

ON A COLLECTION OF FISH FROM THE ANAMALAI AND
NELLIAMPATHI HILL RANGES (WESTERN GHATS)
WITH NOTES ON
ITS ZOOGEOGRAPHICAL SIGNIFICANCES

BY

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(Communicated by Dr. S. L. Hora)

(With a plate and two text maps)

INTRODUCTION

Our knowledge of the fish fauna of the Anamalai and Nelliampathi hill ranges lying immediately south of the Palghat Gap is very scanty. Considerable importance has been attached in recent years to the Palghat Gap as a probable barrier in the distribution of torrential fishes along the Western Ghats. Zoogeographical studies have revealed that this gap, in the otherwise continuous mountain ranges, has had profound effects on the southward distribution of certain forms of animals. Situated $10^{\circ}46'$ N and $72^{\circ}42'$ E, Palghat lies within the Malabar region. Day (1865) in his 'Fishes of Malabar', Blanford (1901) in his classical work on the distribution of Indian vertebrates, Annandale (1911) in his account of the fresh water sponges and polyzoa in India, and Prashad (1942) in his systematic survey of the zoogeographical evidence afforded by the distribution of various groups of Indian animals have all recognized the importance of treating the Malabar zone as a distinct biogeographic entity. Hora in his several contributions on the geographical distribution of freshwater fishes in India and adjacent lands has indicated the likely migratory highroads of the torrential fishes along the various mountain trends. As evidenced by the distribution of freshwater fishes along the Western Ghats, Bhimachar (1945) has divided the Ghats into three divisions, *vis.*, a Northern Division, comprising the Deccan Trap area from the Tapti river down to 16° N latitude about the level of Goa; a Central Division, extending from 16° N latitude southwards and including the Malnad parts of the Mysore State, Coorg, Wynaad, parts of South Kanara district and the Nilgiris; and a Southern Division, comprising the Anamalai, Palani and Cardomom hills of Travancore. The Palghat Gap thus forms the dividing line between the Central and the Southern Divisions.

Though considerable work has been done on the fish fauna of the Central Division in recent years, the regions immediately south of the Palghat Gap have remained practically unexplored. What little we know about the fishes of this region, we owe to the work of Day (1865) and more recently to that of Herre (1942, 1945). After his visit to India in 1941, Herre reported the discovery of two new fishes from the Anamalai Hills, one a sisorid catfish *Glyptothorax housei* Herre, and the other a homalopterid, *Homaloptera montana* Herre. In addition he extended the distribution of the remarkable homalopterid *Travancoria jonesi* Hora, previously known only from the hill ranges of northern and central Travancore, to the Anamalai Hills in the north. The bedrock of Zoogeography being intensive systematic studies, an extensive collection from this region was found to be want-

ing. On the suggestion of Dr. Hora, therefore, the author visited and made fish collections from places south of the Palghat Gap lying in the Coimbatore, Malabar and Cochin districts. The specimens forming the basis of the present paper were collected during the months of April and May 1950.

TOPOGRAPHY OF THE AREA

OROGRAPHY

The Anamalai and the Nelliampathi hill ranges lying in an east to west direction have an average altitude of about 3,500 to 4,500 ft. Though well within the tropics they have a temperate climate. Like most of the isolated hill tracts of the peninsula, these hills arise abruptly from the lower country around them and are bounded on all

