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FISHES OF SILENT VALLEY

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INTRODUCTION

This paper deals with the list of fishes from Silent Valley and their importance in the study of fishes. As has been demonstrated in several papers (Hora, 1941 ; Hora and Law, 1941 ; Hora, 1942; Rajan, 1955 ; Silas, 1951 a & b), the Western Ghats of Peninsular India, especially the hill ranges lying to the south of the Nilgiris have proved to be one of the most fertile fields for Ichthyological studies. The fiish-fauna exhibit a variety of adaptive modifications induced by the necessity of living in swift currents of the torrential streams.

During the years 1979-1980 the Zoological Survey of India team headed by Dr. R. S. Pillai, Deputy Director conducted three intensive surveys of the little explored Silent Valley Reserve Forests. A systematic account giving details of the number of specimens of each species present in the collection, the size range in standard length, the date and locality of collection and their range of distribution are given in this paper.

List of Species

Family I : ANGUILLIDAE

1. *Anguilla bengalensis* (Gray & Hardw.)

Family II : CYPRINIDAE

2. *Barilius gatensis* (Cuv. & Val.)
3. *Garra menoni* Rema Devi & Indra

Family III : HOMALOPTERIDAE

4. *Noemacheilus (mesonoemacheilus) triangularis* (Day)
5. *Noemacheilus (mesonoemacheilus) guentheri* Day
6. *Homaloptera pillaii* Indra & Rema Devi

Family IV : COBITIDAE

7. *Lepidocephalichthys thermalis* (Cuv. & Val.)

Family V : SISORIDAE

8. *Glyptothorax annandalei* Hora

Family VI : CHANNIDAE

9. *Channa gachua* (Ham.)

Order : ANGUILLIFORMES

Suborder : ANGUILLOIDEI

Family : ANGUILLIDAE

Genus : **Anguilla** Shaw.

Anguilla bengalensis (Gray & Hardw.)

1833-34. *Muraena bengalensis* Gray and Hardwicke, *Ill. Ind. Zool. Hardwicke,* 2, pl. 95, fig. 5. (type locality : the Ganges).

1889. *Anguilla bengalensis* Day, *Fauna. Brit. India*, Fish. 1, p. 86.

Material : 1 ex., 98.5 cm. T.L.

Description : Length of head 3 in the distance between the snout and the vent ; length of tail one fifth more than that of the trunk ; the distance between the gill opening and the origin of the dorsal fin is one seventh more than the length of the head unlike the description of Day (1889) where it is one third or one fourth more than head length ; also the distance between the origin of dorsal and anal fins is less than the length of the head ; head rather broader than the body ; lower jaw prominent ; the cleft of the mouth is nearly one third head length ; diameter of eye nearly three in length of snout ; lips well developed, the vomerine band does not extend posteriorly so far as the maxillary one, the mandibular teeth divided by a longitudinal groove ; Pectorals three in head length ; vertical fins fleshy and rays are not distinct.

Distribution : Islands in the Indian Ocean, Continent of India and Burma. This eel is common in the Andaman Islands and probably ranges to the Malay Archipelago, Formosa and the Pacific. It attains to about four feet and upwards in length.

Affinities : *Auguilla bengalensis* has been recorded only in the rivers of North India. For the first time a large specemen has been collected from Silent Valley. Menon, A.G.K. (Pers. Comm.) opines that *Anguilla bicolor*, a South Indian form which grows upto two feet and which has lesser number of dorsal fin rays (220–245) and a shorter fin length may be a smaller variety of *Anguilla bengalensis* which grows upto 4 feet and has more number of fin rays (250—305) ; as observed in *Cynoglossus* where rays are added on to the front of the dorsal fin, as the fish grows, shifting the position of dorsal fin. Hence this character, viz. the position of dorsal fin to vent used in classifying *A. bengalensis* and *A. bicolor* may not be of a specific nature. This view can be substantiated only by the study of different size groups of *A. bicolor* and *A. bengalensis*.

