supraorbital spine in addition to the preorbital backwardly directed, spinous process.

Lateral line concave from the posterior mid-region of the head, then descending downwards up to the base of pectoral fin afterwards it runs straight to the base of caudal fin when complete (as in all the species under the subgenus *Danio*), it may be incomplete (as in *D. albolineatus* and *D. sondhii*) or either incomplete or absent (as in *D. rerio* and *D. choprai*). One species viz. *D. shanensis* is normally with incomplete lateral line but some specimens of this species have complete lateral line. Hora and Mukerji (1934a) also recorded one specimen of this species with complete lateral line. Lateral line is totally absent in *D. acuticephala*, *D. nigrofasciatus* and *D. horai*. Scales along the normal course of lateral line varies from 28 to 65.

Dorsal fin with 6 to 17 branched rays, commencing opposite interspace between pelvic and anal fin, nearer to caudal fin base than to tip of snout, its hinder part at least above the anal fin. Anal fin with 11 to 20 rays. Pectoral fin with 12 to 13 rays, subcylindrical or pointed, reaching to

pelvic fin base or extending to base of pelvic fin (as in *D. horai*, *D. albo-lineatus*, *D. manipurensis*, *D. fraseri* and *D. aequipinnatus*). Pelvic fin short with 7 to 8 rays, originating far before the dorsal fin. Both the paired fins are provided with scaly flap or appendages at their bases. Caudal fin with 19 branched rays, emarginate, lunate or forked. Scales moderate.

Body and fins may be provided with longitudinal coloured bands or may be devoid of colour markings.

The external characters and the body proportional measurements of a *Danio* are shown in figure No. 1.

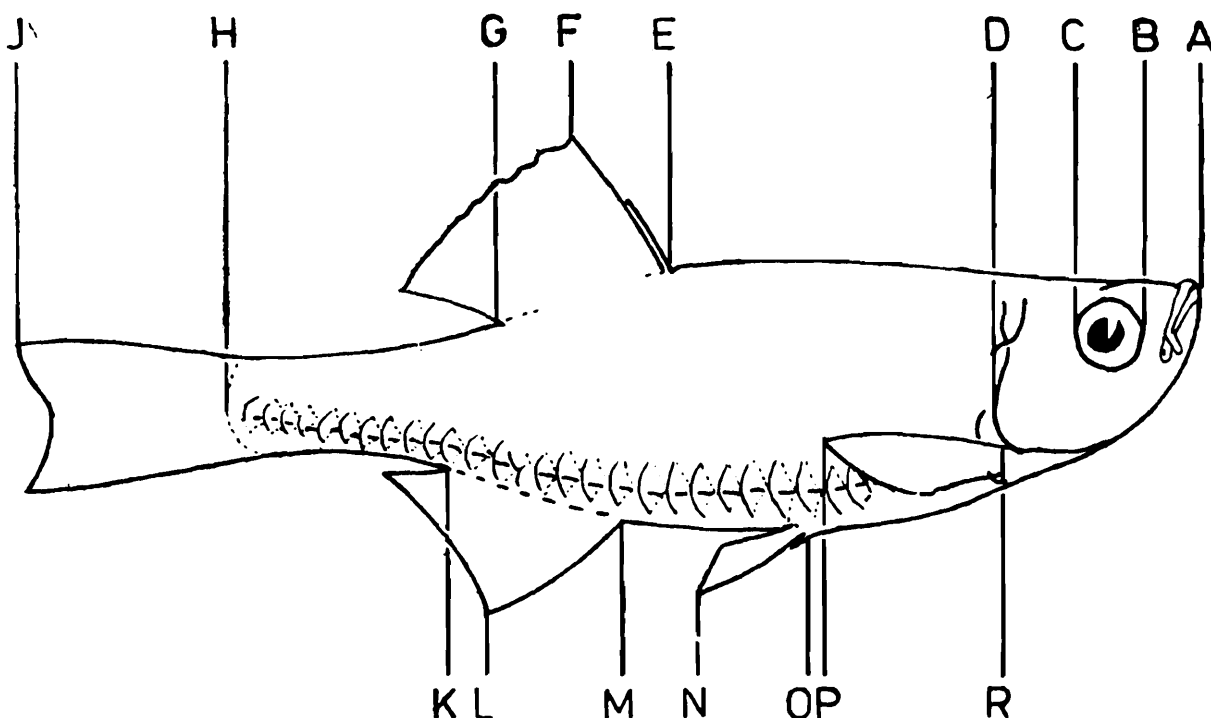


Fig. 1. Schematic illustration showing the external characters and body measurements of a *Danio*

AE = Predorsal distance, AO = Prepelvic distance, HK = Caudal peduncle length, HJ = Caudal fin length, EG = Length of dorsal fin, AJ = Total length, AH = Standard length, AD = Head length, AB = Snout length, BC = Eye diameter, EF = Height of dorsal fin, ML = Height of anal fin, RP = Length of pectoral fin, ON = Length of pelvic fin.

SYSTEMATIC ACCOUNT OF THE GENUS DANIO HAMILTON BUCHANAN

Superorder

OSTARIOPHYSI

Order

CYPRINIFORMES

Family

CYPRINIDAE

Subfamily

RASBORINAE

Genus	<ul style="list-style-type: none"> * Esomus Swainson <li style="padding-left: 2em;">Danio Hamilton Buchanan * Horadandia Deraniyagala * Microrasbora Annandale * Rasbora Bleeker * Aspidoparia Heckel * Amblypharyngodon Bleeker * Barilius Hamilton Buchanan
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FAMILY CYPRINIDAE

Body with scales, generally compressed, abdomen rounded or cutting. Eyes never covered with skin. Mouth transverse, superior, inferior or terminal, with or without sucker, more or less protractile or toothless. Lower jaw may be prominent or rounded, sometimes provided with a knob at the symphysis, which may be movable. Lips developed in various stages, sometimes absent from one of the jaws or closely infesting both jaws or reflected from one of the other. A labial fold continuous or interrupted present. Occasionally a few genera have a horny cartilaginous covering in either of the lips or both. No subocular spine. Gill openings wide. Opercular bones well developed. Barbels one or two pairs or absent. Last undivided dorsal fin ray osseous or articulated. No adipose dorsal fin. Pharyngeal teeth one to three series. Lateral line complete, incomplete or absent.

Swimbladder usually large and divided into an anterior and a posterior chamber, not surrounded by a bony capsule.

A very large and most common group of primary freshwater fishes, distributed throughout freshwaters of Africa, Europe, Asia North and central America up to Guatemala.

This family has been subdivided into 6 subfamilies as follows :

* The other genera under the subfamily

SUBFAMILY RASBORINAE

Body oblong or elongated and laterally compressed. Abdomen not trenchant, more or less rounded. Mouth terminal, obliquely ascending; lower jaw often projecting, generally provided with a symphyisial knob, fitting into an emargination or incision of the upper jaw. Pharyngial teeth lanceolate or uncinata in one to three rows. Barbels present or absent. Dorsal fin short or of moderate length, with 6 to 17 branched rays, without an osseous spine, its origin behind that of pelvic fins. Anal fin short or elongated, with 5 to 17 branched rays, its origin generally below the end of the dorsal fin. Pectoral and pelvic fins always well developed. Caudal fin forked. Scales small, moderate or large. Lateral line, if present abruptly bending downwards, if complete running along lower half of caudal peduncle.

KEY TO THE GENERA

1. Lower lip absent. Lower jaw with a sharp crescentic edge.. *Aspidoparia* Heckel
- Lower lip present. Lower jaw with or without a symphyisial knob. 2
2. Maxillary barbels very long. No symphyisial knob on lower jaw. Anal fin with 8 rays (5 branched rays). *Esomus* Swainson
- Maxillary barbels short or absent. A symphyisial knob present on lower jaw. 3
3. Cleft of mouth extending up to middle of the orbit. *Barilius* Hamilton Buchanan
- Cleft of mouth not extending beyond anterior border of the orbit. 4
4. Upper lip absent. *Amblypharyngodon* Bleeker
- Upper lip present. 5
5. Lateral line and barbels absent. 6
- Lateral line present. Barbels present or absent. 7
6. Anal fin with 9 rays. *Horadandia* Deraniyagala
- Anal fin with 13 to 16 rays. *Microrasbora* Annandale

7. Lower jaw with three prominences. Anal fin with 8 to 9 rays.
Rasbora Bleeker
- Lower jaw with a single symphyisial knob. Anal fin with 11 to 20 rays.
Danio Hamilton Buchanan

Genus *Danio* Hamilton Buchanan, 1822

1822. *Danio* Hamilton Buchanan, *Fish. Ganges*, : 321, 390 (type-species : *Cyprinus dangila* Hamilton Buchanan)
1916. *Brachydanio* Weber and de Beaufort, *Fish. Indo-Austral.*, 3 : 85 (type-species : *Brachydanio albolineatus* Biyth)
1934. *Rambaibarnia* Fowler, *Proc. Acad. nat. Sci. Philad.*, 86 : 67-163 (type-species : *Danio regina* Fowler)
1935. *Danioides* Chu, *Biol. Bull. St. John's Univ., Shanghai* No. 2 : 10, 34 & 123 (type-species : *Danio kakhienensis* Anderson).
1945. *Daniops* Smith, *Bull. U. S. natn. Mus.*, No. 188 : 91-95 (type-species : *Daniops myersi* Smith)
1945. *Allodanio* Smith, *Bull. U. S. natn. Mus.*, No. 188 : 100-101 (type-species : *Danio ponticulus* Smith)

Body elongated or oblong, compressed, subcylindrical with rounded abdomen. Head moderate, blunt with obtuse snout. Mouth anterior, small, directed obliquely upward. Lower jaw prominent, provided at its symphysis with a knob, fitting into a more or less superficial emargination of the upper jaw. Maxilla extending not beyond anterior margin of the orbit. Pharyngeal teeth unciniate. Barbels generally 4 ((one anterior or rostral pair and one pair posterior or maxillary at the corner of the mouth) or 2, very short or absent. Dorsal fin with 6 to 17 branched rays, originating opposite interspace between pelvic and anal fin, its hinder half extending at least above the anal fin which is composed of numerous rays (11 to 20 rays). Pelvic fins short, with 7 to 8 rays far before dorsal fin. Pectoral fins with 12 to 13 rays. Caudal fin emarginate, lunate or forked, with 19 branched rays. Scales moderate. Lateral line concave, complete, incomplete or absent, with 28 to 65 scales along the normal course of lateral line. Body generally with longitudinal bands.

Distribution : India, Pakistan, Nepal, Bangladesh, Sri Lanka, Burma, Thailand, Malaya, Sumatra and China.

SPECIES OCCURRING IN THE INDIAN SUBCONTINENT

1. *Danio acuticephala* Hora, 1921 : India : Manipur and Nagaland.
2. *Danio aequipinnatus* (McClelland, 1839) : India : Throughout, Pakistan, Nepal, Bangladesh, Burma, Sri Lanka, Thailand and China.
3. *Danio albolineatus* (Blyth, 1860) : Burma, Thailand and Sumatra.
4. *Danio annandalei* Chaudhuri, 1908 : Burma : Dawna Hills.
5. *Danio assamensis* Barman, 1984 : India : Assam.
6. *Danio choprai* Hora, 1928 : Burma.
7. *Danio dangila* (Hamilton Buchanan, 1822) : India : North-East India, West Bengal, Bihar, Madhya Pradesh, Uttar Pradesh. Bangladesh. Nepal and Burma.
8. *Danio devario* (Hamilton Buchanan, 1822) : North and North-East India, West Bengal, Punjab, Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat and South India. Pakistan. Bangladesh and Nepal.
9. *Danio fraseri* Hora and Mukerji, 1935 : India : River Darna, Deolali, Maharashtra.
10. *Danio horai* Barman, 1983 : India : Arunachal Pradesh.
11. *Danio kakhienensis* Anderson, 1878 : China and Burma.
12. *Danio manipurensis* Barman, 1987 : India : Manipur.
13. *Danio naganensis* Chaudhuri, 1912 : India : Nagaland and Manipur.
14. *Danio neilgherriensis* (Day, 1867) : India : Nilgiri Hills, South India ; Madhya Pradesh and Arunachal Pradesh.
15. *Danio nigrofasciatus* (Day, 1869) : Burma : Pegu, Moulmein.
16. *Danio rerio* (Hamilton Buchanan, 1822) : India : Eastern Himalaya, North-East India, Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Rajasthan and South India. Pakistan. Nepal. Bangladesh. Burma and Sri Lanka.
17. *Danio shanensis* Hora, 1928 : Burma
18. *Danio sondhii* Hora and Mukerji, 1934 : Burma.
19. *Danio spinosus* Day, 1869 : Burma.

8. Barbels well developed, both pairs of barbels much longer the orbit diameter. *D. dangila* (Hamilton Buchanan) 19
- Barbels not well developed, maxillary and rostral pair not longer than orbit diameter. 9
9. Lower lip hypertrophied forming a loose flap along the lower jaw. Anal fin with 17 to 19 rays. *D. fraseri* Hora
- Lower lip not hypertrophied, simple. Anal fin with 13 to 16 rays. 10
10. Lateral line scales 40 to 42. Dorsal fin with 10 rays. *D. naganensis*
- Lateral line scales 33 to 38. Dorsal fin with 11 to 14 rays. 11
11. Lateral line scales 33 to 34. Body depth 3.00 to 3.30 in standard length *D. manipurensis* Barman
- Lateral line scales 37 to 38. Body depth 4.00 to 4.63 in standard length *D. neilgherriensis* (Day)
12. Lateral line incomplete. 13
- Lateral line totally absent. 17
13. Lateral line extending up to or beyond anal fin (or rarely reaching up to caudal fin base in some specimens) *D. shanensis* Hora
- Lateral line extending up to pelvic fin base but not extending to anal fin. 14
14. Barbels absent. A well-developed black mark near superior angle of gill-opening. *D. sondhii* Hora
- Barbels 2 pairs, well-developed, present. No such black mark near superior angle of gill-opening 15
15. Lateral four metallic bands extending from opercular end to caudal fin base present. *D. rerio* (Hamilton Buchanan)*
- No such lateral longitudinal band present. 16
16. Head length 4.00 to 4.28 in standard length. A light lateral longitudinal band from caudal fin base extending forward and tapering beyond origin of dorsal fin. *D. albolineatus* (Blyth)

- Head length 3.50 to 3.83 in standard length. Several dark broad bars in anterior half and gradually reduces to mere dots in posterior half. *D. choprai* Hora*
17. Barbels absent 18
 Barbels present. 19
18. Anal fin with 11 to 12 rays. Predorsal scales 16 to 17 and scales along the normal course of lateral line 30 to 32. Eye diameter 3.00 to 3.50 in head length. *D. acuticephala* Hora**
 Anal fin with 14 to 15 rays. Predorsal scales 13 to 14 and scales along the normal course of lateral line 28 to 30. Eye diameter 3.50 to 4.66 in head length *D. horai* Barman
19. Only one pair of maxillary barbels present. A dark band passing along side of body and a second dotted line below the first one. Dorsal and anal fins spotted with black dots.
D. nigrofasciatus Day
 Barbels 2 pairs, well-developed, present Lateral side either with four metallic longitudinal bands or with several dark broad bands in anterior half and gradually reduces to mere dots in posterior half. 20
20. Maxillary barbels shorter than head. Head length 3.50 to 3.83 in standard length. Eye diameter 2.50 to 3.00 and snout length 5.00 to 6.00 in head length. *D. choprai* Hora*
 Maxillary barbels longer than head, extending half of pectoral length. Head length 3.76 to 4.44 in standard length. Eye diameter 3.00 to 3.50 and snout length 3.60 to 4.66 in head length.
D. rerio (Hamilton Buchanan)*

* As the lateral line in these two species (viz. *D. rerio* and *D. choprai*) is highly variable, being either incomplete or totally absent, these two species are included in both the possible combination of key).

** Hora and Mukerji (1934a) included this species (*D. acuticephala*) among the species with lateral line incomplete. The present study shows that lateral line is totally absent in this species. Therefore, this species is included among the species having no lateral line in the present key to the species.

Danio acuticephala Hora, 1921

Figure 2

1921a. *Danio acuticephala* Hora, *Rec. Indian Mus.*, 22 : 193, fig. 4 (type-locality : small streams and ponds of Manipur). 1934a. Hora and Mukerji, *Rec. Indian Mus.*, 36 : 131 (synoptic table to species of *Brachydanio*). 1935b. Hora & Mukerji, *Rec. Indian Mus.*, 37 : 387 (Naga Hills, Assam). 1954b. Menon, *Rec. Indian Mus.*, 52 : 22 (Manipur).

Material examined :

Type specimen : ZSI F 9986/1, 1 ex., 35.0 mm SL.; on Ukhang sang Road, one mile from Yaribuk, Manipur; S.L. Hora.

Other examples : ZSI F 9991/1—ZSI F 10000/1, 149 exs., 16.0 mm—40.0 mm SL.; Manipur; S.L. Hora; 8.3.1920. ZSI F 4310/2—ZSI F 4314/2, 11 exs., 13.0 mm—34.0 mm SL.; Manipur; A.G.K. Menon 22.1.1953. ZSI F 4243/2, 4 exs., 24.0 mm—29.0 mm SL.; Imphal; A.G.K. Menon; 20.1.1953. ZSI F 11800/1—ZSI F 11801/, 10 exs., 20.0 mm—28.0 mm SL.; Naga Hills, Assam; J.H. Hutton; March, 1927.

Diagnosis (based on 226 specimens including type, 13.0 mm—40.0 mm SL. ;) : Head length 3.75—4.00 and body depth 3.18—4.00 in standard length. Eye diameter 3.00—3.50 in head length. Lateral line totally absent, scales along the normal course of lateral line 30-32. Barbels absent.

Description : Head length 3.90 (3.75—4.00), body depth 3.73 (3.18—4.00), predorsal distance 1.68 (1.60—1.80), prepelvic distance 2.17 (2.07—2.33) and caudal peduncle length 4.57 (4.28—5.00) in standard length. Minimum height of caudal peduncle 7.34 (6.75—8.22) in standard length, 1.70 (1.40—1.85) in its length. Height of head 1.18 (1.12—1.40) and width of head 1.84 (1.80—2.00) in head length. Snout length 4.22 (3.75—4.50) in head length, 1.89 (1.75—2.00) in interorbital length. Eye diameter 3.25 (3.00—3.50) in head length, 1.46 (1.33—1.50) in interorbital width. Eye diameter longer than snout length. Mouth small, obliquely directed upward. Barbels absent.

Scales : Lateral line totally absent, scales along the normal course of lateral line 30—32. Lateral transverse rows of scales 7—8. Predorsal scales 16—17 and circumpeduncular scales 10.

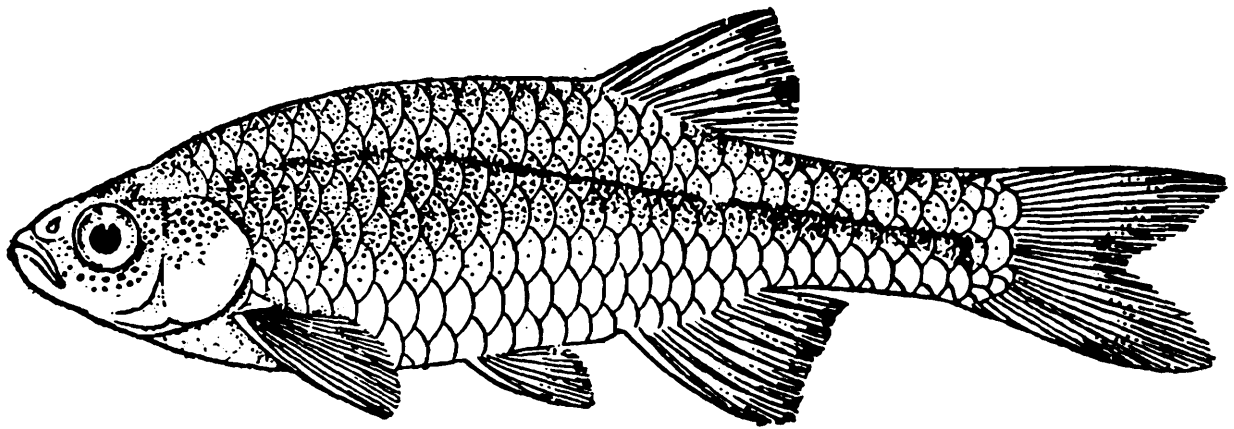


Fig. 2. Lateral view of *D. acuticephala*.

Fins : Dorsal rays ii/6-7, Anal rays ii/9-10, Pectoral rays i/11, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 5.01 (4.57—5.45), height of anal 5.67 (5.33—6.00), pectoral length 4.31 (4.00—4.61) and pelvic length 6.95 (6.40—7.50) in standard length. Caudal fin deeply emarginate with both the lobes pointed, length 4.08 (3.50—4.66) in standard length. Pectoral fin rounded and when adpressed do not reach base of pelvic fin.

Colour in alcohol : A longitudinal broad band extending along middle of either side of body and a black narrow streak along dorsal surface extending from head to base of caudal fin.

Size : Largest specimen examined 40.0 mm. SL.

Distribution : *India* : Manipur and Nagaland.

Remarks : Hora (1921a) described this species from Manipur. Hora and Mukerji (1934a) included this species among the species characterised by “lateral line short, not extending beyond pectoral fin”, in the key to the species of *Brachydanio*. Hora and Mukerji (1935b) while examining this species from Naga Hills, Nagaland, pointed out that the lateral line in this species is totally absent. I examined all the specimens of this species including type specimen and agree with their latter observation.

Danio aequipinnatus (McClelland, 1839)

Figure 3

1839. *Perilampus aequipinnatus* McClelland, *Asiat. Res.*, 19(2) : 393, pl. 60, fig. 1 (type locality : Assam).