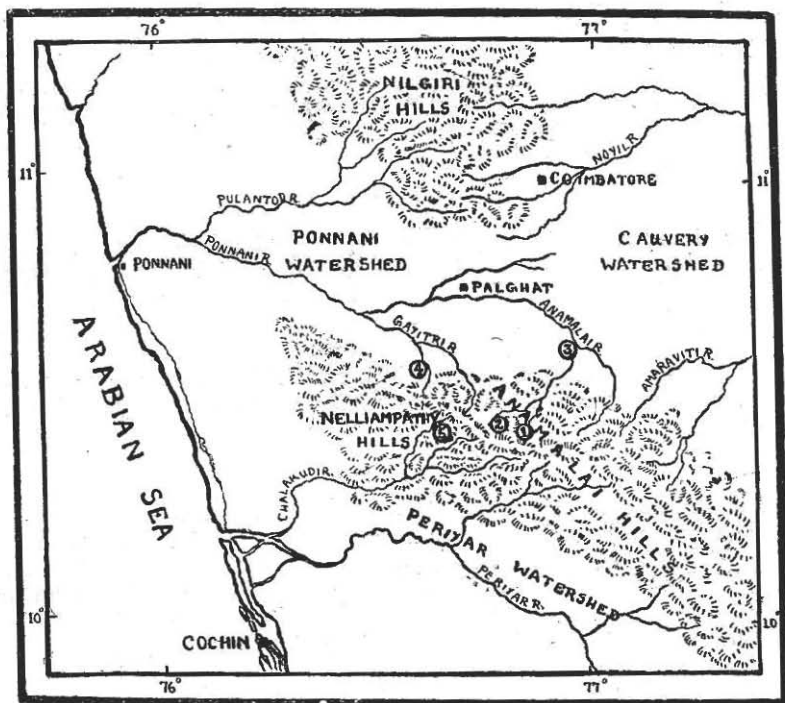


Fig. 1

Map showing the hill-ranges, the drainage systems and the localities from where collections were made immediately south of the Palghat Gap.

1. Puthutotam Estate; 2. Stream beyond Valparai town, Anamalai Hills; 3. Stream at base of Anamalai Hills; 4. Stream at Nemmara; 5. Streams in the Manalaroo Estate, Nelliampathi Hills.

sides by short precipitous spurs—the remnants of a former great escarpment. To the north of these, separated by the Palghat Gap and the extensive plains of Coimbatore District, lie the Nilgiri Hills. The intervening plains of the Palghat Gap at no place rise to anywhere near a thousand feet and hence

the abrupt high ranges on either side help to stop both the North-east and South-west Monsoon clouds and precipitate moisture in the hills closeby. Meteorological records show that these hills receive an annual maximum rainfall of about 200 inches.

DRAINAGE SYSTEM

Great importance must be attached to the nature of the watershed in a given place in discussing the distribution of freshwater organisms, especially fishes, as fortuitous dispersal of hillstream fishes through any agency whatsoever must be a very rare occurrence. The streams of the Anamalai and the Nelliampathi hill ranges and of the areas in their immediate vicinity drain ultimately into three main systems, namely, the Cauvery, the Ponnani and the Periyar.

The Cauvery Drainage

The Cauvery is fed by a number of streams arising in the Central Division of the Western Ghats, viz., the hills of Coorg, Mysore and the Nilgiris. On the east of the Anamalai Hills, a tributary of the Amaraviti originates and flows due east and then joins the Amaraviti, which in turn joins the river Cauvery further east. The Cauvery thus links up the eastern faces of the Ghats in the Central and the Southern divisions. No collection was made from the Cauvery watershed.

The Ponnani Drainage

The rivers Anamalai and Gayitri which take their origin from the eastern slopes of the Anamalai and Nelliampathi hill ranges respectively, flow in a north-west direction before turning due west and eventually joining the river Ponnani which empties itself into the Arabian Sea. The river Ponnani also receives a number of tributary streams from the Nilgiri and the Wynaad hills. The Ponnani watershed drains the western face of the Ghats of the Central Division and the eastern face of the Ghats of the Southern Division.

The Periyar Drainage

The streams and rivers on the western and south-western faces of the Anamalai and Nelliampathi hills are separated from the watersheds of the north-eastern face by the intervening high hill ranges. The river Chalakudi receives a tributary each from the Anamalai and Nelliampathi hills, flows due south-west and joins the river Periyar close to the sea in Cochin. The Periyar river is fed by a number of streams draining the western face of the Anamalai Hills in the north and the Cardamom Hills in the south. The Periyar watershed though isolated from the north, is continuous with the system of waterways further south.

The Cauvery and the Ponnani watersheds which connect the Central and the Southern divisions are likely to facilitate the dispersal of fishes from the north to the south. But unfortunately we do not know anything of the fish fauna of the tributaries of the Cauvery draining the Southern Division of the Western Ghats. The collections dealt with here from the Ponnani watershed shows the co-mingling of the species hitherto recorded from the Central and the Southern divisions. The collection from the Periyar watershed is not representative enough for drawing any conclusions from,

DESCRIPTION OF LOCALITIES AND LIST OF FISHES COLLECTED THEREFROM

The Ponnani Drainage System

Anamalai Hills.—As many as 21 species were collected from the streams and tanks in the Anamalai Hills and their immediate vicinity. First the author visited the coffee plantation of Puthutotam Estate, situated at an elevation of 3,600 feet in the Anamalai Hills. Collections were made from a shingly stream and a tank in this estate. The stream is springfed and perennial. Plenty of shade is afforded by the dense vegetation on either bank of the stream. Fallen and decaying leaves collected at various places along the stream harboured myriads of aquatic insects. A few loaches were obtained from underneath stones and from certain muddy patches. Most of the fish were collected from the numerous rocky pools.