Order : CYPRINIFORMES

Suborder : CYPRINOIDEI

Family : CYPRINIDAE

Genus : **Barilius** Hamilton.

Barilius gatensis (Cuv. & Val.)

1844. *Leuciscus gatensis*, Cuvier and Valenciennes, *Hist. Poiss.* xvii. p. 309.
1889. *Barilius gatensis*, Day, *Faun. Brit. India*, Fish. 1. p. 349.

Material : 18 exs., 34.0–121.0 mm. S.L., 22nd January 1979; 3 exs., 32.0—33.0 mm. S.L., 23rd January 1979; 1 ex., 82.0 mm. S.L., 24th January 1979; 9 exs., 48.0 71.0 mm. S.L., 1st January 1979; 3 exs., 19.0 38.0 mm. S.L., 16th January 1980; 23 exs., 46.0 —90.0 mm. S.L., 26th January 1980; 1 ex., 65.0 mm. S.L., 28th February 1980; and 8 exs., 56.0—93.0 mm. S.L., 29th April 1980.

Description : D.2/8; A.3/14; L.1.40. One pair of minute mandibular barbels. In the males the snout and cheek covered with large glands and rough spots on the scales. 11–15 vertical bars along the sides becoming more or less broken up in the adult. Opercle blotched, dorsal and anal with dark bases and light margins. Caudal deeply forked.

Distribution : Western Ghats of Malabar and Nilgiri hills upto about 5000' above the sea level.

Garra menoni Rema Devi & Indra

1984. *Garra menoni* Rema Devi and Indra, *Bull. Zool. Surv. India*, 5 (2 & 3) : 121-122.

Holotype : River Kunthi, Silent Valley (Alt. 867 metres), Kerala, 19th January, 1979, 69.0 mm. S.L., Reg. No. F.553.

Paratypes : River Kunthi, Kerala, 19th January, 99 exs, 31.0—69.0 mm. S.L,

Description : D.3/7-8; P.1/12-15; V.1/7-8; A.2-3/5; C.17-19.

Depth of body 5.29 (4.39—6.48), length of head 4.23 (3.71 - 5.23). in standard length; width of head 1.3 (1.17 – 1.65); snout 2.01 (1.71 – 2.38); eye 5.7 (4.0 – 7.0) in length of head; eye 2.63 (1.75 – 3.5) in interorbital width; eye 2.85 (2.0 – 3.5) in snout. Pupil of eye either in the middle or a little behind the middle of the length of head. Snout round and smooth, the males with fine tubercles. Two pairs of barbels, smaller than the diameter of eye. 7-8 outer gill rakers in the lower part of the anterior arch. Mental disc well developed, length of disc 1.46 (1.2—1.7) in its own width. 32-36 scales in lateral line, 4.5 from the origin of dorsal to lateral line, 3-3½ between this and the pelvic. Chest and belly naked. A part of the prepelvic region with subcutaneous scales. Distance from vent to anal fin 3.48 (2.13—5.0) in that between pelvic and anal fin. Width of caudal peduncle 1.35 (1.0—1.82) in its own length.

Posterior chamber of air bladder measured in one specimen is found to be 14% in standard length.

Colour in formaldehyde dark brown above paler beneath. A faint lateral band from gill opening to the base of the caudal fin.

Relationships : This form differs from the widely distributed *G. mullya* (Sykes) and other known forms, Menon (1964), in colour pattern, in the absence of scales on the chest and belly, and in the marked difference in the position of the vent. It differs from *G. hugi* Silas in eth presence of scales in the mid dorsal streak, and in the lesser number of lateral line scales etc.

Distribution ; River Kunthi, Silent Valley, Kerala State

Order : CYPRINIFORMES
Suborder : COBITOIDEI
Family : HOMALOPTERIDAE
Subfamily : NOEMACHEILINAE
Genus : **Noemacheilus** Van Hasselt, 1823
Subgenus : **Mesonoemacheilus** Banarescu & Nalbant

Noemacheilus (Mesonoemacheilus) triangularis Day.