1849. *Perilampus malabaricus* Jerdon, *Madras. J. Lit. & Sci.*, **15** : 325 (Malabar coast).
 1858. *Leuciscus lineolatus* Blyth, *J. Asiat. Soc. Beng.*, : 219 (type-locality : Sikkim).
 1860. *Perilampus affinis* Blyth, *J. Asiat. Soc. Beng.*, **29** : 163 (type-locality : Tenasserim, Burma).
 1868. *Danio micronema* Günther, *Cat. Fish. Br. Mus.*, **7** : 282 (synonymy).
 1868. *Danio lineolatus* Günther, *Cat. Fish. Br. Mus.*, **7** : 282 (Sikkim).
 1868. *Pteropsarion aequipinnatus* Günther, *Cat. Fish. Br. Mus.*, **7** : 285 (Assam).
 1907. *Danio browni* Regan, *Rec. Indian Mus.*, **1** : 395 (Upper Burma).
 1924. *Danio strigillifer* Myers, *Am. Mus. Novit.*, **150** : 2 (Upper Burma).
 1878. *Danio aequipinnatus* Day, *Fish, India* : 596, pl. 150 fig. 6. 1889. Day, *Fauna Br. India, Fish.* **1** : 356, fig. 3. 1913. Chaudhuri, *Rec. Indian Mus.*, **8** : 252 (Abor Hills, Assam), 1918. Annandale, *Rec. Indian Mus.*, **14** : 35 (Inle Lake, Burma). 1919. Chaudhuri, *Rec. Indian Mus.*, **16** : 243 (Hkamti Long, Burma). 1919. Annandale, *Rec. Indian Mus.*, **16** : 256 (Bombay). 1921a. Hora, *Rec. Indian Mus.*, **22** : 193 (Naga Hills, Assam). 1921b. Hora, *Rec. Indian Mus.*, **22** : 743 (Darjeeling). 1923. Hora, *Rec. Indian Mus.*, **25** : 582 (Khasi Hills, Assam). 1924. Hora, *Rec. Indian Mus.*, **26** : 28 (Garo Hills, Assam). 1934a. Hora and Mukerji, *Rec. Indian Mus.*, **36** : 134 (Synoptic table to species of the subgenus *Danio*). 1936. Hora and Mukerji, *Rec. Indian Mus.*, **38** : 332 (Naga Hills, Assam). 1937. Shaw and Shebbeare, *Jl. Asiat. Soc. Beng. Sci.*, **3** : 26 (North Bengal). 1938b. Hora, *Rec. India Mus.*, **40** : 237 (Madhya Pradesh). 1938. Misra, *Rec. Indian Mus.*, **40** : 255 (Cuddapah dist., Andhra Pradesh). 1941. Hora and Gupta, *Jl. R. Asiat. Soc. Beng. Sci.*, **6**(2) : 78 (Kalimpong Duars and Siliguri Terai, North Bengal). 1941a. Hora and Nair, *Rec. Indian Mus.*, **43** : 371 (notes on synonymy). 1941. Hora and Law, *Rec. Indian Mus.*, **43** : 243 (Travancore). 1949b. Menon, *Rec. Indian Mus.*, **47** : 232 (Kosi River, E. Nepal). 1953. Silas, *Rec. Indian Mus.*, **51** : 28 (Madras). 1954b. Menon, *Rec. Indian Mus.*, **52** : 22 (Manipur). 1960. De Witt, *Stanford Ichthyol. Bull.*, **7**(4) : 84 (Manipur). 1964. Jayaram and Majumdar, *J. Bombay nat. Hist. Soc.* **61**(2) : 268 (developmental stages). 1964. Datta and Majumdar, *Rec. Indian Mus.*, **62** : 77 (Udaipur dist. Rajasthan). 1966. Srivastava, *J. zool Soc. India.* **18**(2) : 124 (Tirap Frontier Division, Arunachal Pradesh). 1968. Tilak, *Rec. zool. Surv. India*, **66** : 277 (Sikkim). 1976. Yazdani, *J. Bombay nat. Hist. Soc.*, **74**(1) : 18 (Khasi Hills, Meghalaya). 1977. Pillai and Yazdani, *Rec. zool. Surv. India*, **72** : 9 (Garo Hills, Assam). 1977. Jayaram and Singh, *Rec. zool. Surv. India*, **72** : 248 (North Bengal). 1977. Choudhury and Sen, *Newsl. zool. Surv. India*, **3** : 219 (Arunachal Pradesh).

Material examined :

Type specimen : Not known.

Other examples : ZSI FF 1895, 72 exs., 24.0 mm—85.0 mm. SL.; Namdhapa River, Tirap dist., Arunachal Pradesh; S. Biswas; 11.4.1981. ZSI F 4234/2, 11 exs., 36.0 mm—58.0 mm. SL.; Manipur, A.G.K. Menon, 24.2.1953. ZSI F 7911/1—F 7922/1, 13 exs., 35.0—73.0 mm. SL.; Yambung, Assam; S.W. Kemp. ZSI F 1181/1—F 1184/1, 37 exs., 42.0 mm—52.0 mm. SL.; Naga Hills, Nagaland; B.P. and B.N.C.; 27.2.1935. ZSI F 12581—12582, 13 exs., 32.0 mm—65.0 mm. SL.; Deolali, Maharashtra; A.G.L. Fraser, 12.9.1935. ZSI F 13119, 5 exs., 41.0 mm—45.0 mm, SL., Raipur dist., Madhya Pradesh; H.S. Rao; 20.12.1935. ZSI F 4245/1—F 4246/1, 2 exs., 74.0 mm—75.0 mm. SL.; Kurseong, North Bengal; F. Gravely; 26.3.1910. ZSI FF 721, 18 exs., 30.0 mm—62.0 mm. SL.; Deogharia Hills, Bihar; A.P.K. and G.M.; 26.12.1935. ZSI F 1093/2, 50 exs., 36.0 mm—69.0 mm. SL.; Mewar State, Rajasthan; B.N. Chopra and M.L. Roonwal; 19.10.1921. ZSI FF 587, 30 exs., 30.0 mm—62.0 mm SL.; Brahamani River, Orissa; T.K. Sen; 24.4.1973. ZSI F 1743/2, 10 exs., 43.0 mm—63.0 mm. SL.; Nilgiri Hills, Madras; S. Rajan; March, 1954, ZSI F 13523/1, 18 exs., 33.0 mm—57.0 mm. SL.; Travancore, Kerala; C.C. John; 17.2.1940. ZSI F 10509/1, 2 exs., 67.0 mm—76.0 mm. SL.; Nakon Sritamarat Mountain, Siam. ZSI F 1876/1, 4 exs., 32.0 mm—45.0 mm. SL.; N. Shan States, Burma; J.C. Brown. ZSI FF 1941, 4 exs., 19.0 mm—45.0 mm. SL.; Hee Cyathang, North Sikkim; R.K. Ghose; 9.1.1982.

Diagnosis (based on 286 specimens, 19.0 mm.—85.0 mm. SL.) Head length 3.53—4.33 and body depth 2.92—3.47 in standard length. Eye diameter 3.00—4.00 in head length and eye provided with a preorbital backwardly directed spinous process at the anterior rim of orbit (Fig. 3a & 3b). Lateral line scales 35-37. Barbels 2 pairs.

Description : Head length 3.90 (3.53—4.33), body depth 3.19 (2.92—3.47), predorsal distance 1.76 (1.60—1.88), prepelvic distance 2.14 (2.04—2.22) and caudal peduncle length 4.91 (4.50—5.33) in standard length. Minimum height of caudal peduncle 8.05 (7.27—9.00) in standard length, 1.84 (1.75—2.00) in its length. Height of head 1.05 (1.00—1.12) and width of head 1.83 (1.66—2.00) in head length. Eye diameter 3.50 (3.00—4.00) in head length, 1.41 (1.16—1.80) in interorbital width. Eye with a backward projecting preorbital spinous process originating from the lachrymal bone at the anterior rim of eye socket. Snout length 3.83

(3.33—5.00) in head length, 1.58 (1.33—2.00) in interorbital width. Mouth obliquely directed upward and extending to under anterior margin of orbit. Barbels 2 pairs, short.

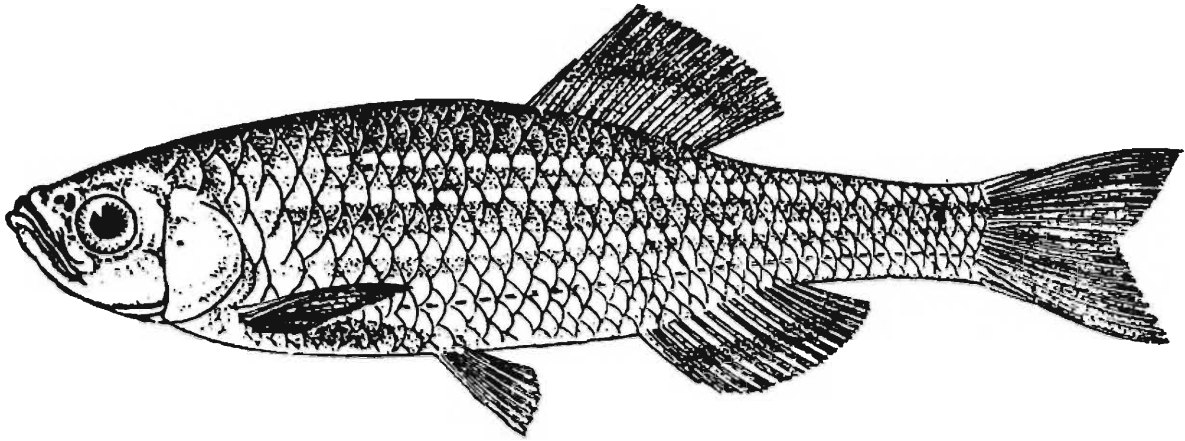


Fig. 3. Lateral view of *D. aequipinnatus*.

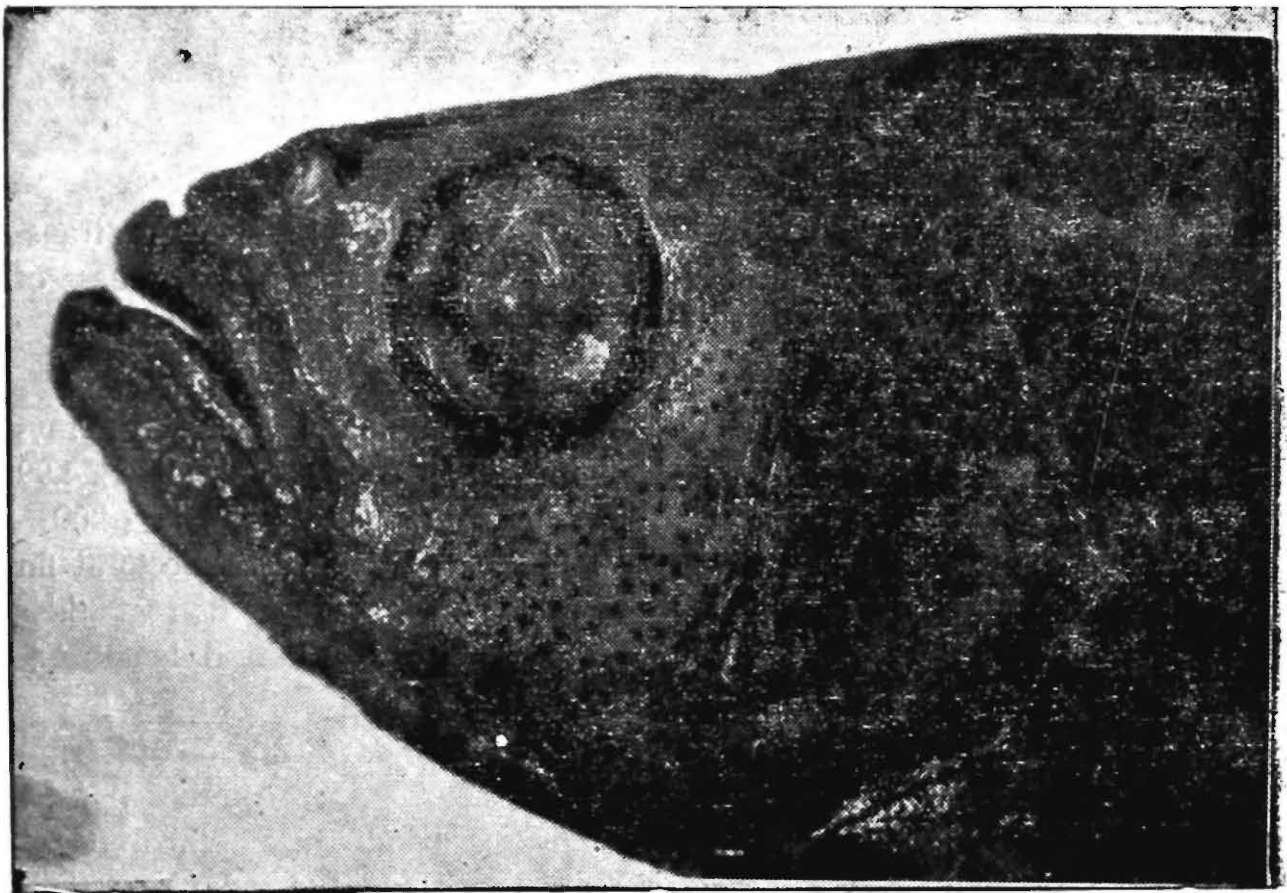


Fig. 3a. Photograph of head region of *D. aequipinnatus*.

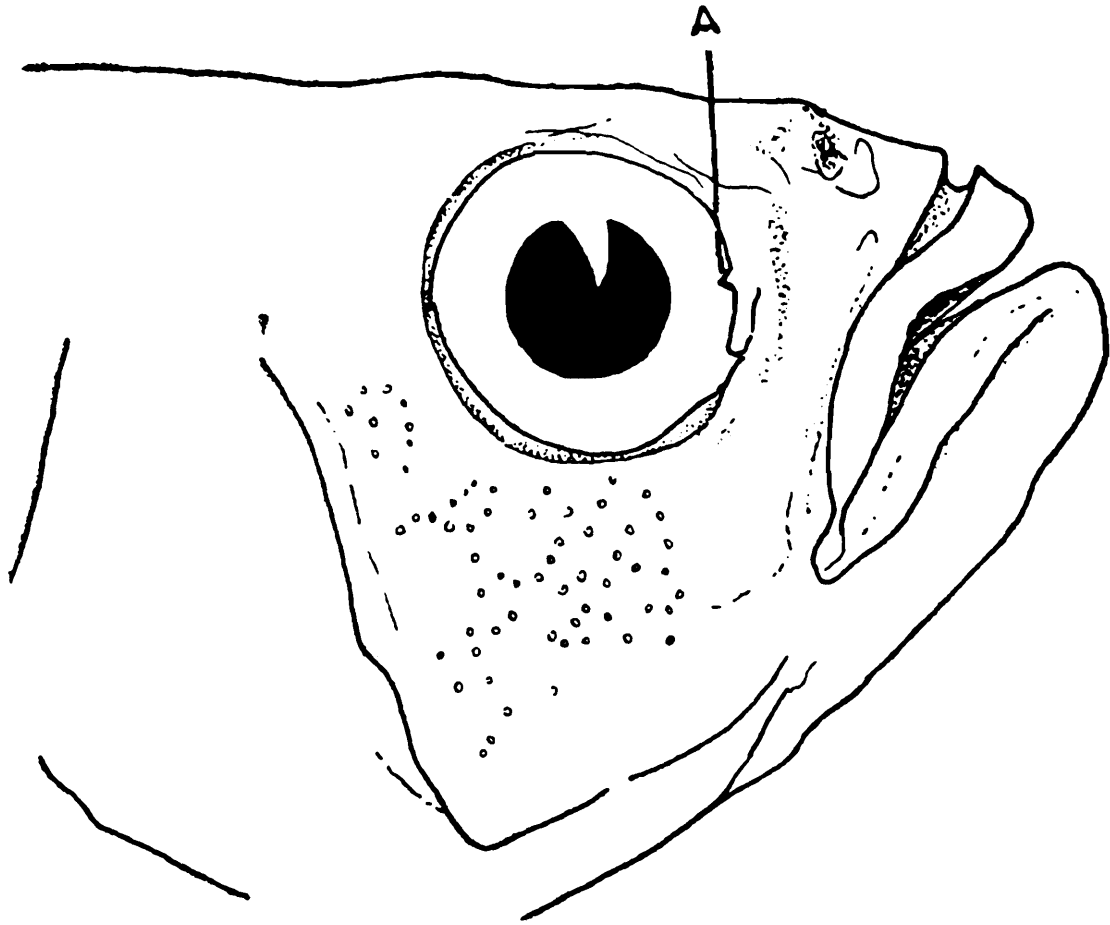


Fig. 3b. Outline sketch of head region of *D. aequipinnatus* showing the preorbital spine (A).

Scales Lateral line complete covering 35—37 scales; lateral transverse row of scales 10—11, $2\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 14-15 and circumpeduncular scales 10-12.

Fins: Dorsal rays ii-iii/11-12, Anal rays ii-iii/14-15, Pectoral rays i/11-12, Pelvic rays 1/7-8 and Caudal rays 19. Height of dorsal 4.99 (4.09—6.15), height of anal 5.72 (5.14—6.36), pectoral length 4.47 (4.00—5.00) and pelvic length 6.84 (6.00—7.37) in standard length. Pectoral fin extending to pelvic fin. Both the paired fins possess scaly flap at their bases. Caudal fin forked, length 4.00 (3.45—4.70) in standard length.

Colour in alcohol: Yellowish white with a wide bluish lateral band extending from the opercular end to base of caudal fin. Another narrow longitudinal band above and two other lighter bands below them. Fins yellowish, dorsal and anal fins each with a broad bluish band along their rays. Generally a well defined dark mark present at the superior angle of gill-opening but this may be absent in some specimens.

Size : Largest specimen examined 85.0 mm. SL.

Distribution : India : Arunachal Pradesh, Sikkim, Assam, Manipur, Meghalaya, Nagaland, Tripura, West Bengal, Bihar, Orissa, Madhya Pradesh, Maharashtra, Rajasthan, Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala. Pakistan. Bangladesh. Burma. Sri Lanka. Thailand and China.

Notes on synonymy : Hora and Nair (1941b) synonymised *Danio strigillifer* Myers and *Danio malabaricus* Jerdon with *Danio aequipinnatus* (McClelland). Mukerji (1934) also synonymised *Danio browni* Regan (1907) with *D. aequipinnatus*. On examination of a large series of specimens of this species from various localities of India, Burma and Thailand, Mukerji commented that he could not find out any stable character that can be taken into consideration in differentiating *D. aequipinnatus* and therefore, should not be regarded as a species distinct from *D. aequipinnatus*.

The present study also support the opinions of Hora and Nair (1941b) and Mukerji (1934) in synonymising *D. strigillifer*, *D. malabaricus* and *D. browni* with *D. aequipinnatus* because the frequency distribution data of scale counts and fin rays count support the views expressed by them.

Remarks : *Danio aequipinnatus* is the only species under the genus being widely distributed throughout the Indian sub-continent including Thailand and China. The presence of the preorbital backwardly directed spinous process in this species was first pointed out by Vinciguerra (1889—90) and this was later confirmed by Myers (in Herre and Myers, 1937) that in this species there is a preorbital spinous process as in *Danio (Danio) regina* Fowler. The earlier Indian workers appear to have overlooked this preorbital spinous process in this species. The findings of the present work also indicate the presence of the preorbital spinous process at the anterior rim of the orbit in this species. The presence of a backwardly directed preorbital spinous structure has been pointed out by me in the specimens of this species collected from Tripura (Barman, 1988).

***Danio albolineatus* (Blyth, 1860)**

Figure 4

1860. *Nuria albolineatus* Blyth, *J. Asiat. Soc. Beng.*, 29 : 163 (type-locality : Tenasserim, Lower Burma).

1869b. *Danio albolineatus*, Day, *Proc. zool. Soc. Lond.*, : 621 (Burma). 1878. Day, *Fish. India*, : 597, pl. 150, fig. 1. 1889. Day, *Fauna Br. India, Fish* 1 : 358

(Moulmein, Lower Burma). 1908. Chaudhuri, *Rec. Indian Mus.*, **2** : 126 (Lower Burma). 1931. Hora, *Rec. Indian Mus.*, **33** : 2 (Burma). 1934a. Hora and Mukerji, *Rec. Indian Mus.*, **36** : 130 (synoptic table to species of the subgenus *Brachydanio*).

1940. *Brachydanio albolineata*, Herre, *Bull. Raffles Mus.* **16** : 29 (Botanic garden, Penang; Sauk, Perak, Malaya). 1940. Tweedie, *Bull. Raffles Mus.*, **16** : 73 (Sauk, Perak, Malaya).

1954a. *Brachydanio albolineatus*, Menon, *Bull. Raffles Mus.*, **25** : 7 (Sauk, Perak, Malaya).

1956. *Danio (Brachydanio) tweediei* Brittan, *Bull. Raffles Mus.*, **25** : 41 (Kedah, Malaya).

1972. *Brachydanio albolineatus*, Alfred, *Fedn. Mus. J.*, **14** : 116 (synonymy and redescription).

Material examined :

Type specimen : Not known.

Other examples : ZSI F1595/1—F1598/1, 7 exs., 24.0 mm—30.0 mm. SL.; Moulmein, Lower Burma; N. Annandale. ZSI F1567/1 and F1570/1, 2 exs., 25.0 mm.—29.0 mm. SL.; Lower Burma; N. Annandale. ZSI 2491 and 2484, 2 exs., 24.0 mm.—34.0 mm. SL.; Moulmein, Lower Burma; F. Day. ZSI Cat. 833, 5 exs., 32.0 mm.—38.0 mm. SL.; Moulmein, Lower Burma; Mr. Atkinson.

Diagnosis (based on 16 specimens, 24.0 mm.—38.0 mm. SL.) : Head length 4.00—4.28 and body depth 3.69—4.16 in standard length. Eye diameter 2.80—3.00 in head length. Lateral line incomplete, scales along the normal course of lateral line 30-32. Barbels 2 pairs, well developed.

Description : Head length 4.14 (4.00—4.28), body depth 3.92 (3.69—4.16), predorsal distance 1.61 (1.57—1.66), prepelvic distance 2.13 (2.00—2.27) and caudal peduncle length 6.60 (5.80—7.40) in standard length. Minimum height of caudal peduncle 7.92 (7.50—8.33) in standard length, 1.45 (1.25—1.66) in its length. Height of head 1.18 (1.16—1.20) and width of head 1.61 (1.50—1.71) in its length. Snout length 5.33 (4.66—6.00) in head length, 2.50 (2.00—3.00) in interorbital width. Eye diameter 2.90 (2.80—3.00) in head length, 1.35 (1.20—1.50) in interorbital width. Snout length shorter than eye diameter. Mouth small, obliquely directed

upward. Barbels 2 pairs, well developed, rostral pair longer than eye diameter extending up to preopercular region and maxillary pair reach half the length of pectoral fin.

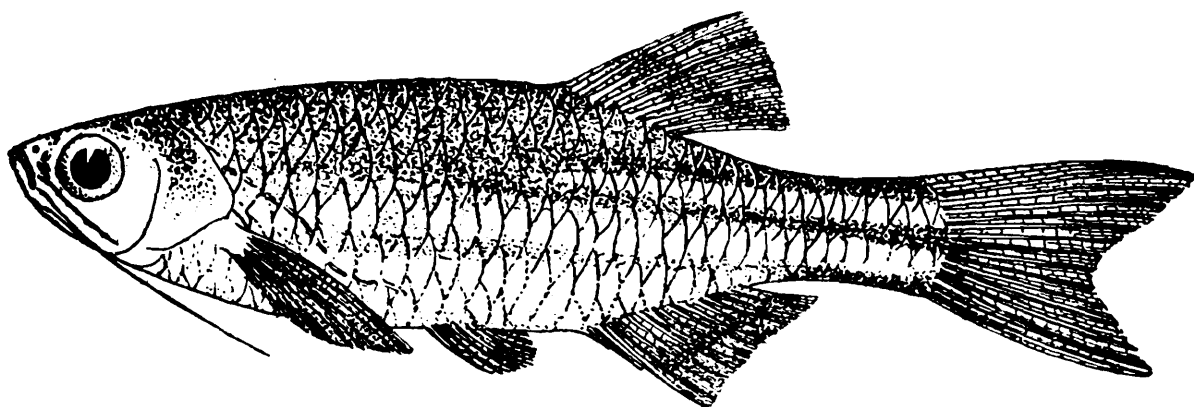


Fig. 4. Lateral view of *D. albolineatus*.

Scales : Lateral line incomplete, perforating 9—10 scales anteriorly, extending up to base of pelvic fin; scales along the normal course of lateral line 30-32. Lateral transverse rows of scales 7-8. Predorsal scales 16—17 and circumpeduncular scales 10.