The tank, which is situated at a higher elevation, had a surface area of about an acre at the time of collection. Part of the tank was found to be overgrown with long grass and waterweeds (*Nymphaeaceae*). Being springfed, it contains water all the year round. The water from the tank is utilised for drinking purposes and the excess outflow is passed through a wire netting.

The following is a list of the species collected from the tank and the stream:—

Name of species	No. of specimens	Standard length
<i>Rasbora daniconius</i> (Ham.)	... 3	55.5—76.0 mm.
<i>Barilius gatensis</i> (Cuv. & Val.)	... 1	102.0 "
<i>Danio aequipinnatus</i> McClelland	... 4	41.0—62.0 "
<i>Barbus</i> (<i>Tor</i>) <i>khudree malabaricus</i> (Jerdon)	... 1	149.0 "
<i>Barbus</i> (<i>Puntius</i>) <i>melanampyx</i> Day	... 5	30—54 "
<i>Garra mullya</i> (Sykes)	... 6	53—93 "
<i>Lepidocephalus thermalis</i> (Cuv. & Val.)	... 3	43—60 "

Another collection was made from a large stream a few miles beyond Valparai town in the Anamalai Hills. This stream flows along the southern boundary of the Mudis group of estates and at the time of collection was over 70 feet wide. The stream was fast-flowing and had a number of large pools at intervals, with plenty of boulders and stones along its course. There was dense vegetation on either bank. Fish life was found to be scarce in this stream. On enquiry it was found that the depletion in numbers was mainly due to the large scale poisoning of the stream by some miscreants a few days prior to the writer's visit. Destructive elements, such as copper sulphate, Bordeaux mixture and dynamite, were said to have been used for this purpose.

The writer was able to collect the following species from this stream:—

Name of species	No. of specimens	Standard length
<i>Rasbora daniconius</i> (Ham.)	... 2	57—71 mm.
<i>Barilius gatensis</i> (Cuv. & Val.)	... 1	88 "
<i>Barbus</i> (<i>Puntius</i>) <i>carnaticus</i> (Jerdon)	... 9	128—302 "
<i>Barbus</i> (<i>Puntius</i>) <i>melanampyx</i> Day	... 4	38—62 "
<i>Barbus</i> (<i>Tor</i>) <i>khudree malabaricus</i> (Jerdon)	... 3	126—221 "
<i>Garra mullya</i> (Sykes)	... 1	33 "

A number of specimens were obtained from the pools and the flowing waters of a large stream at the base of the Anamalai Hills. The water was fast-flowing and a number of small rapids and falls were present in the stream. Vegetation was sparse on either bank. A long distance along the banks of this stream was traversed and collections were made from different niches.

A great majority of the species were obtained from three large pools in the stream near Vannamadi Bridge.

The following species were obtained from this stream:—

Name of species	No. of specimens	Standard length
<i>Chela argentea</i> Day	...	4 63—78 mm.
<i>Barilius barana</i> Ham.	...	1 45.5 "
<i>Danio aequipinnatus</i> McClelland	...	14 41—65.5 "
<i>Rasbora daniconius</i> (Ham.)	...	1 51.0 "
<i>Barbus (Puntius) amphibius</i> (Cuv. & Val.)	...	1 86.0 "
<i>Barbus (Puntius) carnaticus</i> (Jerdon).	...	2 109—176 "
<i>Barbus (Puntius) carmucha</i> (Ham.)	...	5 44—87.0 "
<i>Barbus (Puntius) dorsalis</i> (Jerdon)	...	1 48.0 "
<i>Barbus (Puntius) dobsoni</i> Day	...	1 69.0 "
<i>Barbus (Puntius) melanambyx</i> Day	...	8 31—56.0 "
<i>Barbus (Puntius) ticto</i> (Ham.)	...	4 52—55 "
<i>Barbus (Tor) khudree malabaricus</i> (Jerdon)	...	1 114.0 "
<i>Garra mullya</i> (Sykes)	...	8 89—107 "
<i>Osteochilus (Osteochilichthys) thomassi</i> (Day)	...	5 57—196.0 "
<i>Nemachilus triangularis</i> (Day)	...	2 53—71.5 "
<i>Lepidocephalus thermalis</i> (Cuv. & Val.)	...	2 51—62.0 "
<i>Balasio travancoria</i> Hora & Law.	...	4 90—93 "
<i>Glyptothorax madraspatanus</i> Day	...	2 50.25—63.25 "
<i>Ophicephalus gachua</i> (Ham.)	...	1 65.0 "
<i>Mastacembelus armatus</i> (Lacep.)	...	2 70—76 "