Material : 16 exs., 39.0-61.0 mm. S.L , 22nd January 1979, River Kunthipuzha, Silent Valley, Kerala.

Description : D.3/7-8; V.1/6-7; A.3/5; P.1/9-11; C.18-20. Lateral line complete.

Length of head 4.11 (3.81-4.5), depth of body 6.76 (6.21-7.6) in S.L.; width of head 1.78 (1.52-2.0), length of snout 2.44 (1.78-2.9), eye diameter 6.23 (5.0-7.71) in head length; eye 2.57 (2.0-3.13) in snout and 1.85 (1.62-2.0) in interorbital width; length of caudal peduncle 1.26 (0.85-1.62) in height of caudal peduncle ; post dorsal 1.01 (0.96-1.14) in pre dorsal distance ; distance between anus to anal fin 3.21 (2.17-3.5) in the distance between anus to base of ventral fin.

Body subcylinderical in front and laterally compressed in the posterior half. Nasal flaps produced into a barbel like process. Barbels three pairs, two rostral and one maxillary. The second rostral reaches middle of the eye while the maxillary extends to its hind border. Head mottled and the dorsal body surface is with bands which exhibit variations in size, pattern and number, the bands being of a vertical, horizontal or of a zig-zag pattern. No two specimens were found to have the same colour pattern. Vertical and paired fins not spotted. A dark black band along the lateral line from head to the base of the caudal. Varying number of spots (1-9) are seen along the sides of the body (sometimes spots absent) and none below the lateral line. Caudal forked and its base with two to three spots or a blotch. Males with a movable broad suborbital process. Ventrals with a fleshy appendage at its base.

Relationship : After the work of Day (1889), new species have beed described by Hora (1921,1935 & 1937) and Menon (1950) from Peninsular India. Fraser (1942), Hora (1926,1942), Hora and law (1941), John (1936), Rajan (1955), Raj Tilak and Tiwari (1976), Silas (1951, 1952,1954) and Suter (1944) have reported on the list of Noemacheilus from different parts of Peninsular India. The Noemacheilus are an extremely interesting though difficult group of fishes. A revision of the family has been done by Banarescu & Nalbant (1968). Subsequently Menon (1984) studying the Cobitoid fishes has placed the genus *Noemacheilus* under the subfamily Noemacheilinae, included under the family Homalopteridae. Under the order Cypriniformes the Homalopterids and Noemacheilids have been grouped under the suborder Cobitoidei. *Noemacheilus triangularis* Day has been placed under the subgenus *Mesonoemacheilus* Banarescu and Nalbant, under the *triangularis* complex.

Relationship : *Noemacheilus* (*Mesonoemacheilus*) *triangularis* from Silent Valley differs from all the other peninsular forms in its unique body colour pattern and body stature. It also differs from the typical *N. triangularis* Day in the body colour pattern and in the absence of bands or other markings in the paired and vertical fins. In addition it has a well developed nasal appendage like process.

Noemacheilus (Mesonoemacheilus) guentheri Day

1867. *Noemacheilus guentheri* Day, *Proc. Zool. Soc.* p. 285.

Material : 5 exs., 23.0-37.0 mm. S.L., 18th February 1979, Cherupuzha, Nedungayam, Coll. T S. N. Murthy; 1 ex., 56.0 mm. S.L., 3rd March 1979, R.Cherupuzha, New Amarambalam, Coll. K,R. Rao ; 26 exs., 32.5-52-0 mm, S.L., 7th March 1979, Poochapara, Coll. K. R. Rao ; 25 exs., 32.0-49.0 mm. S.L., 18th March 1979, Sayivala, Coll. K. R. Rao ; and 1 ex., 35.0 mm. S.L., 22nd March 1979, Nelambur, Punjakolli, Coll. K. R. Rao.

Description : D.3/7-8 ; V.1/6-8 ; A.3/5 ; P.1/8-10 ; C.18-19. Lateral line complete.