Fins : Dorsal rays ii/7, Anal rays iii/13-14, Pectoral rays i|11-12, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 4.69 (4.36—5.00), height of anal 4.92 (4.28—5.55), pectoral length 4.08 (4.00—4.16) and pelvic length 6.88 (6.66—7.14) in standard length. Both paired fins possess scaly flap or scaly appendages at their bases. Pectoral fins extending up to base of pelvic fins. Caudal fin emarginate, length 4.48 (4.16—4.80) in standard length.

Colour in alcohol : Dorsal surface dark brown and ventral surface gradually lighter. A light band from base of caudal fin extending forward and tapering beyond commencement of dorsal fin. A median dark straight narrow longitudinal band present on the back.

Size : Largest specimen examined 38.0 mm SL.

Distribution : Burma : Moulmein and Tenasserim. Thailand, Malaya, Sumatra.

Notes on synonymy: Alfred (1972) synonymised *Brachydanio tweediei* Brittan with *D. albolineatus* considering the fact that only the absence of lateral line could not be the separating factor as the lateral line is a highly variable character in *D. albolineatus*.

On examination of the figure and description of *Brachydanio tweediei* Brittan (1956), it appears that there is no stable character that can be taken into consideration in separating *B. tweediei* from *D. albolineatus* and therefore, the present study also support the views of Alfred (1972) in synonymising *B. tweediei* with *D. albolineatus*.

Danio annandalei Chaudhuri, 1908

Figure 5

1908. *Danio annandalei* Chaudhuri, *Rec. Indian Mus.*, 2(2) : 125 (type-locality : Dawna Hills, Tenasserim, Lower Burma).
1924. *Danio annandalei* Myers, *Am. Mus. Novit.*, No. 150 : 2 (Review of *Danio*).
- 1934a. *Danio (Danio) annandalei* Hora and Mukerji, *Rec. Indian Mus.*, 36(1) : 134 (synoptic table to species of the subgenus *Danio*).

Material examined : Syntypes, ZSI F 1599/1, 2 exs., 55.0 mm—57.0 mm. SL.; Jungle stream at the base of Dwana Hills, Tenasserim, Lower Burma; N. Annandale.

Other examples : ZSI F 11496/1, 1 ex., 59.0 mm. SL.; Western drainage of the Pegu Yomas, Upper Burma; V.P. Sondhi; 9.4.1934.

Diagnosis (based on 3 specimens including syntypes, 55.0 mm.—59.0 mm. SL); Head length 3.80—3.93 and body depth 2.85—3.10 in standard length. Eye diameter 3.11—3.33 in head length. Eye with a small backward projecting spinous process at the anterior rim of orbit (fig. 5a & 5b) Barbels 2 pairs. Lateral line scales 54—56.

Description : Head length 3.88 (3.80—3.93), body depth 2.94 (2.85—3.10), predorsal distance 1.75 (1.71—1.78), prepelvic distance 2.10 (2.03—2.18) and caudal peduncle length 5.18 (5.00—5.36) in standard length. Least height of caudal peduncle 8.34 (8.14—8.46) in standard length, 1.61 (1.57—1.69) in its length. Height of head 1.00 (1.00—1.00) and width of

head 2.00 (1.87—2.14) in head length. Eye diameter 3.25 (3.11—3.33) in head length, 1.33 (1.33—1.33) in interorbital width. Snout length 3.66 (3.50—3.75) in head length, 1.50 (1.50—1.50) in interorbital width. Mouth small, obliquely directed upward. Barbels 2 pairs, rostral pair half eye diameter and maxillary pair much shorter than rostral pair.

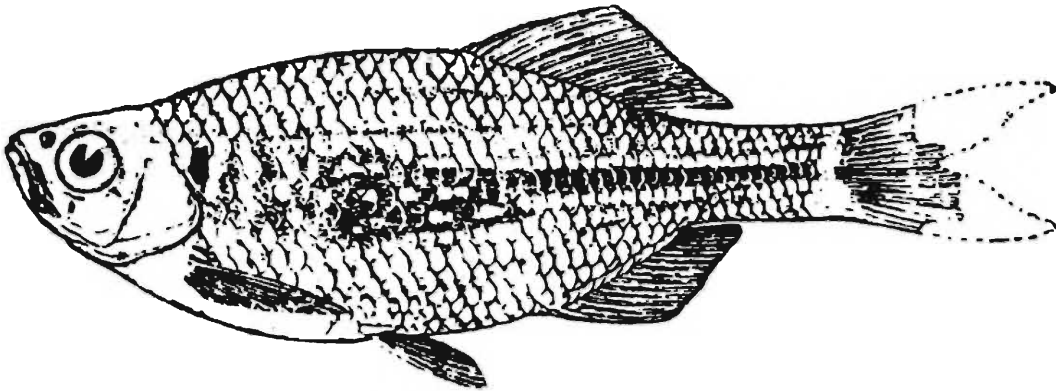


Fig. 5. Lateral view of *D. annandalei*.

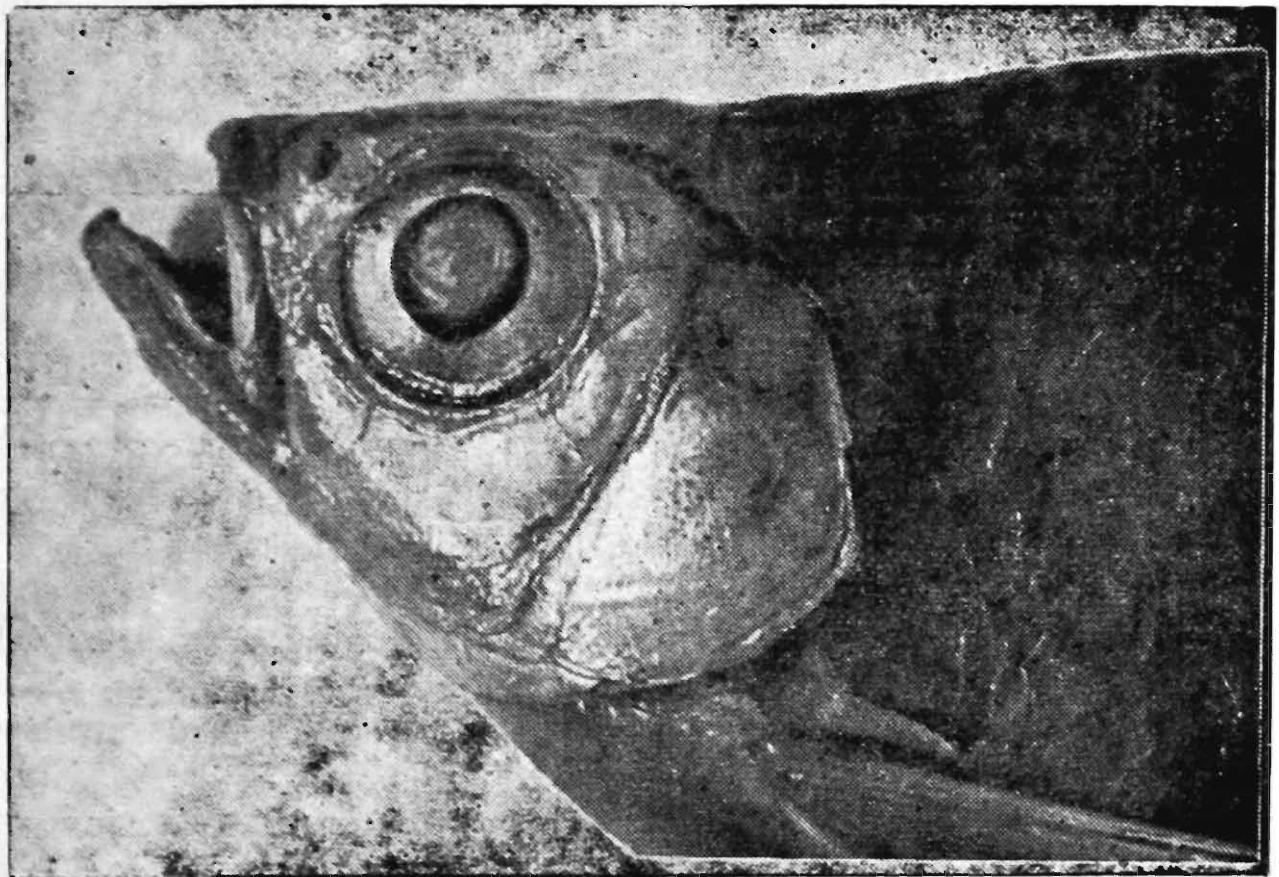


Fig. 5a. Photograph of head region of *D. annandalei*

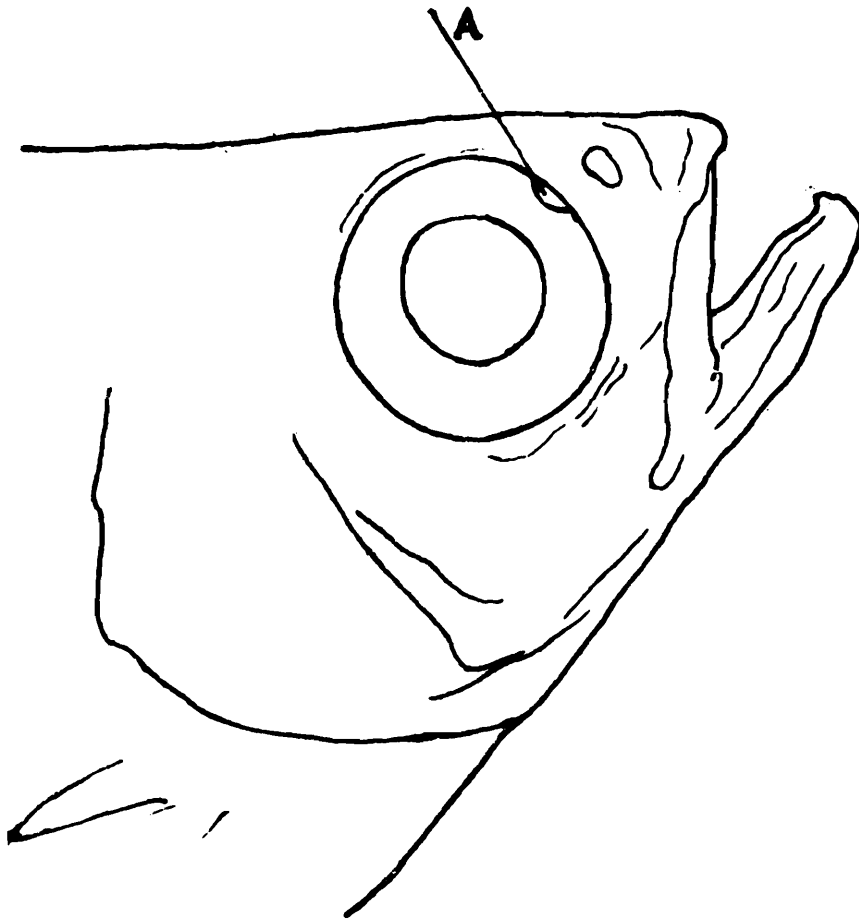


Fig. 5b. Outline sketch of head region of *D. annandalei* showing the preorbital spine (A).

Scales : Lateral line complete with 54—56 scales; lateral transverse rows of scales 14-15, $3\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 17—18 and circumpeduncular scales 16—18.

Fins : Dorsal rays ii/13-14, Anal rays ii/15-16, Pectoral rays i|11-12, Pelvic rays i/7. Height of dorsal 5.18 (5.00—5.36), height of anal 6.33 (6.11—6.55), pectoral length 4.38 (4.23—4.53) and pelvic length 7.12 (6.87—7.37) in standard length. Both the pectoral and pelvic fins possess scaly or fleshy appendages at their bases. Caudal fin deeply forked.

Colour in alcohol : Three longitudinal silvery coloured bands extending from head to base of caudal fin. A dark notch at superior margin of gill opening present. Numerous dark spots on opercles and suborbital region present.

Size : Largest specimen examined 59.0 mm. SL.

Distribution : Burma : Dwana Hills, Tenasserim.

Remarks : Chaudhuri (1908) described *Danio amandalei* from Tenasserim, Lower Burma. The author gave a detailed description of the colour pattern of this species and to establish its relationships he gave much importance to the presence or absence of scaly or fleshy appendages at the base of paired fins. On examination of all the species from the Indian region under the genus, I have found that all the species of the genus possess scaly or fleshy appendages at the base of paired fins, and this is not an unique feature as considered by Chaudhuri (1908). Lateral line scales count was given as 46 to 50 but I have found lateral line with 54 to 56 scales. Another important character, a preorbital backwardly directed spinous process which is present in this species at the front rim of orbit seems to have been overlooked by Chaudhuri. (Barman, 1985)

***Danio assamensis* Barman, 1984**

Figure 6

1984. *Danio (Danio) assamensis* Barman, *Bull. zool. Surv. India*, 6(1-3) : 163-165 (type-locality : Darrang district, Assam).

Material examined : Holotype, ZSI FF 1861, 69.0 mm. SL.; streamlets round about Tangla, Darrang dist., Assam; S.L. Hora; 14.11.1939. Paratypes, ZSI FF 1862, 2 exs., 62.0 mm.—78.0 mm. SL; other data same as holotype.

Diagnosis (based on 3 specimens, 62.0 mm—79.0 mm. SL.); Head length 4.05—4.33 and body depth 2.87—3.10 in standard length. Eye diameter 3.40—3.75 in head length. Eye with a small backward projecting spinous process on anterior orbital rim (fig. 6a & 6b). Lateral line scales 36 to 37. Barbels 2 pairs.

Description : Head length 4.17 (4.05—4.33), body depth 2.99 (2.87—3.10), predorsal distance 1.74 (1.72—1.76), prepelvic distance 2.08 (2.00—2.22) and caudal peduncle length 6.15 (6.00—6.27) in standard length. Minimum height of caudal peduncle 8.10 (7.66—8.85) in standard length, 1.31 (1.22—1.42) in its length. Height of head 1.00 (1.00—1.00) and width of head 1.85 (1.80—1.88) in head length. Eye diameter 3.58 (3.40—3.75) in head length, 1.58 (1.40—1.75) in interorbital width. Eye with a small backward projecting spinous process at the anterior rim of eye socket. Snout length 3.86 (3.60—4.25) in head length, 1.70 (1.60—1.75) in interorbital width. Interorbital width flat or slightly convex. Mouth small,

obliquely directed upward. Barbels 2 pairs, rostral pair half eye diameter and maxillary pair shorter than rostral pairs of barbels.

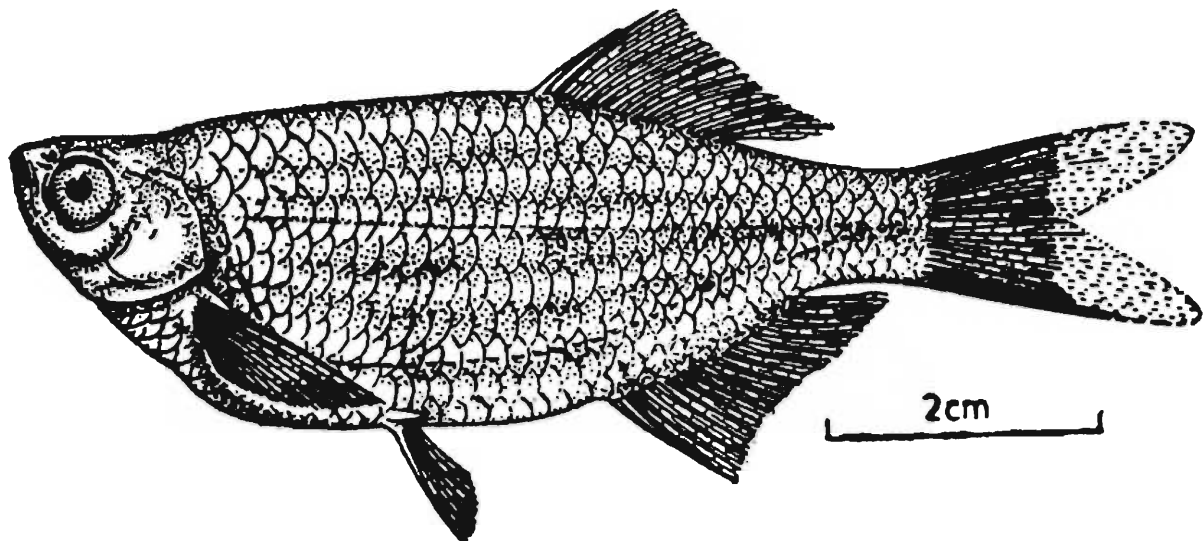


Fig. 6. Lateral view of *D. assamensis*

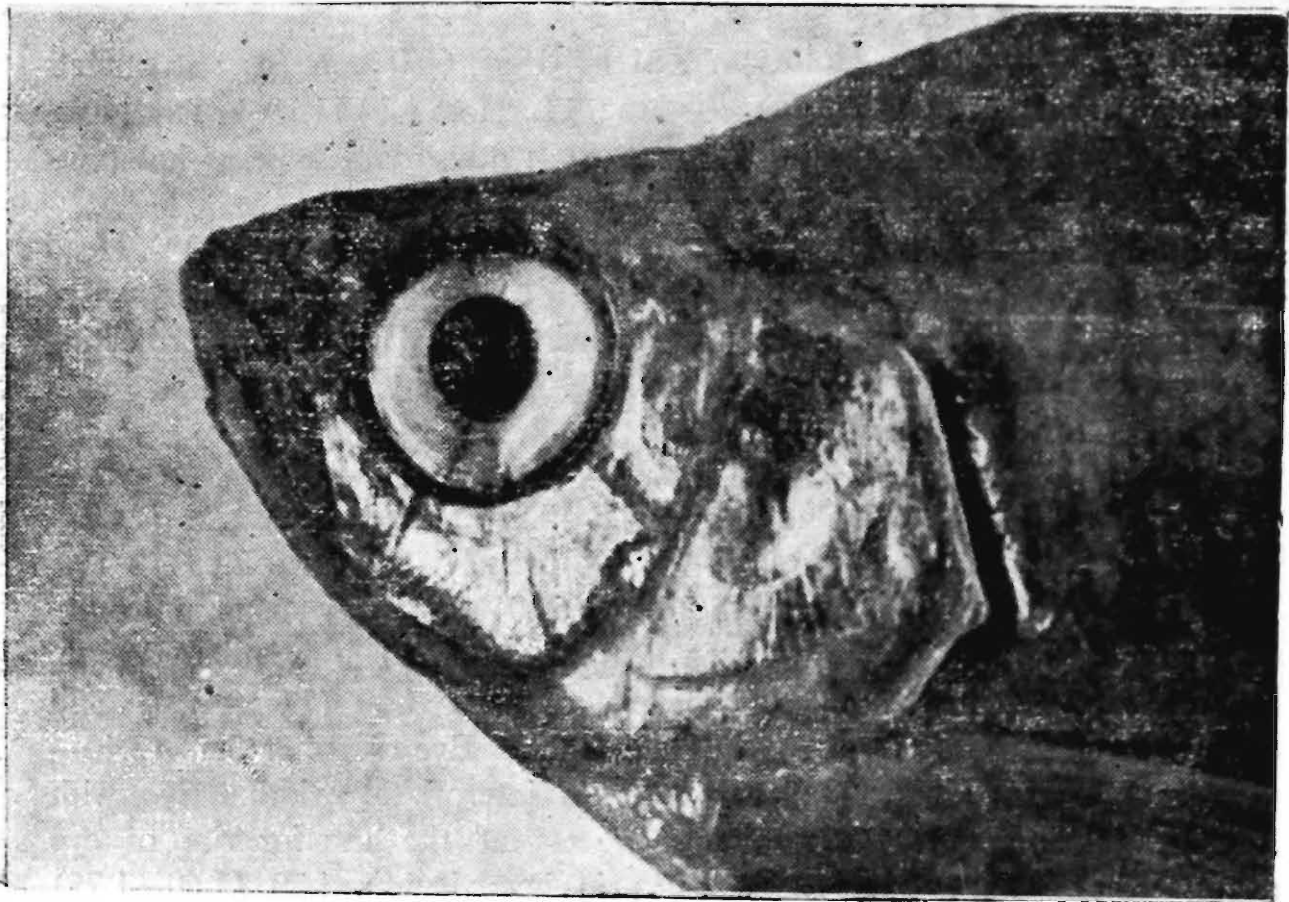


Fig. 6a. Photograph of head region of *D. assamensis*

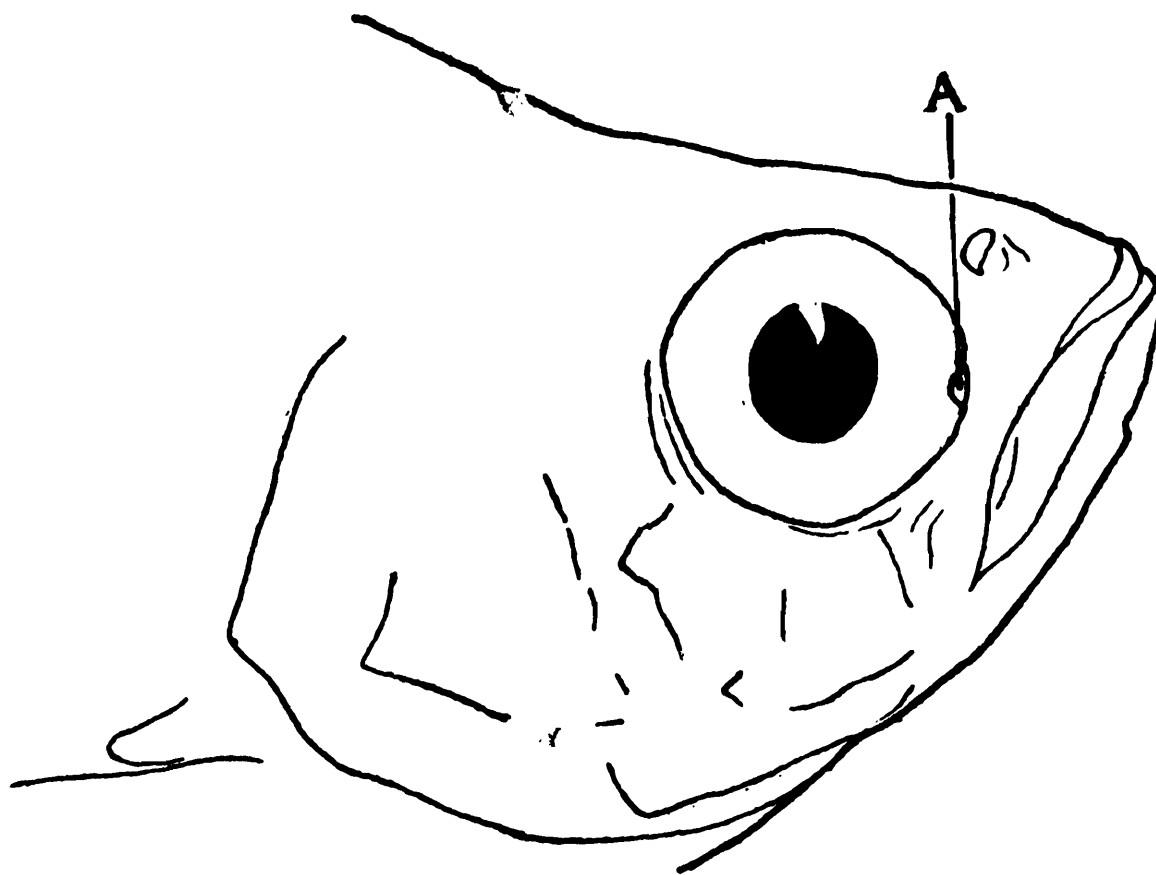


Fig. 6b. Outline sketch of head region of *D. assamensis* showing the preorbital spine (A).