A detailed account of the colour pattern is given (Plate I, Fig.1) to supplement Day's description of *N. guentheri*. There are about 9-13 rows of narrow white bands alternating with broad interspaces

restricted to the back of the body. In very young examples similar bands are also seen on the ventral surface posterior to the ventral fins and in some, these bands meet the dorsal bands along the sides. Two bands are seen encircling the body in all, one behind the head and the other at the base of the caudal fin. The rest of the bands in the adults are broken up on either side to form three alternating rows of spots, the middle row having a black border and situated along the lateral line. Rarely the entire sides are spotted, the spots extending further down to the ventral surface in which case about four to five alternate rows of spots are seen. The dark brown ground colur becomes paler towards the ventral side. Dorsal and caudal brightly spotted in three to four rows. Ventral and anal faintly spotted in two rows. A black spot at the beginning of the dorsal and a black blotch or band at the base of the caudal. Head faintly blotched. A faint black streak extends from eye to base of caudal along the lateral line and another along the dorsal profile. Caudal forked, lower lobe slightly the longer. Ventral bases with a fleshy appendage. Males with a movable broad suborbital spine.

Distribution : Nilgiris, Western Ghats, S. India.

Relationship : This bears a fair resemblance to *N. guentheri* Day, in the colour pattern and morphometric characters; ct differs from the same in the presence of a complete lateral line system. In *N. gucntheri* Day the lateral line extends only upto anal fin.

Subfamily : HOMALOPTERINAE

Genus : **Homaloptera** Van Hasselt

Homaloptera pillaii Indra and Rema Devi

1981. *Homaloptera pillaii* Indra and Rema Devi, *Bull. Zool. Surv. India,* 4 (1) : 67-70.

Material : 21 exs , 33.0-69.0 mm. S.L., 19th January 1979, Silent Valley, Kerala.

Description : D. 1/7-9; A 1-2/4-5; P. 7-9/11-13; V 2-3/8-9; L. 1.83 -93.

Depth of body 14.33 (12.52-16.66), Iength of head 24.51 (20.70-26. 53), Length of caudal 21.19 (16.0-23.92), in percent of S.L., snout 49.02

(44.44-57.14), eye diameter 15.02 (10.0-20 0), length of pectoral 104.9 (89.29-120.5) in percent of head length; eye 30 21 (19 05-40.0) in percetn of snout, 42.63 (25.0-60 24) in percent of interorbital distance The gape of mouth 46 93 (35.71-58.14) in percent of width of head; distance between anus and anal fin 15 31 (10.72-22.22) in percentage of distance between anus and pelvic fin base ; height of caudal peduncle 73.18 (53. 76-92 59) in percent of length of caudal peduncle ; mouth inferior, transverse and slightly arched ; rostral groove and rostral fold slightly developed ; lips full. plain and continuous, two pairs of rostral and a pair of maxillary barbel present ; all are of equal size and nearly twice the length of diameter of eye ; gill opening oblique, extending to ventral surface for a short distance ; head and ventral surface up to the base of pelvic fin scaleless , dorsal origin just behind that of pelvic base and behind the middle of the length ; pectorals not reaching pelvic ; anus nearer to anal fin than to the pelvics ; pelvics with two simple rays except in one example where one side of the fin has three simple rays ; caudal fin emarginate ; lateral line complete with 83-93 small scales ; caudal peduncle 1.08-1.86 in its own length.

Body light to dark brown, mottled with irregularly spaced dark spots. Dorsal side of head with dark spots. Anal with poorly defined bean shaped blotch at its base. All other fins are dusky brown and without any markings. Abdomen yellowish to light brown in colour.

Distribution : River Kunthi, Silent Valley, Kerala.

Relationship : *Homaloptera pillaii* differs from the only other species described from Western Ghats viz. *Homaloptera montana* Herre, in a number of meristic and morphometric characters and in colour pattern. The main differences seen were the more number of branched rays in the dorsal, pectoral and pelvic fins and the more number of lateral line scales in *H. pillaii* compared to *H. montana* Herre.

Family : COBITIDAE

Genus : **Lepidocephalichthys** Bleeker

Lepidocephalichthys thermalis (Cuv. and Val.)