Scales: Lateral line complete, covering 36 to 37 scales; lateral transverse row of scales 10, $2\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 15 to 16 and circumpeduncular scales 14.

Fins: Dorsal rays ii/12, Anal rays ii/16-17, Pectoral rays i/11, Pelvic rays i/7. Height of dorsal 5.56 (4.92—6.20), height of anal 6.21 (5.75—6.88), pectoral length 4.87 (4.60—5.16) and pelvic length 6.84 (6.27—7.75) in standard length. Both pectoral and pelvic fins possess scaly flap at their bases. Caudal fin emarginate.

Colour in alcohol: Two pale (silvery) longitudinal bands extending from opercular end to base of caudal fin on each side. A black spot at the superior margin of gill opening present. Fins are without any colour markings.

Size: Largest specimen examined 78.0 mm. SL.

Distribution: India : Assam.

Remarks: *D. assamensis* is provided with a preorbital spinous process directed backwards on the anterior rim of the orbit similar to *D. regina* Fowler, *D. aequipinnatus* (McClelland), *D. amandalei* Chaudhuri and *D. kakhienensis* Anderson.

Danio choprai Hora, 1928

Figure 7

1928. *Danio* (*Brachydanio*) *choprae* Hora, *Rec. Indian Mus.*, **30** : 39 (type-locality : Myitkyina dist., Upper Burma).
1929. *Danio* (*Brachydanio*) *choprae*, Prashad and Mukerji, *Rec. Indian Mus.*, **31** : 208 (Kamaing and Myitkyina dist., Upper Burma).
- 1934a. *Danio* (*Brachydanio*) *choprae* Hora and Mukerji, *Rec. Indian Mus.*, **36** : 131 (synoptic table to species of *Brachydanio*).
1937. *Danio* (*Brachydanio*) *choprai* Hora, *Rec. Indian Mus.*, **39** : 324 (Sandoway, Lower Burma).

Material examined:

Type specimen: ZSI F 10811/1, 1 ex., 23.0 mm SL.; Myitkyina dist., Upper Burma; B.N. Chopra; 23.12.1926.

Other examples: ZSI F 10812/1, 34 exs., 17.0 mm—21.0 mm SL.; Myitkyina dist., U. Burma; B.N. Chopra; 26.12.1926. ZSI F 10813/1, 12 exs., 16.0 mm—21.0 mm SL.; Myitkyina dist., U. Burma; B.N. Chopra; 15.10.1926. ZSI F 12476/1, 4 exs., 15.0 mm—20.0 mm SL.; Sandoway, L. Burma; 30.11.1937.

Diagnosis (based on 51 specimens including type specimens, 15.0 mm—23.0 mm SL.): Head length 3.50—3.83, body depth 3.16—3.55 in the standard length. Eye diameter 2.50—3.00 in head length. Two pairs of well developed barbels. Lateral line generally absent but in certain specimens (8 out of 51) it may be present extending up to the base of pelvic fins.

Description: Head length 3.67 (3.50—3.83), body depth 3.35 (3.16—3.53), predorsal distance 1.66 (1.61—1.72), prepelvic distance 2.25 (2.10—2.37) and caudal peduncle length 5.50 (5.25—5.75) in standard length.

Least height of caudal peduncle 6.99 (6.33—7.66) in standard length, 1.26 (1.16—1.33) in its length. Height of head 1.23 (1.20—1.25) and width of head 1.83 (1.16—2.00) in head length. Eye diameter 2.75 (2.50—3.00) in head length, 1.38 (1.25—1.50) in interorbital width. Snout length 5.50 (5.00—6.00) in head length, 2.75 (2.50—3.00) in interorbital width. Mouth moderate width, obliquely directed upward. Two pairs of well developed barbels, rostral pair almost equal to eye diameter and maxillary pair much longer than eye diameter extending up to preopercular region.

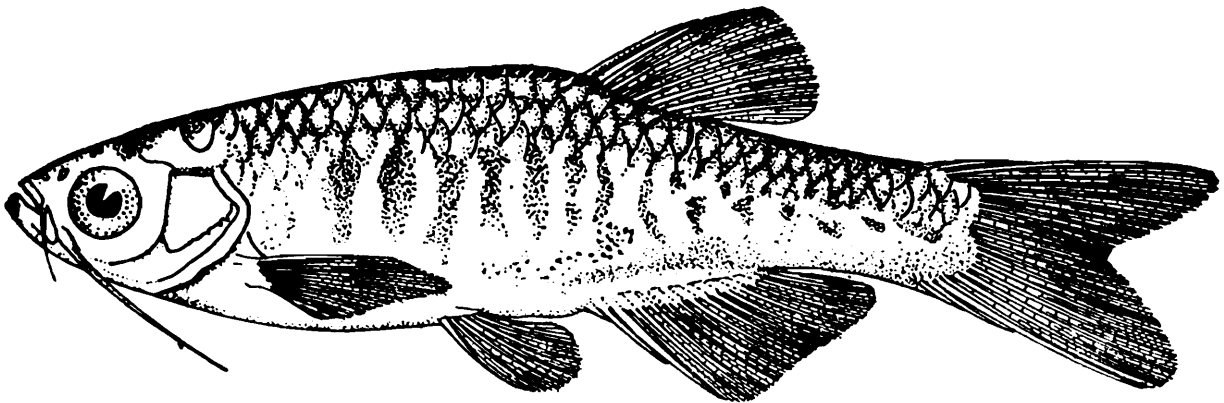


Fig. 7. Lateral view of *D. choprai*

Scales: Lateral line is variable in this species, it may be either absent or incomplete extending on the first few scales, scales along the normal course of lateral line 32—33; lateral transverse row of scales 6-7. Predorsal scales 14-15 and circumpeduncular scales 8-10.

Fins: Dorsal rays ii/6-7, Anal rays iii/12-13, Pectoral rays i/11-12. Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 4.34 (4.20—4.60), height of anal 5.88 (5.75—6.00), pectoral length 4.28 (4.04—4.60) and pelvic length 3.00 (2.90—3.10) in standard length. Caudal fin emarginate, length 3.14 (3.00—3.28) in standard length, longer than head length. Both the paired fins possess short scaly flap at their bases.

Colour in alcohol: *Danio choprai* possesses a peculiar colouration in having several dark, broad, vertical bars in anterior half which gradually reduces to mere dots in posterior half of the body. Both the dorsal and anal fins provided with longitudinal bands across their rays. Each lobe of caudal fin possess a longitudinal dark band.

Size : Largest specimen examined 23.0 mm. SL.

Distribution : Burma : Myitkyina |dist., U. Burma and Sadoway, L. Burma.

Remarks : Hora (1928) described *Danio choprai* entirely lacking lateral line in his original description but subsequently Hora (1937b) commented that "though as a rule lateral line is absent in the species, in certain specimens it may be present on the first few scales; when present, it bends abruptly downward and may extend as far as the base of pelvic"

The findings of the present studies also shows that lateral line in this species is highly variable, 8 out of 51 specimens have been discovered with lateral line incomplete, reaching base of pelvic fin.

Danio dangila (Hamilton Buchanan, 1822)

Figure 8

1822. *Cyprinus dangila* Hamilton, *Fish. Ganges*, : 321, 309 (type-locality : mountain streams of Monghyr, Bihar).
1839. *Perilampus reticulatus*, McClelland, *Asiat. Res.*, : 290, 397, pl. 45, fig. 1(7) (from Hamilton's Ms. drawings).
1937. *Danio feegradei* Hora, *Rec. Indian Mus.*, 39(4) : 325-327, text-fig. 3 (type-locality : Sandoway, Lower Burma).
1868. *Danio dangila* Günther, *Cat. Fish. Br. Mus.*, 7 : 282 (Rocky streams of Bihar). 1878. Day, *Fish. India*, : 596, pl. 150, fig. 3. 1889. Day, *Fauna Br. India, Fish*, 1 : 356. 1908. Chaudhuri, *Rec. Indian Mus.*, 2 : 126 (Lower Burma). 1921. Hora, *Rec. Indian Mus.*, 22 : 193 (Naga Hills, Assam). 1934a. Hora and Mukerji, *Rec. Indian Mus.*, 36 : 133 (synoptic table to species of the subgenus *Danio*). 1935. Hora and Mukerji, *Rec. Indian Mus.*, 37 : 383 (Naga Hills, Assam). 1936. Hora, *Rec. Indian Mus.*, 38 : 318 (Naga Hills, Assam). 1937. Shaw and Shebbeare *Jl. R. Asiat Soc. Beng. Sci.*, 3 : 27 (clear streams of Terai and Duars, N. Bengal). 1941. Hora and Gupta, *Jl. R. Asiat. Soc. Beng. Sci.*, 6(2) : 78 (Kalimpong Duars and Siliguri Terai). 1949b. Menon, *Rec. Indian Mus.*, 47 : 232 (Chhatra, E. Nepal). 1954b. Menon, *Rec. Indian Mus.*, 52 : 22, (Manipur). 1960. De Witt, *Stanford Ichthyo, Bull.*, 7(4) : 84 (Manipur). 1961. Datta, *Rec.*

Indian Mus., 56(3) : 247 (Baghmatti Drainage, Nepal). 1966. Srivastava, *J. zool. Soc. India*, 18(2) : 125 (Arunachal Pradesh). 1976. Yazdani, *J. Bombay nat. Hist. Soc.*, 74 : 19 (Khasi Hills, Meghalaya). 1977. Pillai and Yazdani, *Rec. Indian Mus.*, 72 : 9 (Garo Hills, Meghalaya). 1977. Choudhury and Sen, *Newsl. zool. Surv. India*, 3 : 219 (Arunachal Pradesh)

Material examined :

Type specimen : Not extant.

Other examples ZSI FF 1896, 47 exs., 42.0—72.0 mm. SL.; Namdapha river, Tirap district, Arunachal Pradesh; S. Biswas and S. Saha; 11.4.1971. ZSI F 11933/1, 21 exs., 49.0 mm.—65.0 mm. SL.; Assam; B. Prashad and B. N. Chopra; 28.1.1936. ZSI F 1675/2, 4 exs., 50.0 mm.—58.0 mm. SL.; Nepal; A. K. Datta; 24.6.1958. ZSI F 11415/1 and ZSI F 9619/1, 25 exs., 32.0 mm.—83.0 mm. SL.; Siliguri, West Bengal; Shaw and Shebbeare; 24.10.1931. ZSI F 12443/1, 10 exs., 35.0 mm.—69.0 mm. SL.; Naga Hills, Nagaland; C. McCann; 1930. ZSI F 1500/2, 1 ex., 53.0 mm. SL.; Rapti River, Gorakhpur, Uttar Pradesh. ZSI F 2204/2, 1 ex., 43.0 mm. SL.; Bhareli river, Assam; S. L. Hora; 12.11.1939. ZSI FF 1943, 60 exs., 30.0 mm.—53.0 mm. SL.; Arunachal Pradesh, S. Biswas; 16.12.1982. ZSI FF 1768, 6 exs., 21.0 mm.—42.0 mm. SL.; Bastar district, Madhya Pradesh, Hafeezullah and party; 28.3.1979.

Diagnosis (based on 175 specimens, 21.0 mm.—83.0 mm. SL.) : Head length 4.33—4.61 and body depth 3.25—3.66 in standard length. Eye diameter 2.50—3.75 in head length. 2 pairs of barbels, well developed. Lateral line scales 36-40.

Description : Head length 4.40 (4.33—4.61), body depth 3.46 (3.25—3.66), predorsal distance 1.70 (1.62—1.76), prepelvic distance 2.21 (2.09—2.40) and caudal peduncle length 5.73 (4.80—7.33) in standard length. Minimum height of caudal peduncle 7.43 (6.50-8.80) in standard length, 1.31 (1.20-1.66) in its length. Height of head 1.09 (1.07-1.11) and width of head 1.69 (1.62-1.83) in head length. Eye diameter 3.05 (2.50-3.75) in head length, 1.40 (1.25-1.50) in interorbital width. Snout length 3.81 (3.33-4.33) in head length, 1.76 (1.50-2.00) in interorbital width. Mouth small, obliquely directed upward. Barbels 2 pairs, rostral pair slightly shorter than head length and maxillary pair longer than head.

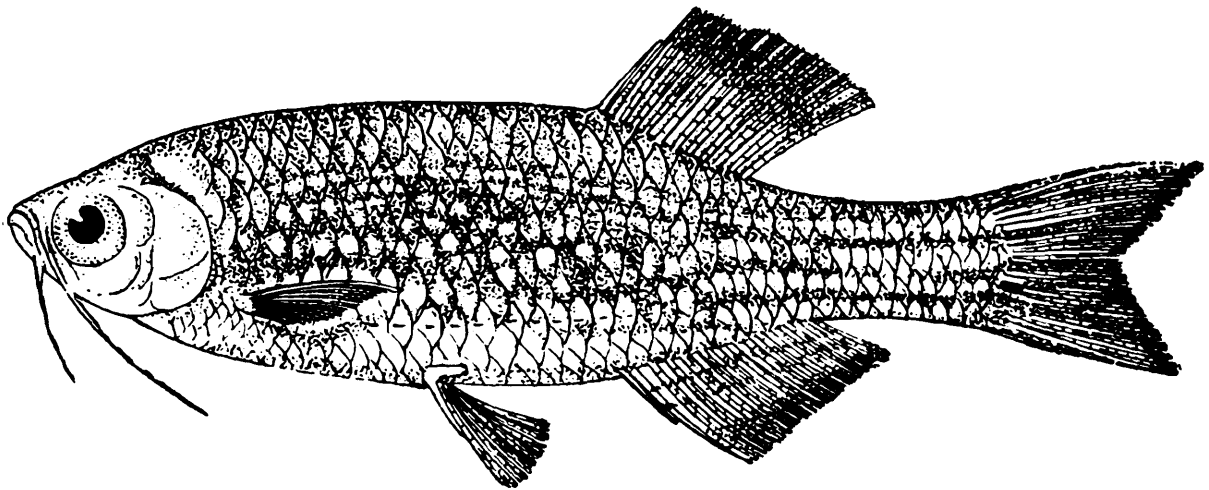


Fig. 8. Lateral view of *D. dangila*

Scales : Lateral line complete, covering 36—40 scales. Lateral transverse row of scales 8-9, $1\frac{1}{2}$ — $2\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 16-17 and circumpeduncular scales 12-14.

Fins : Dorsal rays ii/9-11, Anal rays ii-iii/12-15, Pectoral rays i/11-12, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 5.25 (4.40-5.90), height of anal 5.83 (5.50-6.00), pectoral length 4.55 (4.00-4.80) and pelvic length 6.28 (5.77-6.85) in standard length. Caudal fin emarginate, length 4.30 (3.38-5.00) in standard length. Both the pectoral and pelvic fins possess scaly flap at their bases.

Colour in alcohol : Lateral side of the body provided with several narrow blue bands, which in anterior half or two thirds of the body form a beautiful network. A dark notch present at the superior margin of the gill opening. Anal fin having 2 or 3 blue stripes across their rays.

Size : Largest specimen examined 83.0 mm. SL.

Distribution : India : Assam, Meghalaya, Arunachal Pradesh, Tripura, Nagaland, Manipur, West Bengal, Bihar, Madhya Pradesh, Uttar Pradesh, Bangladesh, Nepal and Burma.

Notes on synonymy : Hora (1937b) described a new species, viz. *Danio feegradei* based on single specimen from Sandoway, Lower Burma. Having examined the type specimen of this species preserved in the collection of the Zoological Survey of India, Calcutta, the present study reveals that *D. feegradei* is strikingly similar to *Danio dangila* (Hamilton).

Comparison of a large series of specimens of *D. dangila* from different localities of India and Burma with *D. feegradei*, shows that there are no important characters that can be taken into consideration in differentiating *D. feegradei* from *D. dangila*. Besides this, *D. feegradei* should be included among the members of *Danio* in having dorsal fin rays 11 (ii/9) and a complete lateral line. Myers (1953 : 237) also commented in a similar manner. Therefore, I have synonymised *D. feegradei* with *D. dangila*. (Barman, 1987b).

Remarks : *D. dangila* is the only species among the species of *Danio* having the longest 2 pairs of barbels, so far known, which enable the species to be separated from other species of the genus.

Danio devario (Hamilton Buchanan, 1822)

Figure 9

1822. *Cyprinus devario* Hamilton Buchanan, *Fish. Ganges*, : 341, 393, pl. 6, fig. 94 (type-locality : rivers and ponds of Bengal).
1839. *Perilampus devario*, McClelland, *Asiat. Res.*, 19(2) : 288, 341, pl. 45 (Bengal and Assam).
1839. *Perilampus ostreographus*, McClelland, *Asiat. Res.*, 19(2) : 289, 392, pl. 45, fig. 3 (type-locality : Bengal). 1842. Valenciennes (in C. & V.), *Hist. Nat. Nat. Poiss.*, 16 : 468.
1853. *Leuciscus devario*, Bleeker, *Verh. Bat. Gen.*, 25 : 68. 1842. Valenciennes (in C. & V.), *Hist. Nat. Poiss.*, 16 : 446. 1853. Bleeker, *Verh. Bat. Gen.*, 25 : 66.
1860. *Danio mcClellandi* Bleeker, *Ichth. Arch. Ind. Prodr.*, 2 : 283.
1868. *Danio devario*, Günther, *Cat. Fish. Br. Mus.*, 7 : 284 (Assam). 1869. Day, *Proc. zool. Soc. Lond.*, : 377 (Orissa). 1878. Day, *Fish. India*, : 595, pl. 150 fig. 4. 1889. Day, *Fauna Br. India, Fish*, 1 : 354. 1934a. Hora and Mukerji, *Rec. Indian Mus.*, 36 : 132 (synoptic table to species of the subgenus *Danio*). 1937. Shaw and Shebbeare, *Jl. R. Soc. Beng. Sci.*, 3 : 28 (clear streams of Terai and Duars, N. Bengal). 1941. Hora and Gupta, *Jl. R. Asiat. Soc. Beng. Sci.*, 6(2) : 78 (Kalimpong Duars and Siliguri Terai). 1947. Chauhan, *Rec. Indian Mus.*, 45 : 271 (Orissa). 1949a. Menon, *Rec. Indian Mus.*, 47 : 228 (Hoshiarpur and Gurdaspur, E. Punjab). 1949b. Menon, *Rec. Indian Mus.*, 47 : 232 (R. Kosi, E. Nepal). 1952. Mathur,

Rec. Indian Mus., 50 : 106 (Rajasthan). 1953. Chauhan and Ramakrishna, *Rec. Indian Mus.*, 51 : 393 (Orissa). 1960. De Witt, *Stanford Ichthyol. Bull.*, 7(4) : 84 (Nepal). 1964. Datta and Majumdar, *Rec. Indian Mus.*, 62 : 78 (Rajasthan). 1976. Singh, *Rec. zool. Surv. India*, 71 : 122 (North Bihar). 1977. Pillai and Yazdani, *Rec. zool. Surv. India*, 72(1-4) : 9 (Garo Hills, Meghalaya). 1977. Jayaram and Singh, *Rec. zool. Surv. India*, 72 : 249 (North Bengal). 1977. Choudhury and Sen, *Newsl. zool. Surv. India*, 3 : 219 (Arunachal Pradesh).

Material examined :

Type specimen : Not extant.

Other examples : ZSI F 1080/2, 9 exs., 33.0 mm.—49.0 mm. SL.; Udaisagar stream, Udaipur (Mewar State), Rajasthan; B. N. Chopra and M. L. Roonwal; 11.10.1941. ZSI F 13408/1, 48 exs., 36.0 mm.—52.0 mm. SL.; Kalimpong Duars and Siliguri Terai, Tista River drainage; S. L. Hora; 28.1.1941. ZSI F 2883/2, 4 exs., 43.0 mm.—51.0 mm. SL.; Tangla (Darrang dist.), Assam; S. L. Hora; 14.11.1939. ZSI F 1494/2, 9 exs., 40.0 mm.—53.0 mm. SL.; Rapti river, Conda dist., Uttar Pradesh; A. G. K. Menon; 17.2.1949. ZSI FF 1966, 6 exs., 45.0 mm.—62.0 mm. SL.; Hyderabad, Andhra Pradesh; M. Sajud-ud-Din; 1936. ZSI FF 763, 2 exs., 34.0 mm.—42.0 mm. SL.; Gomati river, Madhupur, Bihar; S. Biswas; 10.11.1968. ZSI FF 546 and FF 547, 2 exs., 31.0 mm.—46.0 mm. SL.; Sundargarh, Orissa; S. Khera and party; 17.9.1972. ZSI F 1079/2, 14 exs., 19.0 mm.—30.0 mm. SL.; Durgapur town (Durgapur state), Rajasthan; B. N. Chopra and M. L. Roonwal; 28.10.1941. ZSI F 4064/2, 2 exs., 52.0 mm.—55.0 mm. SL.; Khandia tank, Jhalawar, Rajasthan; N. Majumdar and R. N. Bhargava; 9.6.1963. ZSI F 1463/2, 7 exs., 35.0 mm.—48.0 mm. SL.; Girwa River, Baraich dist., Uttar Pradesh; A. G. K. Menon; 25.2.1949. ZSI FF 1245, 11 exs., 34.0 mm.—46.0 mm. SL.; Dibru River, Dibrugarh, Assam; T. K. Sen; 4.12.1975.

Diagnosis (based on 114 specimens, 19.0 mm.—62.0 mm. SL.): Head length 3.90—4.33 and body depth 2.60—2.86 in standard length. Eye diameter 2.57—3.00 in head length. Barbels 1 pair, maxillary very short at the junction of upper and lower jaw or absent. Lateral line scales 45-52.

Description : Head length 4.13 (3.90—4.33), body depth 2.74 (2.60—2.86), predorsal distance 1.85 (1.80—1.92), prepelvic distance 2.15 (2.11—

2.17) and caudal peduncle length 6.09 (5.57—6.50) in standard length. Minimum height of caudal peduncle 8.22 (7.80—8.66) in standard length, 1.35 (1.33—1.40) in its length. Height of head 1.37 (1.30—1.46) and width of head 1.94 (1.80—2.00) in the head length. Body much greater than head length. Eye diameter 2.85 (2.57—3.00) in head length, 1.31 (1.14—1.42) in interorbital width. Snout length 4.50 (4.00—5.00) in head length, 2.16 (1.83—2.50) in interorbital width. Mouth small, obliquely directed upward. Barbels 1 pair, maxillary, very short, present at the junction of upper and lower jaw or absent.