1846. *Cobitis thermalis* Valenciennes, *Hist. nat. Poiss.*, 18, p. 78.

Material : 1 ex., 32.0 mm. S.L., 28th Fedruary 1980, Silent Valley.

Distribution : Southern India, Malabar Coast, Wynaad and Ceylon.

Suborder : SILUROIDEI

Family : SISORIDAE

Genus : **Glyptothorax** Blyth

Glyptothorax annandalei Hora

1923. *Glyptothorax annandalei* Hora, *Rec. Ind. Mus.* XXV, p. 14 pl. 1, fig. 3.

1938. *Glyptothorax annandalei* Hora, *Rec. Ind. Mus.* XL, p. 372, text fig. 3.

Material : 1 ex., 53.0 mm. S.L., 19th January 1979, Silent Valley.

Description : D. 1/6 ; P. 1/10 ; V 1/6 ; A. 1/10 ; C. 17.

Length of head 5.5, of caudal 4.3, height of body 8 in total length ; eyes slightly behind the middle of the length of head ; width of the interorbital equals to two sevenths of the length of head ; width of head slightly shorter than head length, upper surface smooth ; gape of mouth $2\frac{1}{5}$ in length of head ; lips not fringed ; thoracic adhesive apparatus elongated, reaching to the first third of the pectoral spine, its plaits are not branched ; the nasal barbel reach halfway to the orbit, the maxillary extend to the first third of pectoral, the outer mandibular to the gill opening, the inner are shorter ; dorsal slightly higher than the body, its spine rather slender and enveloped in the skin ; pectoral spine moderately broad, internally weakly denticulated ; the fins do not reach the ventral ; caudal forked.

Distribution : Western Ghats, Vindhyas and Nepal Himalayas.

Relationship : This fish bears very close resemblance to *G. annandalei* but differs from it in having almost a smooth skin, the dorsal origin being almost equidistant from the snout and the commencement of the adipose dorsal. Pectorals are as long as head. It resembles *G. lonah* (Sykes) in the absence of granulated skin but differs from it in the dorsal being longer than body depth as against $\frac{3}{4}$ th body depth in *G. lonah*.

Order : CHANNIFORMES

Family : CHANNIDAE

Genus : **Channa** Scopoli

Channa gachua (Ham.)

1822. *Ophiocephalus gachua* Hamilton, *Fish. Ganges.*, p. 68, 367, pl. 21, Fig. 21.

Material : 12 exs., 86.0-115.0 mm. S.L., 16th January 1979, Silent Valley.

Distribution : Fresh waters of India, Pakistan, Burma and Ceylon.

Discussion

576 specimens were collected from River Kunthi belonging to six families and comprising 9 species of which two are new to Science. This collection forms a very valuable addition to our knowledge of the fish fauna of this area. From the array of novelties that has hitherto been collected from the Western Ghats, it would seem that in each of its river systems, the naturalist is sure to come across new forms or else new facts pertaining to the status, relationship, distribution etc. of species known to science or forms in the process of evolution. The fish fauna of hill-streams offers an unique opportunity to study some of the most remarkable adaptive designs among fishes.

Among Indian fresh water fishes, members of families Cyprinidae, Psilorhynchidae, Cobitidae, Homalopteridae, Sisoridae, and Pillaiidae have successfully colonised the hill-streams and in doing so many of them have evolved various devices to resist the fast current. Yazdani (1983) studied the origin and evolution of the frictional and adhesive devices in fishes of the torrents.

Of the species collected from Silent Valley extreme adaptations to hill-stream habitats are met with in *Garra, Glyptothorax* and *Homaloptera. Noemacheilus* which live in rapid running streams under pebbles show less well-marked adaptations.

A detailed morphometric study of the two new species and the *Noemacheilus* spp. were undertaken principally with a view to determine the more precise systematic characters in the genus and to find the range of variation within individual species limits of certain characters, which have been earlier widely used for separating species. For ex. *Noemacheilus (Mesonoemacheilus) triangularis* (Day) showed extreme variations in colour pattern and no two individual showed similar pattern thus showing that in this form slight changes in colour pattern cannot be of use in separating species (Plate 1, fig. 2&3). But as a group they showed certain marked difference in the colour pattern from other known forms.

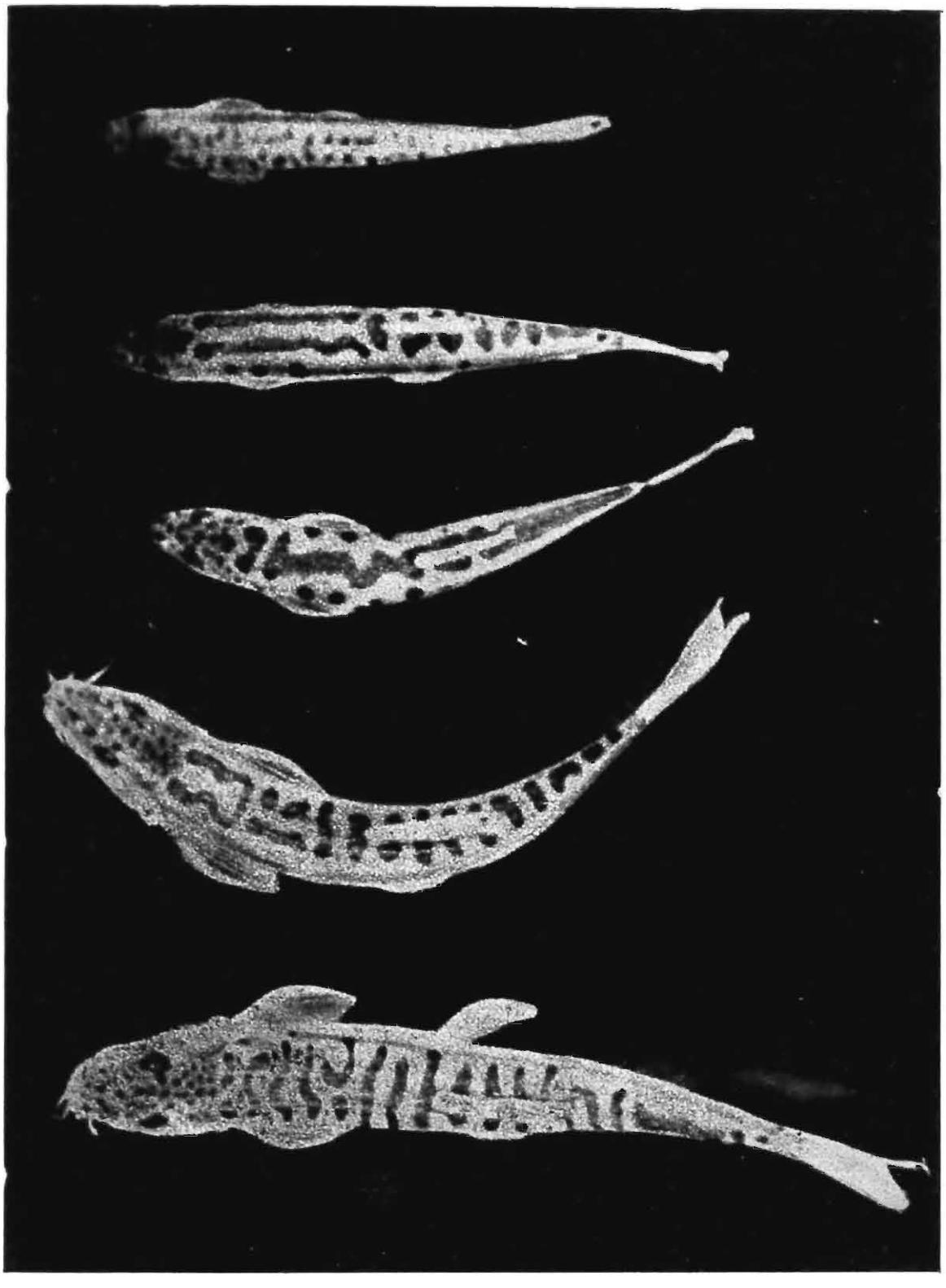
In *Garra* spp. the position of eye which was previously used as one of the characters in classification were found to vary in the 100 exs. of the new species studied in detail. The different size groups studied showed that the eye occupies more or less the anterior position in young forms and as the size increased they were gradually found to shift through the middle to a posterior position. Similarly the presence or absence of scales is of phenomenal importance in Ichthyological studies and hill stream forms show extreme adaptations in the reduction of scales thus reducing the resistance against the fast flowing mountain streams. In the new species of *Garra* the scales are absent along the ventral surface which are in close contact with the substratum and laterally subcutaneous scales are present, weaker scales along the remainder of the body are met with. So also on the dorsal side scales greatly apposed to the skin were met with showing that evolutionary changes are still in progress towards complete absence of scales. Of the other species described from Silent Valley *Anguilla bengalensis* and *Glyptothorax annandalei* and *Noemacheilus* spp. show some variations in their morphometric and meristic characters from the typical form. The wide ranges in the biometric characters and the variable colour pattern seen within species could well imply that evolutionary changes are still in progress ; the structural modifications arising in response to the necessities of the hill-stream habitat in fish fauna which have colonized the torrents by means of a step by step migration from lower levels. The various factors that have brought about the fundamental changes in the adaptive features in the hill-stream fishes can best be observed in the Silent Valley.