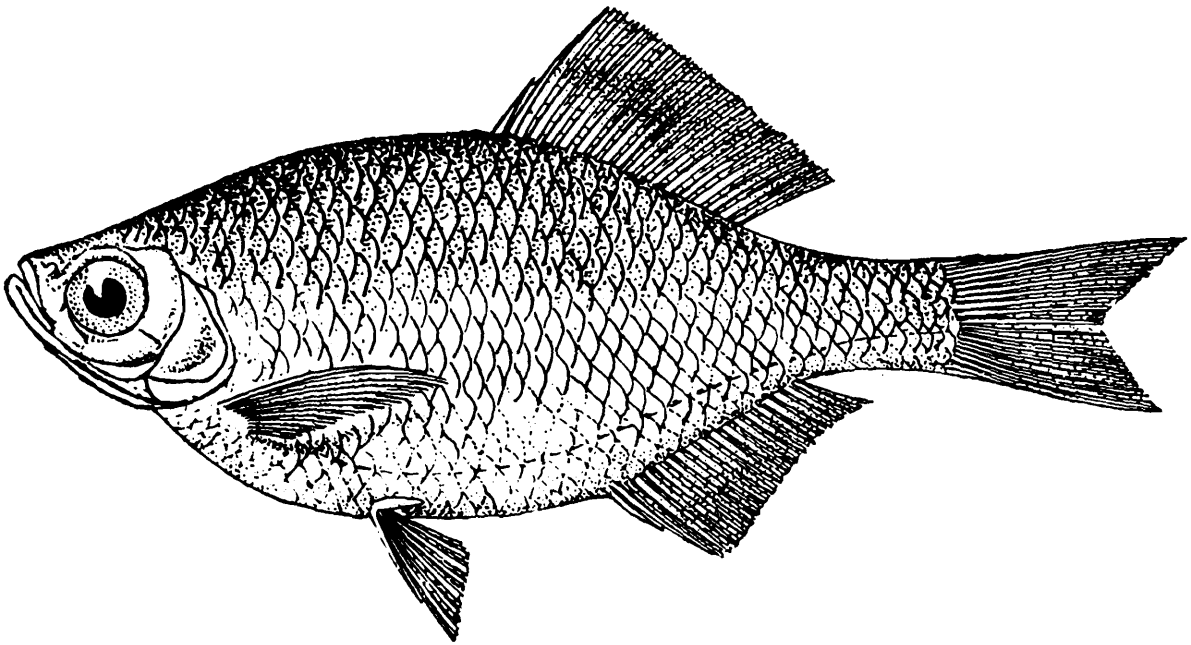


Fig. 9. Lateral view of *D. devario*

Scales : Lateral line complete, with 45—52 scales. Lateral transverse rows of scales 14-15, $2\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 13-17 and circumpeduncular scales 14-16

Fins : Dorsal rays ii-iii/15-17, Anal rays ii-iii/16-17, Pectoral rays i/11-12, Pelvic rays i/7 and Caudal rays 19. Height of dorsal 4.98 (4.50-5.37), height of anal 6.66 (6.00-7.42), pectoral length 4.47 (4.00-4.77) and pelvic length 6.48 (6.00-7.16) in standard length. Caudal fin emarginate, length 4.07 (3.54-4.54) in standard length. Both the pectoral and pelvic fins possess scaly flap at their bases.

Colour in alcohol : Dorsal surface greenish and lateral sides silvery. Anterior part of body reticulated at its centre by steel blue lines divided from one another by narrow, vertical bands. Three blue narrow bands divided by yellow bands extending backwards to base of caudal fin. Sometimes a pair of blue marks present at the base of caudal fin.

Size : Largest specimen examined 62.0 mm. SL.

Distribution : India : Assam, Meghalaya, Arunachal Pradesh, Tripura, West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Orissa, Andhra Pradesh. Pakistan. Bangladesh. Nepal and Burma.

Remarks : Day (1878) gave the description of *D. devario* with lateral line scales 41-48 and with no barbels. Hora and Mukerji (1934a) gave a synopsis of the Indian and Burmese species then known of *Danio* and *Brachydanio*. In this paper (*Rec. Indian Mus.*, 36 : 133), Hora and Mukerji (1934a) gave an erroneous lateral line scale count of 33 to 38 in this species. The findings of the present study reveals that *D. devario* has the lateral line scale 45 to 52 and 1 pair of very short maxillary barbels are present at the corner of upper and lower jaw or barbels absent entirely.

Danio fraseri Hora and Mukerji, 1935

Figure 10

1935a. *Danio fraseri* Hora and Mukerji, *Rec. Indian Mus.*, 37 : 378—380, text-fig. 3
(type-locality : Deolali, Nasik dist., Bombay Presidency, Maharashtra).

Material examined :

Type specimen : ZSI F 11791/1, Deolali, Nasik dist., Maharashtra; A. G. L. Fraser; 28. 7. 1935.

Other examples : ZSI F 12587/1, 9 exs., 29.0 mm.—67.0 mm. SL.; Waldi river, 2 miles east of its junction with Darna river up to village of Chedi, Maharashtra; A. G. L. Fraser; 7.11.1935. ZSI F 12588/1, 8 exs., 31.0 mm.—60.0 mm. SL.; Darna river, Deolali, Maharashtra; A. G. L. Fraser; 28.7.1935.

Diagnosis (based on 17 specimens, 29.0 mm.—67.0 mm. SL.) : Head length 3.50—4.25 and body depth 3.77—5.08 in standard length. Eye diameter 2.83—3.33 in head length. Lateral line scales 38-40. Lower lip hypertrophied forming a broad loose flap along the lower jaw (Fig. 10a & 70b).

Description : Head length 3.96 (3.50-4.25), body depth 4.16 (3.77-5.08), predorsal distance 1.75 (1.65-1.83), prepelvic distance 2.24 (2.05-2.45) and caudal peduncle length 5.31 (4.37-6.10) in standard length. Minimum height of caudal peduncle 8.43 (8.00-9.00) in standard length, 1.75 (1.50-2.00) in its length. Height of head 1.28 (1.18-1.42) and width of head 1.99 (1.85-2.14) in head length. Snout length 4.09 (3.75-4.33) in head length, 1.75 (1.50-2.00) in interorbital width. Eye diameter 3.12 (2.83-3.33) in head length, 1.25 (1.20-1.33) in interorbital width. Mouth small, obliquely directed upward, lower lip hypertrophied forming a broad loose flap along the lower jaw, upper lip normal. Barbels 2 pairs, rostral pair half of the eye diameter and maxillary pair shorter than rostral pair.

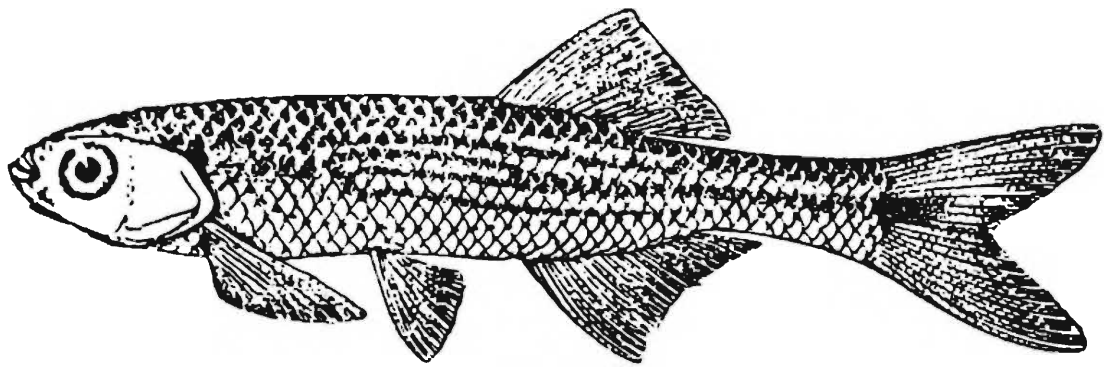


Fig. 10. Lateral view of *D. fraseri*

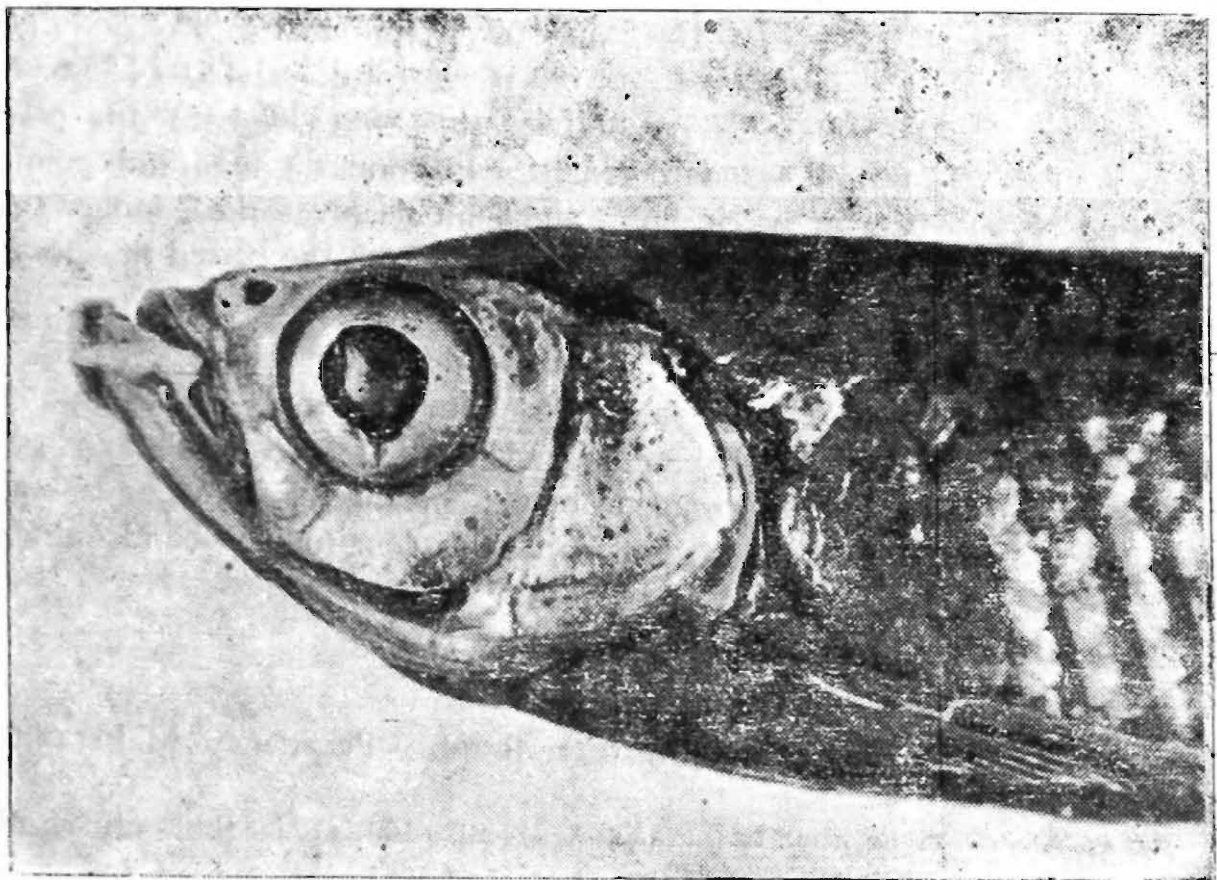


Fig. 10a. Photograph of head region of *D. fraseri*

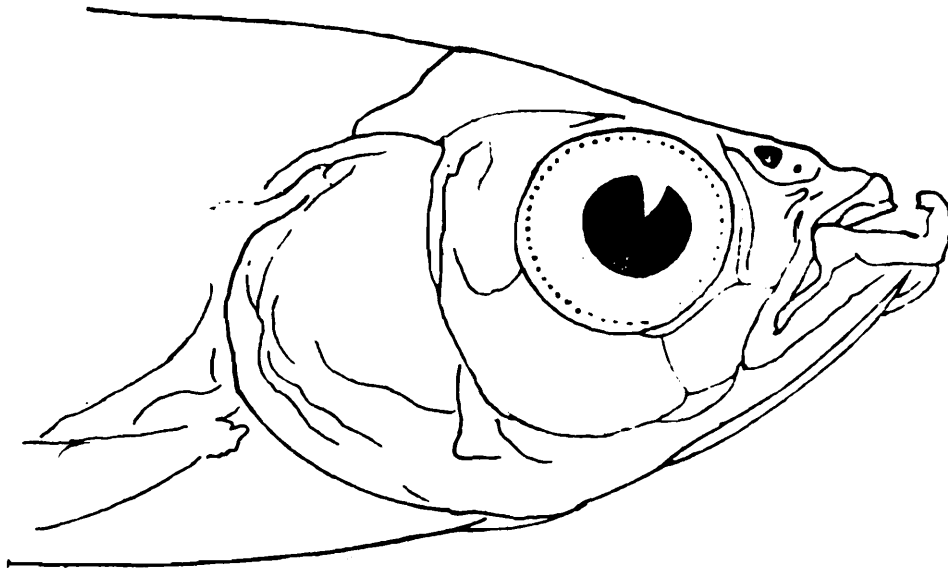


Fig. 10b. Outline sketch of head region of *D. fraseri* showing the lower lip hypertrophied forming a loose flap along the lower jaw.

Scales : Lateral line complete, covering 38-40 scales and lateral transverse rows of scales 9-10, $1\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 16-17 and circumpeduncular scales 10-12.

Fins : Dorsal rays iii/10-11, Anal rays ii-iii/15-16, Pectoral rays i/11-12, Pelvic rays i/7 and Caudal rays 19. Height of dorsal 4.91 (4.35-5.66), height of anal 5.70 (5.00-6.18), pectoral length 4.38 (3.88-4.85) and pelvic length 6.50 (6.00-7.00) in standard length. Pectoral fin long and pointed extending beyond base of pelvic fin. Caudal fin deeply forked, longer than head, length 3.10 (2.90-3.50) in standard length. Both the paired fins possess scaly flap or fleshy appendages at their bases.

Colour in alcohol : Three or four longitudinal bands extending along middle of body, middle band broader and continued to caudal fin rays. A dark spot present near upper angle of gill-opening. Free edges of scales bear series of black dots. In some specimens longitudinal bands absent.

Size : Largest specimen examined 67.0 mm. SL.

Distribution : India : Nasik district, Bombay Presidency, Maharashtra.

Remarks : *D. fraseri* Hora and Mukerji (1935a) is the only species so far known under the genus *Danio* with a hypertrophied lower lip

forming a loose flap along the lower jaw. This peculiar feature separates the species from the other members of the genus.

Danio horai Barman, 1983

Figure 11

1983. *Danio (Brachydanio) horai* Barman, *Curr. Sci.*, **52**(4) : 177-178 (type-locality : Namdapha river, Tirap dist., Arunachal Pradesh).

Material examined :

Type specimen : Holotype, ZSI FF 1827, 24.0 mm SL.; Namdapha river, Tirap dist., Arunachal Pradesh; S. Biswas and S. Saha; 12.4.1981. Paratypes, ZSI FF 1828, 9 exs., 21.0 mm—28.0 mm SL.; other data same as holotype.

Other examples : ZSI FF 1942, 48 exs., 14.0 mm—27.0 mm SL.; Namdapha river, Tirap dist., Arunachal Pradesh; S. Biswas; 20.12.1982.

Diagnosis (based on 58 specimens including type specimens, 14.0 mm—28.0 mm SL.) : Head length 3.50—4.00 and body depth 3.50-3.71 in standard length. Eye diameter 3.50-4.66 in head length. Lateral line and barbels absent. Scales along normal course of lateral line 28-30.

Description : Head length 3.75 (3.50—4.00), body depth 3.61 (3.50—3.71), predorsal distance 1.63 (1.50—1.75), prepelvic distance 2.09 (2.00—2.18) and caudal peduncle length 5.55 (5.10—6.00) in standard length. Least height of caudal peduncle 7.33 (6.00—8.66) in standard length, 1.67 (1.33—2.00) in its length. Head length almost equal to body depth. Height of head 1.28 (1.16—1.40) and width of head 1.87 (1.75—2.00) in head length. Snout length 4.50 (3.00—6.00) in head length, 2.50 (1.50—3.50) in interorbital width. Eye diameter 4.08 (3.50—4.66) in head length, 1.20 (1.00—1.40) in interorbital width. Eye diameter longer than snout length. Mouth small, obliquely directed upward with lower jaw longer than upper jaw. Barbels absent. Lateral line absent.

Scales : Scales along normal course of lateral line 28-30 and lateral transverse rows of scales 7. Predorsal scales 13-14 and circumpeduncular scales 10.

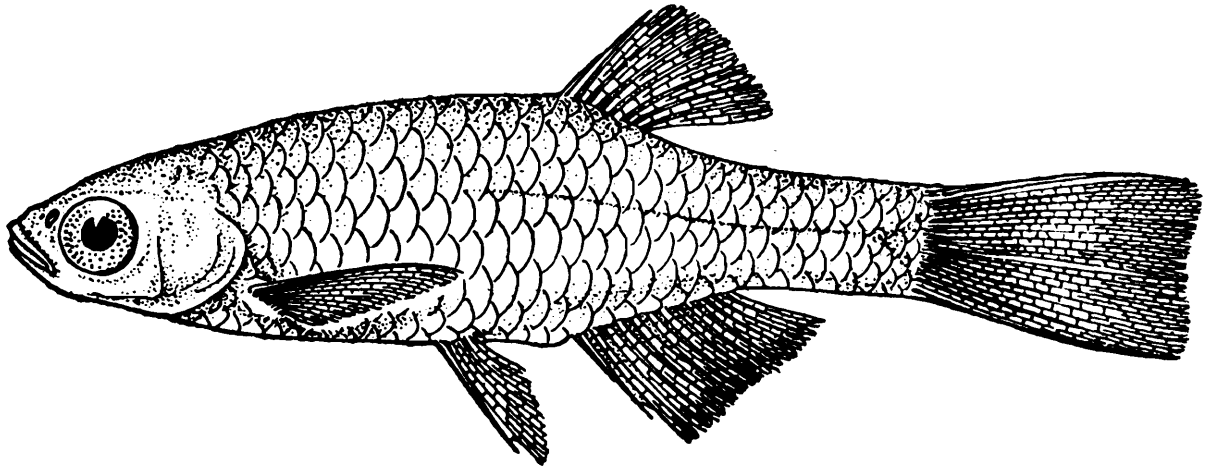


Fig. 11. Lateral view of *D. horai*.

Fins: Dorsal rays ii/7, Anal rays ii/12-13, Pectoral rays i/10-11, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 3.66 (3.28—4.00), height of anal 4.27 (3.83—4.80), pectoral length 3.50 (3.00—4.00) and pelvic length 5.14 (4.60—6.00) in standard length. Pectoral fins pointed and well extending beyond base of pelvic fin. Caudal fin slightly emarginate or truncate, length 4.30 (3.60—5.20) in standard length, shorter than head length.

Colour in alcohol: A dark longitudinal band extending from the mid-region of the body to base of caudal fin on each side. Fins are devoid of any colour markings.

Size: Largest specimen examined 28.0 mm. SL.

Distribution: India : Arunachal Pradesh.

Remarks: *D. horai* (Barman, 1983) is closely related to *D. acuticephala* (Hora, 1921a) in the absence of lateral line and barbels but can be easily separated by the following characters. Anal fin rays 14 to 15 in the former species vs. 11 to 12 in the latter species. Pectoral fin pointed and well extending to pelvic fin in the former species vs. pectoral fin rounded and not extending to pelvic fin in the latter species. Caudal fin truncate or slightly emarginate in the former species vs. caudal fin deeply emarginate with both lobes pointed, the lower one slightly longer in the latter species.

Danio kakhienensis Anderson, 1878

Figure 12

1878. *Danio kakhienensis* Anderson, *Anatomical and Zoological researches etc.*, London. Fishes, : 968 (type-locality : Nampoung River, Western Yunnan, China).

1934a. *Danio kakhienensis*, Hora and Mukerji, *Rec. Indian Mus*, 36(1) : 133 (synoptic table to species of the subgenus *Danio*).

Diagnosis : Body depth exceeds head length by nearly the breadth of the interocular interval. Lateral line scales 32. Barbels 1 pair.

Description : The depth of the body exceeds the length of head by nearly the breadth of the interocular interval. Mouth small, obliquely directed upward. Barbels 1 pair, equalling half of head length by nearly breadth of interocular interval.

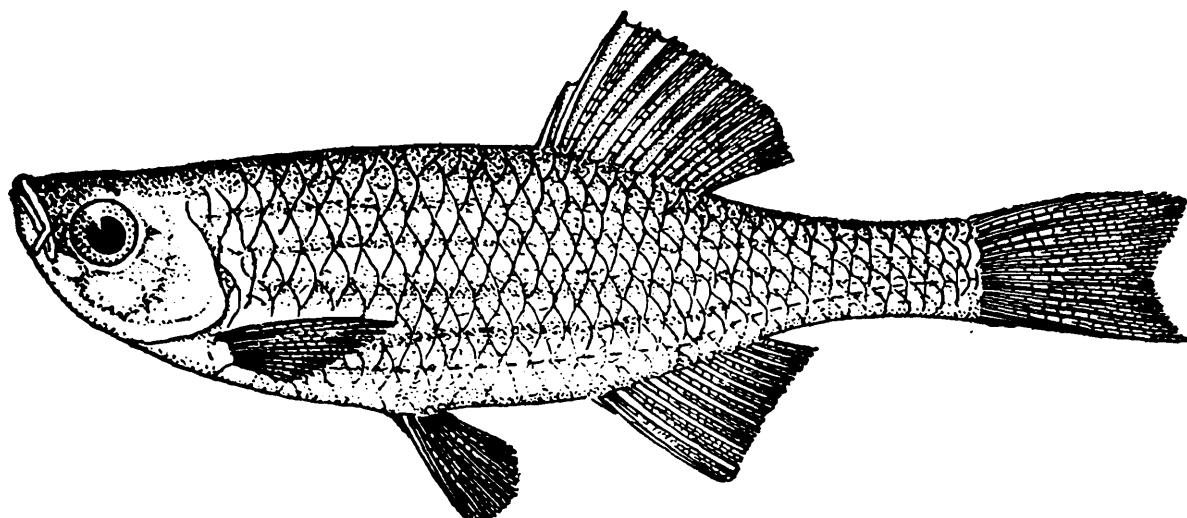


Fig. 12. Lateral view of *D. kakhienensis*.

Scales : Lateral line complete, with 32 scales and lateral transverse rows of scales 11. Scales rather thick and stiff, the size decrease posteriorly, those on the breast very small. Basal radii never present, apical radii very strong, 10 to about 26, invading into lateral fields in some scales. In scales on the trunk and tail, there have been developed very strong vertical breaks connecting the apical radii and thus making the exposed field reticular in appearance. Scales subspherical on the back, broadly triangular, with the basal margin subtruncate, on the trunk; subhexagonal, with the basal margin slightly produced in middle, on the tail; roundish or ovate on the breast.

Fins : Dorsal rays 10, last divided in base, anal rays 14 and pectoral rays 13.

Colour in alcohol : A dark narrow band along the middle of side and through caudal fin, with occasionally obscure dusky bands above and below it. The scales are minutely punctuated with black, the dots tending to group themselves along margins of scales.

Distribution : China : Western Yunnan and Burma.

Type specimen : Syntypes, in the British Museum Natural History, London.

Remarks : As I could not examine any specimen of this species this description is based on the literature of this species.

***Danio manipurensis* Barman, 1987**

Figure 13

1987a. *Danio manipurensis* Barman, *J. Bombay nat. Hist. Soc.*, **84**(1) : 172-174 (type-locality : Manipur, India).