Hora (1949), Silas (1952), Menon (1973) and Jayaram (1977) have clarified the taxonomic position of many of the Peninsular representatives of the Indian fresh water fishes and their probable course of migration, their zoogeographical significance etc. From the contributions of the above mentioned Systematists it is known that the most remarkable feature of the zoogeography of India is the occurrence of the Malayan element in the freshwater and torrential fauna of the Indian peninsula. The typical Himalayan Ichthyofauna *Noemacheilus* and *Garra* are represented in the present collection.

The Homalopteridae constitute a remarkable family of Cyprinoid fishes which have undergone a great variety of adaptive modifications induced by the necessity of living in swift currents of the torrential streams ; it has a fairly wide range of distribution, extending from

Lateral view of *Noemacheilus Mesonoemacheilus güentheri* Day.

Lateral view of *Noemacheilus Mesonoemacheilus triangularis* Day.



Dorsal view of *Noemacheilus Mesonoemacheilus triangularis* Day.

Peninsular India in the West to the Formosa in the Northeast and Islands of the Malayan Archipelago in the South. The preponderance of endemic genera and species in the different zoogeographical units is a remarkable feature met with among these fishes, for it indicates rapid evolutionary radiation after isolation. Of the four Homalopterid genera the genus *Homaloptera* is represented by only one species which are endemic in Peninsular India. The discovery of yet another species of *Homaloptera* in Peninsular India may throw light on the migration of torrential fishes from Eastern Himalayas to Western Ghats.

According to Hora (1932) "it is worthwhile to remember that so long as we are ignorant of the factors constituting what is known as an enviornment, it is futile to lay too much stress on the characters of the animals inhabiting it, more especially with refenence to their utility and evolution." and that evolution in the hill-stream fish fauna has been solely determined by the peculiar factors of their environement; increased specialisation always been associated with increased efficiency for life in tempestuous currents. The torrential streams of hills and mountain ranges owing to their strong currents, abundant oxygen, characteristic nature of the encrusted and other food sources owing to the rocky nature of the bottom, and the thick canopy above provide an unusual environment which offers unlimited gradations to aquatic life. Hora (op. cit.) also remarks that the fish fauna have become so modified under the influence of these factors that it is not possible to keep them alive out of hill-streams.

Summary

The Silent Valley by the Zoological Survey of India has yielded 576 specimens belonging to nine species and five families of which two are new to science viv. *Homaloptera pillaii* Indra and Rema devi and *Garra menoni* Rema devi and Indra. Species descriptions are detailed wherever necessary.

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