Material examined :

Type specimen : Holotype : ZSI FF 1999, 25.0 mm. SL.; Manipur, India; S. L. Hora; 8.3.1920.

Paratypes, ZSI FF 2000, 17 exs. 16.0 mm.—38.0 mm. SL.; Locality, collector and date of collection same as in holotype.

Diagnosis (based on 18 type specimens, 16.0 mm.—38.0 mm. SL) : Head length 3.33—3.87 and body depth 3.00—3.30 in standard length. Eye diameter 2.66—3.00 in head length. Barbels 2 pairs, short, maxillary pair shorter than rostral pair. Lateral line scales 33-34.

Description : Head length 3.62 (3.33-3.87), body depth 3.14 (3.00-3.30), predorsal distance 1.67 (1.65-1.72), prepelvic distance 2.07 (2.00-2.13) and caudal peduncle length 5.59 (5.00-6.33) in standard length. Minimum height of caudal peduncle 8.17 (6.88-10.33), in standard length, 1.23

(1.20-1.25) in its length. Height of head 1.22 (1.11-1.33) and width of head 1.78 (1.60-2.00) in head length. Eye diameter 2.79 (2.66-3.00) in head length, 1.19 (1.00-1.33) in interorbital width. Snout length 4.37 (3.75-5.00) in head length, shorter than eye diameter, 1.75 (1.50-2.00) in interorbital width. Mouth small, obliquely directed upward, lower jaw longer than upper jaw. Barbels 2 pair, rostral pair shorter than eye diameter and maxillary pair half the length of rostral pair.

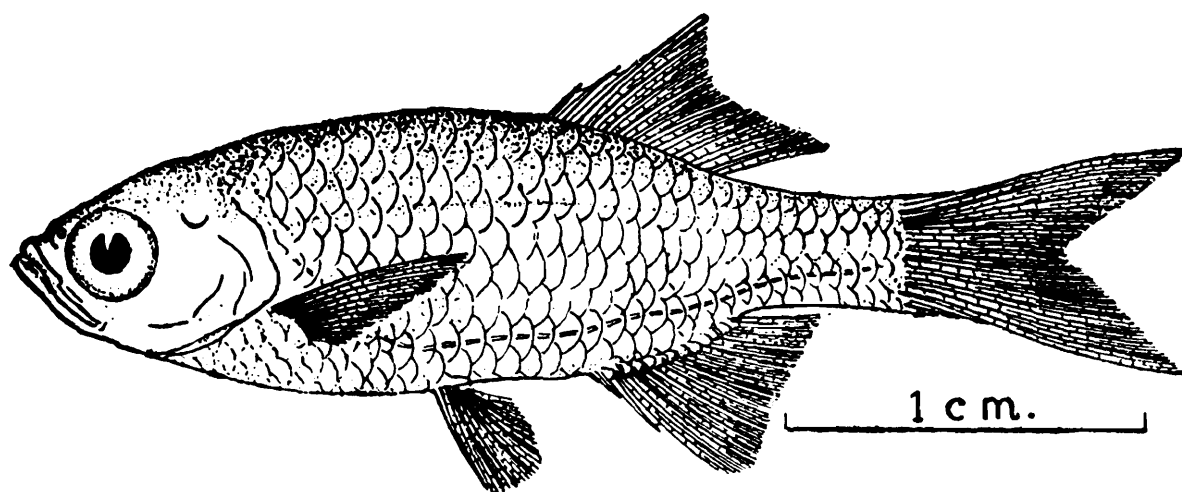


Fig. 13. Lateral view of *D. manipurensis*.

Scales : Lateral line complete, with 33-34 scales. Lateral transverse rows of scales 8-9, $1\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 14-15 and circumpeduncular scales 8-10.

Fins : Dorsal rays ii-iii/10-11, Anal rays iii-iii/12-13, Pectoral rays i/11-12, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 4.92 (4.50-5.33), height of anal 5.88 (5.00-6.75), pectoral length 4.21 (3.85-4.57) and pelvic length 7.13 (6.25-8.00) in standard length. Pectoral fin reaches base of pelvic fin. Both pectoral and pelvic fins possess scaly flap at their bases. Caudal fin emarginate, length 3.53 (3.25-4.00) in standard length, almost equal to head.

Colour in alcohol : A light darkish longitudinal narrow band extending from behind the head to base of caudal fin. Fins are without any colour bands.

Size : Largest specimen examined 38.0 mm. SL.

Distribution : India : Manipur.

Remarks : *D. manipurensis* Barman (1987a) is related to *D. naganensis* Chaudhuri (1912) from which the former species can be easily separated mainly on the lateral line scale and dorsal fin ray counts.

Danio naganensis Chaudhuri, 1912

Figure 14

1912. *Danio naganensis* Chaudhuri, *Rec. Indian Mus.*, **7** : 441, pl. 40, figs. 1, 1a and 1b (type-locality : Lungting river, Naga Hills, Assam).
1921. *Danio naganensis*, Hora, *Rec. Indian Mus.*, **22** : 175 (Manipur). 1934a. Hora and Mukerji, *Rec. Indian Mus.*, **36** : 133 (synoptic table to species of the subgenus *Danio*). 1935b. Hora and Mukerji, *Rec. Indian Mus.*, **37** : 387 (Naga Hills, Assam). 1936. Hora, *Rec. Indian Mus.*, **38** : 318 (Naga Hills, Assam). 1954b. Menon, *Rec. Indian Mus.*, **52** : 22 (Manipur).

Material examined :

Type specimen : Syntypes, ZSI F5297/1—F5302/1, 6 exs., 31.0 mm—53.0 mm. SL.; Lungting river, Manipur; Rev. Pettygreav.

Other examples : ZSI F11854/1,—F11855/1, 11 exs., 34.0 mm—51.0 mm. SL.; Tizu river, Naga Hills, Nagaland; J. H. Hutton; March, 1927. ZSI F11856/1, 2 exs., 32.0 mm.—48.0 mm. SL.; Zhuzati stream, Naga Hills, Nagaland; J. H. Sutton; March, 1927. ZSI F11858/1, 85 exs., 21.0 mm.—51.0 mm. SL.; Sakhai, Naga Hills, Nagaland; B. P. and B. N. C.; 24.2.1935. ZSI F11932/1, 1 ex. 57.0 mm. SL.; Naga Hills, Nagaland; 1936.

Diagnosis (Based on 106 specimens including syntypes, 31.0 mm.—57.0 mm. SL.) : Head length 3.60—4.16 and body depth 3.60—4.16 in standard length. Eye diameter 3.33—4.00 in head length. Lateral line scales 40-42. Barbels 2 pairs.

Description : Head length 3.90 (3.60-4.16), body depth 3.88 (3.60—4.16), predorsal distance 1.66 (1.55—1.77), prepelvic distance 2.40 (2.19—2.60) and caudal peduncle length 5.01 (4.33—5.70) in standard length. Least height of caudal peduncle 8.57 (8.14—9.00) in standard length, 1.70 (1.42—2.00) in its length. Height of head 1.24 (1.16—1.33) and width of head 1.90 (1.80—2.00) in head length. Head length almost equal to

body depth. Eye diameter 3.67 (3.33—4.00) in head length, 1.47 (1.33—1.60) in interorbital width. Snout length 4.50 (4.00—5.00) in head length, 1.80 (1.60—2.00) in interorbital width. Mouth small, obliquely directed upward. Barbels 2 pairs, rostral pair half of eye diameter and maxillary pair shorter, being half of rostral pair.

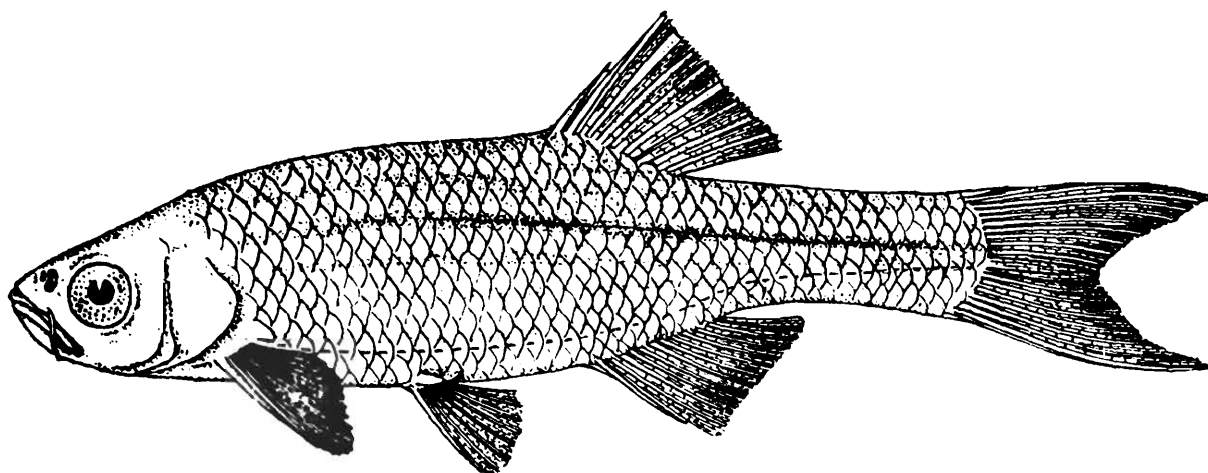


Fig. 14. Lateral view of *D. naganensis*.

Scales: Lateral line complete, covering 40—42 scales. Lateral transverse rows of scales 10-11, $2\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 18-20 and circumpeduncular scales 10-12.

Fins: Dorsal rays iii/8, Anal rays ii/12-13, Pectoral rays i/11-12, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 5.10 (4.33—5.88), height of anal 5.38 (4.87—5.88), pectoral length 5.13 (4.38—5.88) and pelvic length 7.20 (5.57—8.83) in standard length. Both the paired fins possess scaly flap at their bases. Caudal fin emarginate.

Colour in alcohol: Dorsal surface greenish brown and ventral surface dull white. A light steel grey longitudinal band present in the middle of lateral side extending to base of caudal fin.

Size: Largest specimen examined 57.0 mm. SL.

Distribution: India : Manipur and Nagaland.

Remarks: The findings of the present study shows that from the distributional point of view it appears that *D. naganensis* replaces *D. aequipinnatus* in the Chindwin drainage of Naga Hills, Nagaland.

Danio neilgherriensis (Day, 1867)

Figure 15

1867. *Paradanio neilgherriensis* Day, *Proc. zool. Soc. Lond.*, : 296 (type-locality : Nilgiri Hills, S. India).
1878. *Danio neilgherriensis* Day, *Fish. India*, : 597, pl. 150, fig. 2. 1889. Day, *Fauna Br. India, Fish*, 1 : 357. 1934a. Hora and Mukerji *Rec. Indian Mus.*, 36(1) : 134 (synoptic table to species of the subgenus *Danio*).

Material examined :

Type specimen : Syntypes, ZSI 2488 and ZSI 2492, 2 exs., 50.0 mm.—58.0 mm. SL.; Neilgherry Hills, S. India purchased from Day.

Other examples : ZSI FF1998, 4 exs. 40.0 mm.—52.0 mm. SL.; Namdapha river, Tirap district, Arunachal Pradesh; S. Biswas; 16.12.1982.

Digagnosis (based on 6 specimens including syntypes, 40.0 mm.—58.0 mm. SL.) : Head length 4.00—4.25 and body depth 4.00—4.63 in standard length. Eye diameter 3.33—4.33 in head length. Barbels 2 pairs, short. Lateral line scales 37-38.

Description : Head length 4.12 (4.00—4.25), body depth 4.32 (4.00—4.63), predorsal distance 1.79 (1.73—1.85), prepelvic distance 2.18 (2.00—2.36) and caudal peduncle length 4.75 (4.25—5.25) in standard length. Minimum height of caudal peduncle 10.56 (10.00—11.12) in standard length, 2.20 (2.00—2.40) in its length. Height of head 1.34 (.25—1.44) and width of head 2.08 (2.00—2.16) in head length. Eye diameter 3.83 (3.33—4.33) in head length, 1.50 (1.33—1.66) in interorbital width. Snout length equal to eye diameter. Mouth small, obliquely directed upward. Barbels 2 pairs, rostral pair shorter than eye diameter and maxillary pair very short.

Scales : Lateral line complete, covering 37-38 scales. Lateral transverse rows of scales 7-8, 2½ rows of scales between lateral line and base of pelvic fin. Predorsal scales 16-18 and circumpeduncular scales 10.

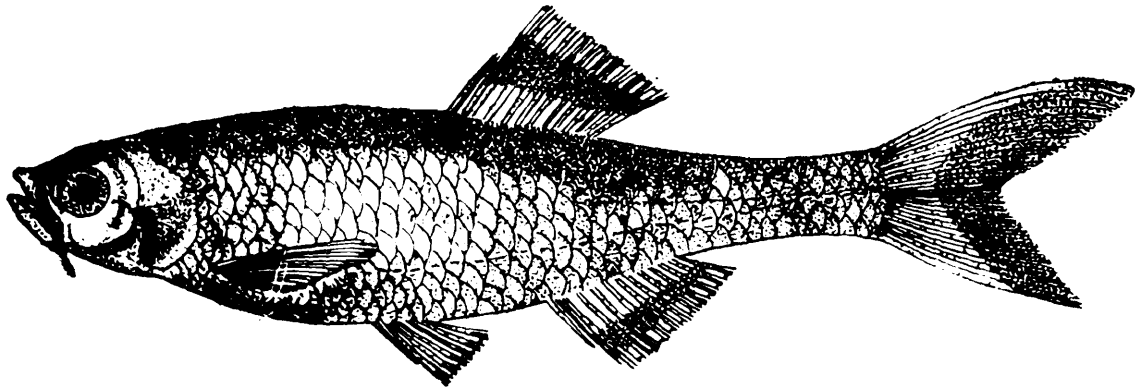


Fig. 15. Lateral view of *D. neilgherriensis*.

Fins : Dorsal ray ii-iii/9-11, Anal rays iii/11-12, Pectoral rays i/12-13, Pelvic rays i/6 and Caudal rays 19. Height of dorsal 5.41 (5.27—5.55), height of anal 6.34 (6.25—6.44), Pectoral length 4.91 (4.83—5.00) and pelvic length 7.79 (7.25—8.33) in standard length. Caudal fin forked, length 4.50 (4.16—5.00) in standard length.

Colour in alcohol : Dorsal surface greenish, sides silvery, with a purplish tinge along the ventral surface. A lateral longitudinal dark narrow band extending from behind head to base of caudal fin

Size : Largest specimen examined 58.0 mm. SL.

Distribution : India : Nilgiri Hills, Tamil Nadu, Madhya Pradesh and Arunachal Pradesh.

Remarks : Day (1867) described *D. neilgherriensis* from the rivers of the Nilgiri Hills, Tamil Nadu. After Day, no record of this species is known from anywhere in India. A recent (1981) collection of fish from the Namdapha river, Tirap district, Arunachal Pradesh (formerly NEFA) shows that the presence of this species in that locality (Datta & Barman, 1985). This discontinuous distribution of this species is of great zoogeographical interest because its presence in that locality indicates its range of distribution to the North-Eastern India. Moreover, the present record of this species is second record subsequent to Day (1867) in India. Karmakar and Datta (1988) also recorded this species from Bastar district, Madhya Pradesh.

Danio nigrofasciatus (Day, 1869)**Figure 16**

1869b. *Barilius nigrofasciatus* Day, *Proc. zool. Soc. Lond.*, : 620 (type-locality : Burma).

1878. *Danio nigrofasciatus* Day, *Fish. India*, : 597. 1889. Day, *Fauna Br. India, Fish*, 1 : 359. 1931. Hora, *Rec. Indian Mus.*, 33 : 2 (Rangoon).

1934a. *Danio (Brachydanio) nigrofasciatus*, Hora and Mukerji, *Rec. Indian Mus.*, 36 : 131 (synoptic table to species of the subgenus *Brachydanio*).

Diagnosis : Head length 5.50 and body depth 3.50 in total length. Eye diameter almost half of head length. Barbels 1 pair. Scales along the normal course of lateral line 30-32. Lateral line absent.

Description : Head length 5.50 and body depth 3.50 in total length. Eye diameter nearly half of head length. Barbels 1 pair, maxillary extending below the orbit, rostral pair absent.

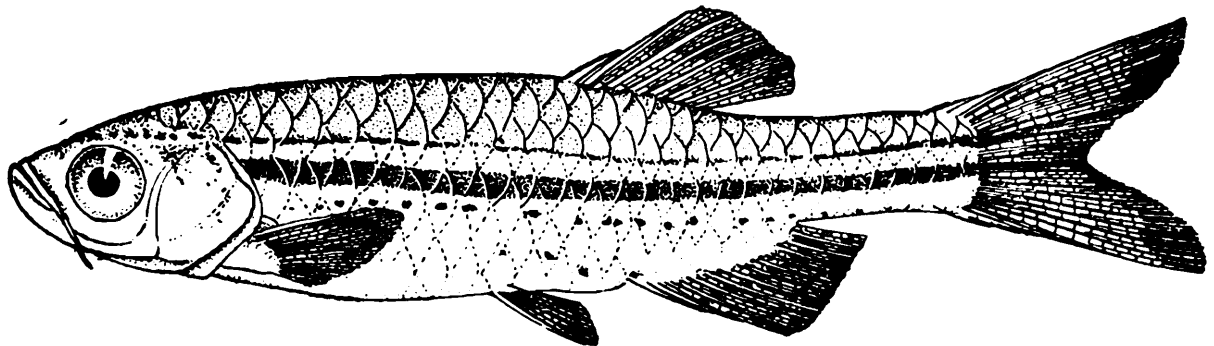


Fig. 16. Lateral view of *D. nigrofasciatus*.

Scales : Lateral line absent, scales along the normal course of lateral line 30-32. Lateral transverse rows of scales 7.

Fins : Dorsal rays ii/7, Anal rays ii/11, Pectoral rays i/14, Pelvic rays i/6 and Caudal rays 19. Dorsal fin situated over the first portion of the anal fin and midway between the posterior extremity of the orbit and base of caudal fin which is lunate.

Colour in alcohol : A dark band passing along the side of body and a second dotted narrow band below it. Dorsal and anal fins spotted with black in lines. In some specimens the body is intensely blue.

Size : Largest specimen recorded 25.0 mm. TL.

Distribution : Burma : Pegu and Moulmein.

Type specimen : Not known.

Remarks : As no specimen of this species is available to me for examination, this description has been based on the literature of this species.

Danio rerio (Hamilton Buchanan, 1822)

Figure 17

1822. *Cyprinus rerio* Hamilton Buchanan, *Fish. Ganges*, : 323 (type-locality : R. Kosi).
1822. *Cyprinus chapalio* Hamilton Buchanan, *Fish. Ganges*. : 324, 390 (type-locality : ponds of Bengal).
1839. *Perilampus striatus*, McClelland, *Asiat. Res.*, **19** : 290, 397, pl. 46, fig. 1 (from Hamilton's Ms. drawings).
1853. *Nuria rerio* Bleeker, *Verh. Bat Gen.*, **25** : 62.
1868. *Barilius rerio*. Günther, *Cat. Fish. Br. Mus.*, **7** : 292 (Bengal).
1868. *Danio lineatus*, Day. *Proc. zool. Soc. Lond.*, : 198 (Madras).
1878. *Danio rerio*, Day, *Fish. India*, : 597, pl. 151, fig. 4. 1889. Day, *Fauna Br. India, Fish*, **1** : 358. 1921b. Hora, *Rec. Indian Mus.*, **22**(4) : 743 (Darjeeling). 1922. Hora, *Rec. Indian Mus.*, **24**(1) : 35 Naga Hills, Nagaland). 1934a Hora and Mukerji, *Rec. Indian Mus.*, **36**(1) : 130, 131 (synoptic table to species of *Brachydanio*). 1936. Hora and Mukerji, *Rec. Indian Mus.*, **38** : 133 (Eastern Doons). 1937c. Hora, *Rec. Indian Mus.*, **39** : 339 (Kumaon Himalayas). 1937. Shaw and Shebbeare, *Jl. R. Asiat. Soc. Beng. Sci.*, **3** : 29 (edge of streams and ditches in the Terai, N. Bengal). 1938a, Hora, *Rec. Indian Mus.*, **40** : 173 (Rajmahal Hills, Bihar) 1939. Das, *Rec. Indian Mus.*, **41**(4) : 439 (Bihar), 1941. Hora and Gupta, *Jl. R. Asiat. Soc. Beng. Sci.*, **6**(2) : 79 (Kalimpong Duars and Siliguri Terai). 1947. Chauhan, *Rec. Indian Mus.*, **45** : 273 (Orissa). 1949c. Menon, *J. Bombay nat. Hist. Soc.*, **48** : 538.

(Kumaon Himalayas). 1949a. Menon, *Rec. Indian Mus.*, **47** : 228 (Hoshiarpur and Gurdaspur, E. Punjab). 1951. Menon, *Rec. Indian Mus.*, **48** : 71 (Chotanagpur, Bihar). 1954. Chauhan and Ramakrishna, *Rec. Indian Mus.*, **51** : 396, 401 (Orissa). 1960. De Witt, *Stanford Ichthyol. Bull.* **7** : 84 (Nepal). 1961. Menon, *Rec. Indian Mus.*, **59** : 44 (Chilka lake, Orissa). 1964. Datta and Majumdar, *Rec. Indian Mus.*, **62** : 78 (Rajasthan). 1966. Srivastava, *J. zool. Soc. India* **18** : 125 (Tirap Frontier Division, NEFA). 1966. Srivastava, Chandra and Wishard, *Rec. Indian Mus.*, **64** : 132 (Uttar Pradesh). 1968. Tilak, *Rec. zool. Surv. India*, **66** : 285 (Sikkim). 1971. Jayaram and Yazdani, *Rec. zool. Surv. India*, **69** : 311 (Orissa). 1976. Yazdani, *J. Bombay nat. Hist. Soc.*, **74** : 18 (Khasi Hills, Meghalaya). 1977. Pillai and Yazdani, *Rec. zool. Surv. India*, **72** : 9 (Garo Hills, Meghalaya). 1977. Jayaram and Singh, *Rec. zool. Surv. India*, **72** : 249 (North Bengal). 1977. Choudhury and Sen, *Newsl. zool. Surv. India*, **3** : 220 (Arunachal Pradesh).

Material examined :

Type specimen : Not extant.

Other examples : ZSI F 10957/1—F 10959/1, 102 exs., 20.0 mm—38.0 mm SL ; Mitkyina dist., Upper Burma ; B.N. Chopra 22.12.1926. ZSI F 2273/2, 35 exs., 9.0 mm—16.0 mm SL. ; Balaghat dist., Madhya Pradesh ; B.S. Lamba ; 9.11.1961. ZSI F 12420/1, 60 exs., 13.0 mm—23.0 mm SL. ; stream on Kalurkatte Road, Karnataka ; H.S. Rao ; 20.5.1937. ZSI F 7327/1—F 7337/1, 11 exs., 21.0 mm—31.0 mm SL. ; Kalka Hill stream, Haryana ; N. Annandale ; May, 1911. ZSI F 9353/1, 19 exs., 12.0 mm—23.0 mm SL. ; Cooch Behar, West Bengal ; T. Southwell ; 26.1.1917. ZSI F 2207/2, 62 exs., 20.0 mm—31.0 mm SL. ; Darrang dist., Assam ; S.L. Hora ; 18.12.1939. ZSI F 12008/1, 8 exs., 14.0 mm—23.0 mm SL. ; Dehra Dun, Uttar Pradesh ; S.L. Hora ; 2.10.1935. ZSI F 2529/2, 90 exs., 11.0 mm—28.0 mm SL. ; River Ganges, Bhagalpur, Bihar ; D.D. Mukerji ; 16.11.1929. ZSI F 12740/1, 84 exs., 13.0 mm—30.0 mm SL. ; Boarijore, Bihar ; H.S. Rao and H.A. Hafix ; 24.11.1938. ZSI FF 862, 15 exs., 11.0 mm—26.0 mm SL. ; Koraput dist., Orissa ; K.V.S. Rao ; 10.2.1972. ZSI FF 405, 2 exs., 15.0 mm—25.0 mm SL. ; Khairna River, Nepal ; Mitter and Gonur ; 25.11.1948.

Diagnosis (based on 488 specimens, 9.0 mm—38.0 mm SL. ;) : Head length 3.76—4.44 and body depth 3.36—4.16 in standard length. Eye diameter 3.00—3.50 in head length. 2 pairs of well developed barbels, Lateral

line variable, it may be incomplete or totally absent. Longitudinal row of scales 32-33.

Description : Head length 4.10 (3.76—4.44), body depth 3.76 (3.36—4.16), predorsal distance 1.64 (1.60—1.66), prepelvic distance 2.11 (2.00—2.22) and caudal peduncle length 6.38 (5.75—7.00) in the standard length. Least height of caudal peduncle 8.50 (7.66—9.33) in the standard length, 1.28 (1.20—1.33) in its length. Height of head 1.17 (1.16—1.21) and width of head 1.65 (1.50—1.80) in head length. Eye diameter 2.25 (3.00—3.50) in head length, 1.48 (1.33—1.60) in interorbital width. Snout length 4.13 (3.60—4.66) in head length, 1.80 (1.60—2.00) in interorbital width. Mouth small, obliquely directed upward. Barbels 2 pairs, well developed, rostral pair considerably longer than eye diameter and maxillary pair extending beyond half the length of pectoral fin.

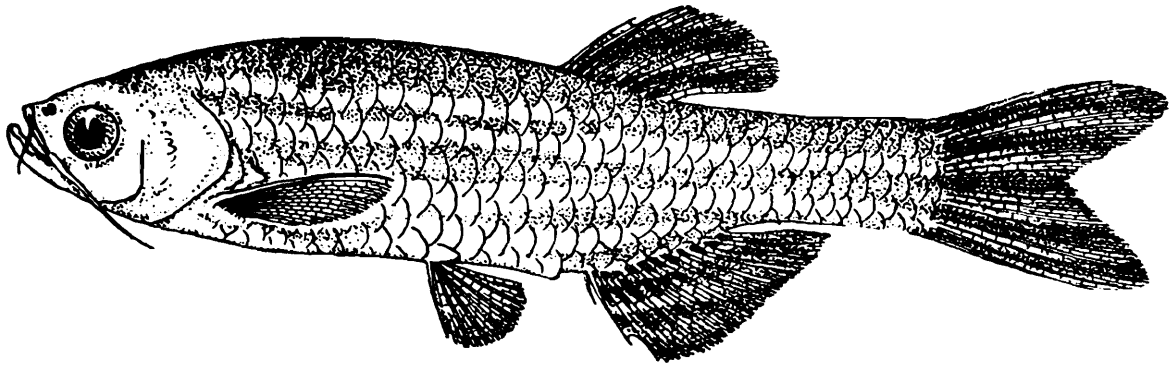


Fig. 17. Lateral view of *D. rerio*

Scales : Lateral line is highly variable, it may be incomplete extending up to base of pelvic fin or absent entirely. Scales along the normal course of lateral line 32-33. Lateral transverse row of scales 6-7. Predorsal scales 15-16 and circumpeduncular scales 8-10.

Fins : Dorsal rays ii/6-7, Anal rays ii-iii/12-13, Pectoral rays i/11-12, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 4.50 (4.00—5.00), height of anal 5.16 (4.60—5.71), pectoral length 4.09 (3.73—4.44) and pelvic length 6.38 (5.75—7.00) in standard length. Both the pectoral and pelvic fins possess scaly flap at their bases. Caudal fin deeply forked, length 3.56 (3.12—4.00) in standard length.

Colour in alcohol : Four metallic longitudinal bands separated by three narrow silver ones along sides present, forming three bands on the caudal fin. Anal fin with three bands across their rays.

Size s Largest specimen examined 38.0 mm SL.

Distribution : India : Assam, Meghalaya, Tripura, Nagaland, Arunachal Pradesh, Sikkim, West Bengal, Bihar, Orissa, Haryana, Punjab, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka and Kerala (W. Ghats). Pakistan. Bangladesh. Burma. Sri Lanka. Nepal. Burma.

Danio shanensis Hora, 1928

Figure 18

1928. *Danio (Brachydanio) Shanensis* Hora *Rec. Indian Mus.*, **30** : 38 (type-locality : Hsipaw, Northern Shan States, Burma). 1934a. Hora & Mukerji, *Rec. Indian Mus.*, **36** : 128 (Southern Shan State, Burma).
- 1934a. *Danio shanensis* Fowler, *Proc. Acad. nat. Sci. Phillad.*, : 113, fig. 65 (Chiengmai and Metang, north of Chiengmai, Northern Thailand).

Material examined :

Type specimen : ZSI F 10814/1, 1 ex., 30.0 mm SL.; Hsipaw, N. Shan States, Burma; B.N. Chopra and H.S. Rao; Jan. 1927.

Other examples : ZSI F 10815/, 11 exs., 15.0 mm—30.0 mm SL.; Hsipaw, N. Shan States, Burma; B.N. Chopra and H.S. Rao; Jan. 1927. ZSI F 10816/1, 8 exs., 19.0 mm—36.0 mm SL.; Namkhan, N. Shan States, Burma; H.S. Rao; Nov. 1926. ZSI F 10817/1, 7 exs., 30.0 mm—40.0 mm SL.; Namkhan, N. Shan States, Burma; H.S. Rao; Dec. 1927. ZSI F 10818/1, 60 exs., 15.0 mm.—37. mm. SL.; Namhkan, S. Shan States, Burma; H. S. Rao; Nov. 1926.

Diagnosis (based on 93 specimens including type specimen, 15.0 mm.—40.0 mm. SL.) : Head length 3.63—4.11 and body depth 3.36—3.70 in standard length. Eye diameter 3.00—3.66 in head length. Lateral line is generally incomplete but in some specimens (9 out of 93) it is complete. Scales along the normal course of lateral line 33—34.

Description : Head length 3.88 (3.63—4.11), body depth 3.53 (3.36—3.70), predorsal distance 1.67 (1.66—1.68), prepelvic distance 2.12 (2.05—2.22) and caudal peduncle length 4.95 (4.62—5.28) in standard length. Least height of caudal peduncle 8.33 (7.40—9.25) in standard length, 1.70

(1.40—2.00) in its length. Height of head 1.25 (1.12—1.37) and width of head 2.48 (2.20—2.75) in head length. Eye diameter 3.33 (3.00—3.66) in head length, 1.33 (1.33—1.33) in interorbital width. Snout length 5.00 (4.50—5.50) in head length, 2.00 (2.00—2.00) in interorbital width. Eye diameter considerably longer than snout length. Mouth small, obliquely directed upward. Barbels generally absent but in some specimens a pair of very short maxillary barbels present. Lateral line is highly variable in this species, in most of the specimens it is incomplete, extending near or beyond base of anal fin but in some specimens it reaches up to base of caudal fin.

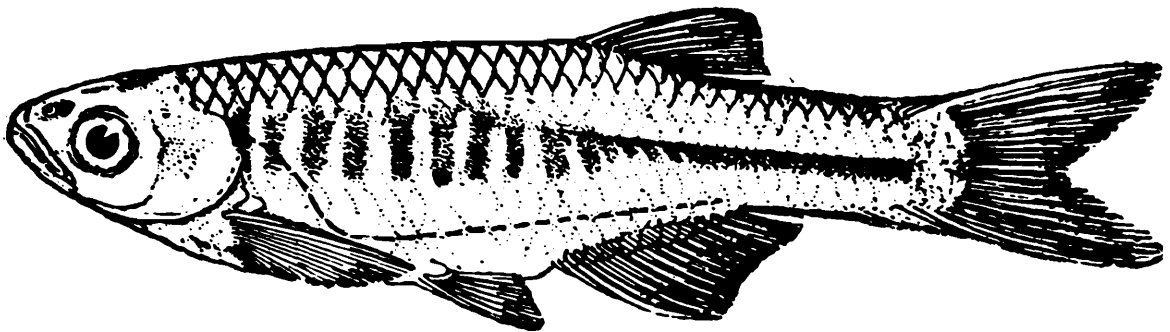


Fig. 18. Lateral view of *D. shanensis*

Scales : Scales along the normal course of lateral line 33-34 and transverse rows of scales 7-8. Predorsal scales 15-17 and circumpeduncular scales 10.

Fins : Dorsal rays ii/7, Anal rays ii-iii/11-12, Pectoral rays i/11-12, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 4.86 (4.44—5.28), height of anal 5.16 (5.00—5.28), pectoral length 4.95 (4.62—5.28) and pelvic length 7.70 (7.40—8.00) in standard length. Caudal fin deeply forked, length 4.70 (4.11—5.28) in standard length.

Colour in alcohol : Colouration of this species is very peculiar in having a broad lateral longitudinal band of dark colour which becomes narrower posteriorly. With the growth of this fish, anterior half of band is broken up into a number of vertical bars with lighter space in between and ultimately only the narrow posterior half of band persists.

Size : Largest specimen examined 40.0 mm. SL.

Distribution : Burma : Northern and Southern Shan States and Thailand.

Remarks: Hora (1928) described this species from the Northern Shan States, Burma where it is quite common in rice fields, in pools and ditches in the bed of hill streams at Namkhan, Kutkai, Lashio and Hsipaw. Subsequently Hora and Mukerji (1934a) recorded this species from the Southern Shan States, Burma and found one specimen with the lateral line nearly complete. Examination of all the specimens of this species preserved in the collection of the Zoological Survey of India, Calcutta by me reveals the fact that there are many more examples (9 out of 93 specimens) with the lateral line complete or almost reaching the base of caudal fin.

Danio sondhii Hora and Mukerji, 1934

Figure 19

1934a. *Danio* (*Brachydanio*) *sondhii* Hora and Mukerji, *Rec. Indian Mus.* 36(1) : 128-130, fig. 1 (type-locality : Southern Shan States, Burma).

Material examined :

Type specimen : Syntypes, ZSI F 11513/—F 11514/1, 10 exs., 29.0 mm.—37.0 mm. SL.; from a spring about 15½ miles east of Taunggyi and about 3½ miles east of Hopong, South Shan States, Burma; V. P. Sondhi; April, 1933.

Diagnosis (based on 10 syntypes 29.0 mm.—37.0 mm. SL.) Head length 3.65—4.15 and body depth 3.50—4.00 in standard length. Eye diameter 2.66—3.60 in head length. Scales along the normal course of lateral line 32-34. Lateral line incomplete. Barbels absent.

Description : Head length 3.90 (3.65—4.15) body depth 3.75 (3.50—4.00), predorsal distance 1.67 (1.57—1.78), prepelvic distance 1.96 (1.85—2.07) and caudal peduncle length 4.73 (4.12—5.33) in standard length. Minimum height of caudal peduncle 7.88 (7.25—8.50) in standard length, 1.75 (1.50—2.00) in its length. Head length almost equal to body depth. Height of head 1.23 (1.14—1.33) and width of head 2.08 (2.00—2.15) in head length. Snout length 3.85 (3.20—4.50) in head length, 1.65 (1.50—1.80) in interorbital width. Eye diameter 3.13 (2.66—3.60) in head length, 1.30 (1.20—1.40) in interorbital width. Eye diameter

longer than snout length. Mouth small, obliquely directed upward, maxillary extending below anterior margin of eye. Barbels absent.

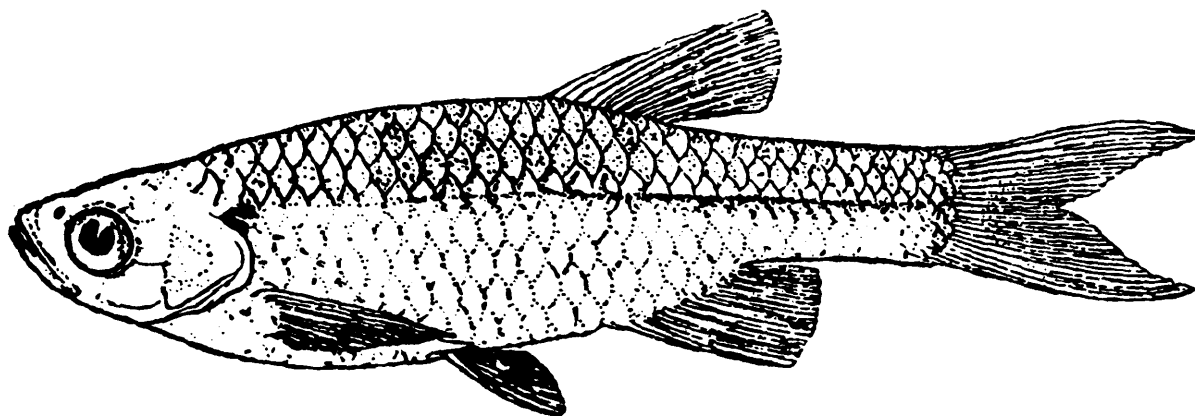


Fig. 19. Lateral view of *D. sondhii*

Scales : Lateral line incomplete, pierces only 7-8 anterior scales, scales along the normal course of lateral line 32-34. Lateral transverse rows of scales 7, predorsal scales 14-15 and circumpeduncular scales 10.

Fins : Dorsal rays ii/7, Anal rays iii/10-11, Pectoral rays i/11-12, Pelvic rays i/6-7 and Caudal rays 19. Height of dorsal 3.92 (3.55—4.28), height of anal 5.62 (4.83—6.40), pectoral length 3.97 (3.66—4.28) and pelvic length 6.15 (5.50—6.80) in standard length. Both the pectoral and pelvic fins possess scaly flap at their bases. Caudal fin emarginate, almost equal to head length.

Colour in alcohol : A dark spot present near upper angle of gill opening. Edges of scales on back provided with small dark spots.

Size : Largest specimen examined 37.0 mm. SL.

Distribution : Burma : so far only known from the Southern Shan States.

Danio spinosus Day, 1869

Figure 20

1869b. *Danio spinosus* Day, *Proc. zool. Soc. Lond.*, : 621 (type-locality : Pegu, Burma).

1934a. *Danio spinosus*, Hora and Mukerji, *Rec. Indian Mus.*, 36(1) : 133 (synoptic table to species of the subgenus *Danio*).

Material examined :

Type specimens : Syntypes, ZSI 2494—2495 and ZSI Cat. 852, 3 exs., 37.0 mm.—85.0 mm. SL.; Pegu, Burma; F. Day.

Diagnosis (based on 3 syntypes 37.0 mm.—85.0 mm. SL.) : Head length 3.70—4.33 and body depth 2.78—3.54 in standard length. Eye diameter 3.33— 3.50 in head length. A sharp forwardly directed spine present on the superior margin of the orbit in addition to the preorbital backwardly directed spinous process (Fig. 20a and 20b). Lateral line scales 55-65. Barbels 2 pairs.

Description : Head length 4.02 (3.70—4.33), body depth 3.16 (2.78—3.54), predorsal distance 1.75 (1.65—1.85), prepelvic distance 2.16 (2.02—2.29) and caudal peduncle length 5.47 (5.28—5.66) in standard length. Least height of caudal peduncle 7.95 (7.40—8.50) in standard length, 1.45 (1.40—1.50) in its length. Height of head 1.05 (1.00—1.11) and width of head 1.90 (1.80—2.00) in head length. Eye diameter 3.41 (3.33—3.50) in head length, 1.42 (1.33—1.50) in interorbital width. A sharp spine directed forwards above the anterior margin of the orbit and a second broader and blunter backwardly directed preorbital spinous process at the anterior rim of the orbit present. Snout length 3.47 (3.33—3.60) in head length, 1.46 (1.33—1.60) in interorbital width. Mouth small, obliquely directed upward. Barbels 2 pairs, rostral pair shorter than eye diameter and maxillary pair very short.

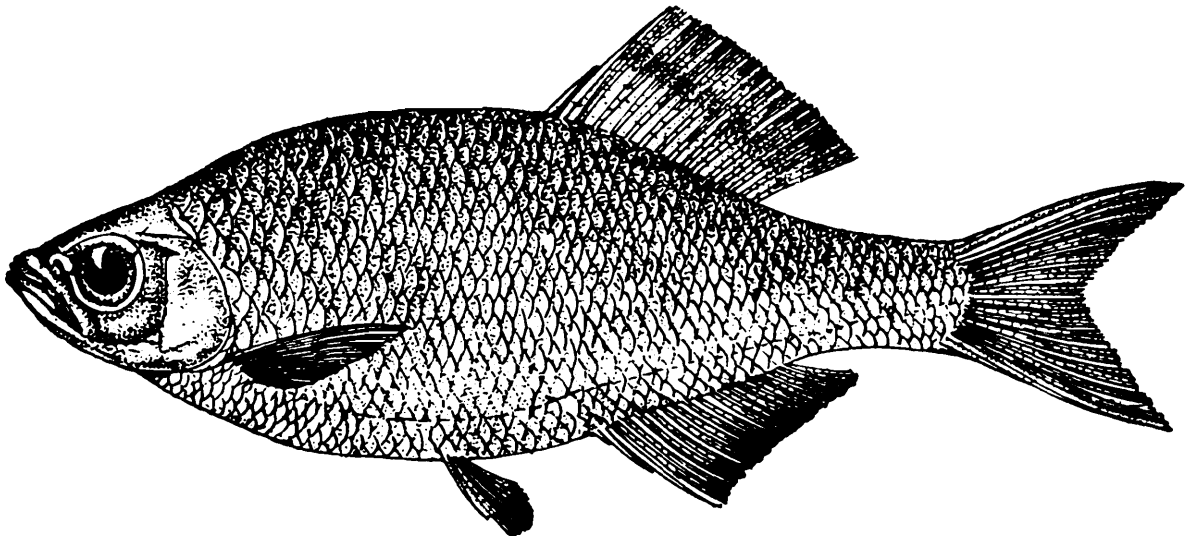


Fig. 20. Lateral view of *D. spinosus*

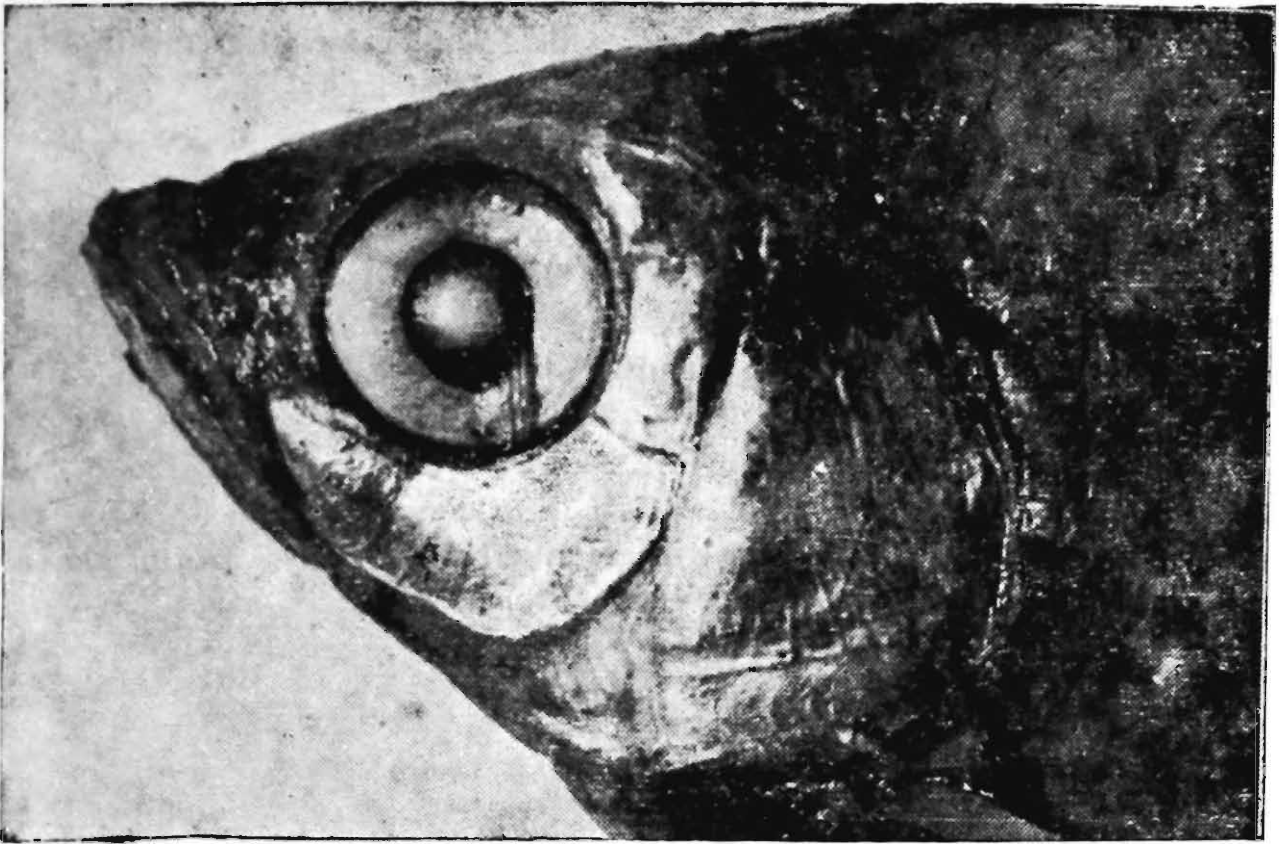


Fig. 20a. Photograph of head region of *D. spinosus*

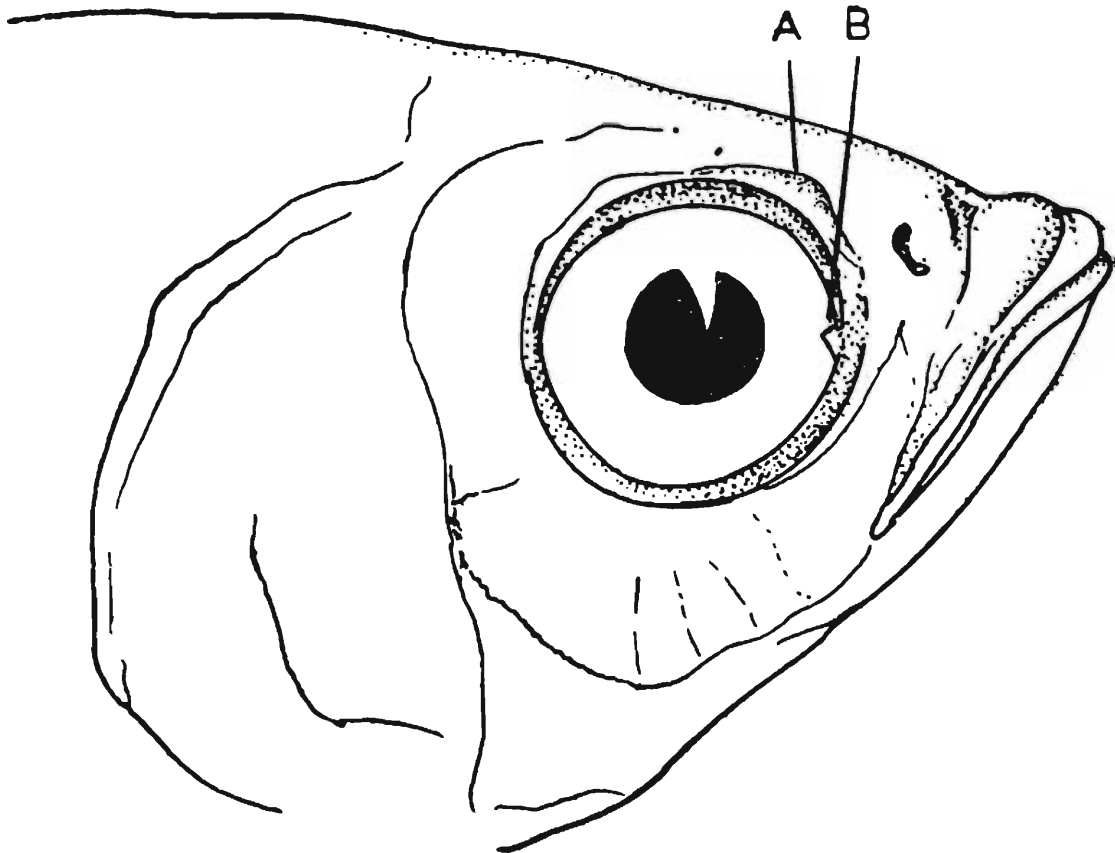


Fig. 20b. Outline sketch of head region of *D. spinosus* showing the preorbital spine (B) and the supraorbital spine (A).

Scales : Lateral line complete, with 55-65 scales. Lateral transverse rows of scales 14-15, $2\frac{1}{2}$ rows of scales between lateral line and base of pelvic fin. Predorsal scales 18-19 and circumpeduncular scales 16-18.

Fins : Dorsal rays iii/14-15, Anal rays ii-iii/17, Pectoral rays i/11-12, Pelvic rays i/7 and Caudal rays 19. Height of dorsal 5.42 (4.62—6.07), height of anal 5.73 (4.62—6.50), pectoral length 4.97 (4.33—5.31) and pelvic length 5.94 (4.60—7.09) in standard length. Caudal fin lunatic. Both the paired fins possess scaly flap at their bases.

Colour in alcohol : Body silvery, with a poorly defined lateral band and some vertical narrow bands in anterior half of body. Dorsal and anal fin greyish, with reddish margins anteriorly.

Size : Largest specimen examined 85.0 mm SL.

Remarks : Hora and Mukerji (1934a) gave a synopsis of the species then known under the subgenera *Danio* and *Brachydanio* from the Indian region. In this paper Hora & Mukerji, (1934a) gave the scale counts of 33-38 in lateral line of *D. spinosus*. The findings of the present study shows that this species is provided with 55-65 lateral line scales. *D. spinosus* is the only species under the genus having the maximum number of lateral line scales.

ZOOGEOGRAPHY

In order to evaluate the zoogeographical significance of the *Danios* of the Indian region, the geographical distribution of each species was investigated and analysed (Table 1). It is relevant to point out that the "Indian region" as implied in the present discussion does not connote any faunal zoogeographical subregion. The limits for the area adopted for the present studies are that defined for the freshwater fish species by Misra (1969*).

7 species under the genus *Danio*, viz., *D. acuticephala* Hora, *D. assamensis* Barman, *D. fraseri* Hora, *D. horai* Barman, *D. manipurensis* Barman, *D. naganensis* Chaudhuri and *D. neilgherriensis* (Day) are endemic species to India only. Among the 7 Indian endemic species, 5 species, viz., *D. acuticephala*, *D. assamensis*, *D. horai*, *D. manipurensis* and *D. naganensis* are strictly confined to the North-East India only. 5 species belonging to this genus, viz., *D. annandalei*, Chaudhuri, *D. choprai* Hora, *D. nigrofasciatus* Day, *D. sondhii* Hora and *D. spinosus* Day are endemic species to Burma only. Besides these 12 Indian and Burmese endemic species, 3 other species, viz., *D. aequipinnatus* (McClelland), *D. dangila* (Hamilton Buchanan) and *D. rerio* (Hamilton Buchanan) are common to India and Burma. These 3 species are found throughout the Indian subcontinent. *D. aequipinnatus* is also found in Thailand and China along with the Indian subcontinent. *D. devario* (Hamilton Buchanan) is found in India, Pakistan, Nepal & Bangladesh only. 3 species, viz. *D. albolineatus* (Blyth), *D. kakhienensis* and *D. shanensis* Hora are also found in Burma. *D. albolineatus* among these 3 species is distributed throughout Thailand, Malaya Peninsula and Sumatra along with Burma. *D. kakhienensis* is also found in China and Burma. *D. shanensis* is also known from Thailand and in Burma. Altogether 11 species out of the 19 species under the genus *Danio*, are found in Burma including 5 Burmese endemic species. India also harbours 11 species out of the 19 species known under the genus, including 7 Indian endemic species.

* The water area (ponds, lakes, rivers etc.) within the political boundaries of India, Burma, Bangladesh, Pakistan, Sri Lanka and Nepal.

Among these 11 species known to occur in India, 10 species are found in the North-East India.

An analysis of the present distributional pattern shows that 58 per cent of the species belonging to *Danio* are found in Burma. India also harbours 58 per cent species known under the genus. It is noteworthy to point out that the geographical distributional trend of *Danios* of the Indian subcontinent are largely restricted between Burma and India only along with some sporadic distribution in Thailand and China. After Burma and India, Thailand and China harbour most of the *Danios* of the world. Therefore, it may be remarked that the *Danios* are mostly distributed in Burma, India, Thailand only.

Careful examination of the distributional pattern of the genus indicates several factors. India and Burma harbour most of the species of the *Danios* of the Indian subcontinent. Though the number of the endemic species to India is greater than that of Burma. Some of the Burmese species are curiously found in the South-East Asia like Thailand, Malaya Peninsula and Sumatra. It would appear that the stock of *Danios* originally prevalent in Burma, Thailand, Malaya Peninsula etc. has migrated throughout India through the North-Eastern states of India. This is evidenced by the fact that some of the species are common in Burma and Thailand. The occurrence of 10 species out of the 11 species known to be found in India under the genus are available in the North-Eastern states of India including 5 endemic species to North-East India also confirms the above conclusion.

TABLE 1

GENERAL DISTRIBUTION OF DANIOS OF THE INDIAN REGION

	India	Pakistan	Nepal	Bangladesh	Sri Lanka	Burma	Thailand	Malaya Peninsula	Sumatra	China
<i>Danio acuticephala</i> Hora	+									
<i>Danio aequipinnatus</i> (McClelland)	+	+	+	+	+	+	+			+
<i>Danio albolineatus</i> (Blyth)						+	+	+	+	
<i>Danio annandalei</i> Chaudhuri						+				
<i>Danio assamensis</i> Barman	+									
<i>Danio choprai</i> Hora						+				
<i>Danio dangila</i> (Hamilton- Buchanan)	+	+	+	+		+				
<i>Danio devario</i> (Hamilton- Buchanan)	+	+	+	+						
<i>Danio fraseri</i> Hora and Mukerji	+									
<i>Danio horai</i> Barman	+									
<i>Danio kakhienensis</i> Anderson						+				+
<i>Danio manipurensis</i> Barman	+									
<i>Danio naganensis</i> Chaudhuri	+									

TABLE 1 (Contd.)

	India	Pakistan	Nepal	Bangladesh	Sri Lanka	Burma	Thailand	Malaya Peninsula	Sumatra	China
<i>Danio neilgherriensis</i> (Day)	+									
<i>Danio nigrofasciatus</i> Day						+				
<i>Danio rerio</i> (Hamilton- Buchanan)	+	+	+	+	+	+				
<i>Danio shanensis</i> Hora						+	+			
<i>Danio sondhii</i> Hora and Mukerji						+				
<i>Danio spinosus</i> Day						+				

DISCUSSION

The *Danios* are mainly distributed in the Indian sub-continent, Thailand, Malaya Peninsula, Sumatra and China. These small, gorgeously coloured fishes are usually found in great abundance in suitable localities of small watercourses like pools in rice-fields, ditches in the bed of hill-stream, mountain rivulets and rivers and seem to be perfectly adapted for aquarium life. These small active fishes are quite hardy both to variances in temperature and pH, seem to live and reproduce with equal comfort either in an acid (pH from 6.6 to 6.8) lowland flood-pool with a temperature from 72°F to 78°F or in a swift mountain stream of fairly alkaline (pH 7.8 or more) water at a temperature around 70°F. The preferred food of these danios are insect larvae, tiny insects and the small fry of their own or other species. Often, however, they include in their diet considerable vegetable matter which has been washed down the streams with household refuse. The zebra danio or zebra fish, *Danio rerio* (Hamilton Buchanan) is one of the most popular aquarium fishes. Its blue and silver stripes, its constant activity, the ease with which it is kept and fed, and its inoffensive nature make it a prime favourite with most tropical fish hobbyists.

Till 1916, all the *Danios* and *Brachydanios* were grouped under a single genus, *Danio*. Weber and de Beaufort (1916) proposed *Brachydanio* as a subgenus of *Danio* for forms having 7 branched dorsal rays and incomplete or absent lateral line, leaving *Danio* in the strict sense for forms with 12 to 16 branched dorsal rays and complete lateral line. Many species are known, viz. *Danio aequipinnatus* (McClelland), *Danio kakhienensis* Anderson, *Danio dangila* (Hamilton Buchanan), *Danio fraseri* Hora, *Danio naganensis* Chaudhuri, *Danio neilgherriensis* (Day) and *Danio manipurensis* Barman in which the branched dorsal rays are 9 to 11.

Hora and Mukerji (1934a) published a synopsis not only of the Indian and Burmese species then known of *Danio* but also *Brachydanio*. The species then known that fell within the subgenus *Danio* were *Danio spinosus* Day, *Danio devario* (Hamilton Buchanan), *Danio kakhienensis* Anderson, *Danio neilgherriensis* (Day), *Danio dangila* (Hamilton Buchanan), *Danio strigillifer* Myers, *Danio annandalei* Chaudhuri, *Danio aequipinnatus*

(McClelland), *Danio naganensis* Chaudhuri, *Danio malabaricus* (Jerdon) and the species that fell within the subgenus *Brachydanio* were *Danio shanensis* Hora, *Danio albolineatus* (Blyth), *Danio rerio* (Hamilton Buchanan), *Danio sondhii* Hora, *Danio acuticephala* Hora, *Danio choprai* Hora and *Danio nigrofasciatus* Day. In this paper Hora and Mukerji (1934a) seem to have overlooked some characters, their count of 33 to 38 scales in the lateral line of *Danio spinosus* and *Danio devario* appear to be an error. *Danio analipunctatus* is said to be equal to *Danio albolineatus* whereas it really equals to *Danio nigrofasciatus*. Another two important structures which are present in some species of the genus *Danio* and which almost definitely indicate relationships among the species possessing it, seem to have been overlooked by the earlier Indian workers. One of these features is the forwardly directed supraorbital spine (as in *Danio spinosus*) and the other is the backwardly directed preorbital spinous process (as in *Danio aequipinnatus*, *Danio annandalei* and *Danio kakhienensis*) at the anterior rim of the orbit. The preorbital spinous process in *Danio aequipinnatus* was first pointed out by Vinciguerra (1889-90) and later confirmed by Myers (in Herre and Myers, 1937) that there exists this preorbital spinous process in this species as in *Danio regina* Fowler. This has induced me to reexamine all the available species of the genus. Examination of the specimens of *Danio aequipinnatus* and the type specimen of *Danio annandalei* also confirmed the presence of the backwardly directed preorbital spinous process at the anterior rim of the orbit. The presence of a similar structure of the backwardly directed preorbital spinous process in *Danio annandalei* as in *Danio aequipinnatus* has already been, for the first time, pointed out by me (Barman, 1985).

Smith (1945) described a species, viz. *Danio ponticulus* from Chiangmai, Meping, Northern Thailand and to accommodate this species the author proposed a new subgenus *Allodanio* characterised by the possession of "Lateral line complete. Branched dorsal rays 7, branched anal rays 10; barbels (rostral and maxillary) present, no preorbital spine" In order to evaluate the relationships of the members of the genera or subgenera of *Danio* Hamilton Buchanan, 1822, *Brachydanio* Weber and de Beaufort, 1916, *Rambaibarnia* Fowler, 1934, *Danioides* Chu, 1935, *Daniops* Smith, 1945 and *Allodanio* Smith, 1945, the main characters, viz., branched dorsal fin rays, lateral line complete, incomplete or totally absent and the preorbital spinous process present or absent of the above genera or subgenera were compared and analysed. It may be concluded that the distinctions are not real and they intergrade in the main characters on which they were erected. Therefore, I am inclined to propose to

synonymise *Brachydanio*, *Rambaibarnia*, *Danioides*, *Daniops* and *Allodanio* with *Danio* of Hamilton Buchanan, 1822. No matter how many generic or subgeneric names have been proposed since Weber and de Beaufort (1916), the limitations are getting vague with the discovery of intermediate species. Further the species of the genus seem to form such a well knit group of very similar species that it appears to me that the genus should not be split up further.

Day (1869b) described *Danio spinosus* from Burma and distinguished this species largely on the presence of a "a sharp spine directed forwards above the anterior superior margin of the orbit and a second broader and blunter before the centre of the orbit on the preorbital" From the results of the present study it appears that this structure of the supraorbital spine is not more than specific value in this species. The presence of very small scales of *Danio spinosus* (55-65 in the lateral line) seems to me a more important character. Day (1878) gave the description of *Danio devario* with lateral line scales 41-48 and with no barbels. Hora and Mukerji (1934a) also gave the scale counts of 33-38 in the lateral line of this species and with no barbels. Examination of the specimens of this species preserved in the collection of the Zoological Survey of India, Calcutta has revealed either the presence of a pair of very short maxillary barbels or barbels totally absent in the specimens and lateral line scale counts varies from 45-52. Day (1867) also described *Danio neilgherriensis* from the rivers of the Nilgiri Hills, Tamil Nadu. Subsequent to Day (1889), there is no record of this species from anywhere in India. In the course of studies, I have recorded this species from Arunachal Pradesh (formerly NEFA) (in Datta and Barman, 1985).

Choudhuri (1908) described *Danio annandalei* from Tenasserim, Lower Burma. The author gave a detailed description of the colour pattern of this species and in establishing the relationships of the species he gave much importance to the presence or absence of scaly or fleshy appendages at the base of pectoral and pelvic fins. Having examined all the Indian species under the genus, I have found that all the species possess scaly or fleshy appendages at the bases of paired fins and this is not an unique feature as considered by Chaudhuri (1908). Lateral line scale counts was given as 46 to 50 in the type specimens, I have found lateral line with 54 to 56 scales in this species.

Hora (1921a) described *Danio* (*Brachydanio*) *acuticephala* from Manipur. The author characterised this species by the possession of

lateral line incomplete, not extending beyond the pectoral fin. Examination of the type specimen and other examples of this species revealed that the lateral line is totally absent in this species.

Hora (1928) described *Danio* (*Brachydanio*) *choprai* from Myitkyina district, Upper Burma. The author gave the description of this species with lateral line totally absent. Having examined all the specimens of this species preserved in the collection of the Zoological Survey of India, Calcutta, I have found that 8 specimens out of 51 specimens including type specimen, have lateral line incomplete, extending up to base of pelvic fin. Hora (1928) also described another species, *Danio* (*Brachydanio*) *shanensis* from Northern Shan States, Upper Burma. The author characterised this species by the possession of incomplete lateral line but a specimen with practically complete lateral line was recorded by Hora and Mukerji (1934a) and a specimen from Northern Thailand with fully complete lateral line is figured by Fowler (1934a) without any comment. This has induced me to reexamine this species with great interest, which resulted with the discovery of another 9 specimens with complete lateral line out of 93 specimens of this species preserved in the collection of the Zoological Survey of India, Calcutta.

Hora (1937b) described another species, *Danio feegradei* based on a single specimen from Burma. On examination of this species it seems to me that it is not different from *Danio dangila* (Hamilton Buchanan) having 9 branched dorsal fin rays, a complete lateral line, 2 pairs of long barbels. Moreover, it is almost similar in body proportional measurements and squamation. Therefore, *D. feegradei* is synonymised with *D. dangila* (Hamilton) by me (Barman, 1987b).

While working on this genus I have described 3 new species, in addition to 17 species recorded by Jayaram (1981) belonging to this genus. The 3 new species are, viz., *D. assamensis* from Assam, *D. horai* from Arunachal Pradesh and *D. manipurensis* from Manipur, India.

The distributional pattern of the *Danios* shows that 58% of the species of the genus are found in Burma and 58% of the species under the genus are also available in India. It may be pointed out that the geographical distributional trend of *Danios* of the Indian subcontinent are largely confined in Burma and India. Next to Burma and India, Thailand and China harbour most of the *Danios* of the world. An analysis of the distributional pattern of this genus indicates that the number of endemic

species of *Danio* is greater in India than that of Burma. The distributional pattern of this genus also shows that India and Burma harbour most of the species of *Danios* of the Indian subcontinent. Though the number of endemic species of this genus in India is more than that in Burma. Some of the Burmese species are also found in the South-East Asia like Thailand, Malaya Peninsula and Sumatra. It would appear that the stock of *Danio* were originally prevalent in Burma, Thailand, Malaya Peninsula etc., has spread over to India through the North-Eastern India. This is supported by the fact that most of the species are found in Burma and Thailand. The occurrence of 10 species out of the 11 species known to inhabit in India under the genus in the North-Eastern states of India including 5 endemic species to North-East India also confirms the above conclusion.

I have included all the known species to date under a single genus *Danio* Hamilton Buchanan having the characteristics of "Branched dorsal fin rays 6 to 17. Lateral line complete, incomplete or absent entirely. Preorbital spine present or absent", considering the facts that the distinctions are not agreeing with the characters possessing by the species and they intergrade in their major characters on which *Brachydanio*, *Rambaibarnia*, *Danioides*, *Daniops* and *Allodanio* were created. The limitations are getting vague with the discovery of intermediate forms since Weber and de Beaufort (1916).

SUMMARY

The cyprinid freshwater fishes of the genus *Danio* Hamilton Buchanan are small, attractively coloured, active fishes of small watercourses distributed throughout the Indian subcontinent, Thailand, Malaya Peninsula, Sumatra and China. These small fishes which do not grow more than 110 mm. (4.5 inches) are found in great abundance in pools in the rice-fields, ditches, in the bed of hill-streams, mountain rivulets and rivers and seem to be perfectly adapted for aquarium life.

The present study gives a detailed systematic account of the 19 species known from the Indian subcontinent. This has produced many interesting results including three new species discovered by me. These three species are *Danio horai* from Arunachal Pradesh, *Danio assamensis* from Assam and *Danio manipurensis* from Manipur. Hora and Mukerji (1934a) gave the scale count 33 to 38 in the lateral line of *D. spinosus* and *D. devario*. *D. devario* was described with no barbels by Hamilton Buchanan (1822) and other subsequent workers. *D. annandalei* was described having 46 to 50 scales in the lateral line by Chaudhuri (1908). *D. neilgherriensis* was described by Day (1867) from Nilgiri Hills of South India and there is no subsequent record of this species. *D. acuticephala* was described by Hora (1921a) with lateral line incomplete. *D. choprai* was described by Hora (1928) with lateral line entirely absent. *D. shanensis* was described by Hora (1928) with lateral line incomplete and with only one exception of lateral line complete in this species.

The findings of the present work shows that *D. spinosus* has 55 to 65 scales in the lateral line as pointed out by Day (1869b). *D. devario* is provided with 45 to 52 scales in the lateral line and barbels either absent or one pair of very short maxillary barbels present. *D. annandalei* has been found with 54 to 56 scales in the lateral line. *D. neilgherriensis* has been discovered from Arunachal Pradesh subsequent to Day (1867) in the course of the present study. *D. acuticephala* has been discovered with lateral line totally absent. *D. choprai* has been recorded with a variable lateral line being either totally absent or incomplete. *D. shanensis* has been discovered with a variable lateral line being either incomplete or complete in more than one specimens including type specimen of this species.

D. feegradei Hora, 1937b has been synonymised with *D. dangila* (Hamilton Buchanan, 1822) by me (Barman, 1987b), because of its striking similarity in having 2 pairs of long barbels, complete lateral line, proportional body measurements and squamation.

The preorbital spinous process directed backwards in this genus seems to have been overlooked by the earlier Indian workers. This preorbital structure derived from the lachrymal bone of the orbit is present in *D. spinosus* (in addition to the forwardly directed supraorbital spine), *D. aequipinnatus*, *D. kakhienensis*, *D. annandalei* and *D. assamensis*. This preorbital structure had been considered to be of subgeneric importance by Fowler (1934b) to establish a new subgenus *Rambaibarnia* with *Danio reina* Fowler from the Peninsular Thailand, as the type species. This preorbital spinous process was given generic importance by Chu (1935) to describe a new genus *Danioides* with *D. kakhienensis* from Yunnan, China as the type species. Smith (1945) described a new genus *Daniops* with *D. myersi* Smith from the Peninsular Thailand as the type species, based on the preorbital spinous process at the anterior rim of the orbit, the nature of the pharyngeal teeth and less number of branched dorsal fin rays. If the preorbital structure is given systematic recognition as a genus or subgenus, *Rambaibarnia* Fowler, 1934, *Danioides* Chu, 1935 and *Daniops* Smith, 1945 will fall as a synonym of *Danio* of Hamilton Buchanan, 1822.

Smith (1945) described a new subgenus *Allodanio* with *D. ponticulus* Smith from Chiangmai, Meping, Northern Thailand as the type species mainly based on 7 branched dorsal fin rays and a complete lateral line. Smith (1945) remarked that *D. ponticulus*, the type of the new subgenus *Allodanio*, bridges the gap between *Danio* and *Brachydanio* in having 7 branched dorsal fin rays and a complete lateral line.

An analysis of the literature concerned and having examined the *Danios* from the Indian region, I am, therefore, inclined to propose to synonymise *Brachydanio*, *Rambaibarnia*, *Danioides*, *Daniops* and *Allodanio* with *Danio* Hamilton Buchanan. No matter how many generic or subgeneric names have been proposed since Weber and de Beaufort (1916), the limitations are getting vague with the discovery of intermediate forms.

The distributional records of the species of the genus shows that 58 per cent of the members of *Danio* are found both in India and Burma. Though the number of endemic species of this genus in India is more than

that in Burma. Some of the Burmese species are also found in South East Asia like Thailand, Malaya Peninsula and Sumatra. It would appear that the stock of *Danio* originally prevalent in Burma, Thailand, Malaya Peninsula and Sumatra has migrated to India through North Eastern states of India. This is supported by the fact that a large number of species are found in Burma and Thailand. The presence of 10 species out of 11 species under the genus known to occur in India, in the north-eastern states of India also justify the above contention.

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