Nelliampathi Hills.—A few species were collected from a small stream and a tank in the vicinity of Nemmara, close to the Nelliampathi Hills. Due to the failure of the regular monsoon the level of water in the tank had gone down considerably. One side of the tank received more shade from the overhanging branches of the trees that fringed that part of the bank. The stream had a sandy substratum.

The following species were collected from here:—

Name of species.	No. of specimens.	Standard length
<i>Chela clupeoides</i> (Bloch)	...	5 72—91 mm.
<i>Danio aequipinnatus</i> McClelland	...	4 31—67 "
<i>Rasbora daniconius</i> (Ham.)	...	3 48—55 "
<i>Barbus (Puntius) amphibius</i> (Cuv. & Val.)	...	7 89—112 "
<i>Ophicephalus gachua</i> (Ham.)	...	2 58—62 "

The Periyar Drainage System

Nelliampathi Hills.—In May (1950), the author visited and made fish collections from the streams and pools in the Manalaroo and neighbouring estates in the Nelliampathi hill range. These hills being less extensive and more precipitous than the Anamalais, the streams here flow more abruptly into the plains. Due to the then prevailing drought most of the streams had dried up leaving patches of stagnant water here and there. Collections were made from a few pools and a springfed stream. Intermittent areas of sandy stretches were present

in the stream and the water was not very clear. The rate of flow was also slow. Plenty of submerged weeds and debris were present in the sandy stretches. Isolated pockets of stagnant water teeming with mosquito larvae were found in certain places along the course of the stream. Collections were made by bag-nets, and wherever the water was deep enough and free from weeds and submerged debris a cast-net was used.

The following species were obtained from here:—

Name of species.	No. of specimens.	Standard length.
<i>Barilius bakeri</i> Day	...	7
<i>Danio aequipinnatus</i> McClelland	...	23
<i>Barbus (Puntius) melanampyx</i> Day	...	18
<i>Barbus (Puntius) filamentosus</i> (Cuv. & Val.)	...	4
<i>Garra mullya</i> (Sykes)	...	8
<i>Nemachilus triangularis</i> (Day)	...	14
<i>Aplocheilichthys lineatus</i> (Cuv. & Val.)	...	3
<i>Ophicephalus gachua</i> Ham.	...	1
		71—91 mm.
		21—81 "
		33—65 "
		67—91 "
		39—88 "
		34—56 "
		36—48 "
		39 "

NOTES ON CERTAIN SPECIES

Barbus (Puntius) carnaticus (Jerdon)

1942 *Barbus (Puntius) carnaticus*, Hora, *Rec. Ind. Mus.*, xliv, p. 195.

2 specimens—Tank in Puthutotam Estate, Anamalai Hills; length 142—154 mm.

9 specimens. Large stream 7 miles from Valparai town; Annamalai Hills; length 128—302 mm.

2 specimens. Stream at base of Anamalai Hills; length 109—176 mm.

To *Barbus (Puntius) carnaticus* (Jerdon) are referred 13 specimens 109 to 302 mm. in length collected from the Anamalai Hills. About the distribution of this species Day observed, 'Found in the rivers along the base of the Nilgiris, Wynnad and South-Kanara Hills'. The present collection extends the distribution of this species from the Central Division of the Western Ghats to the Anamalai Hills in Southern Division. It is of interest to note that this species while present in the Ponnani and Cauvery watersheds in the Anamalai and Nelliampathi hill ranges has not so far been recorded from the Periyar drainage and from the rivers further south in Travancore. *B. (Puntius) carnaticus* grows to a fairly large size and is known to attain over 25 lb. in weight.

Osteochilus (Osteochilichthys) thomassi (Day)

1877 *Scaphiodon thomassi*, Day, *Fish. India*, p. 551, pl. cxxxiv, fig. 1.

1942 *Osteochilus (Osteochilichthys) thomassi*, Hora, *Rec. Indian Mus.*, xliv, p. 196. 5 specimens—Streams at base of Anamalai Hills; length 57-196 mm.

This species was hitherto known to occur in the Central Division of the Western Ghats, Bhimachar (1945) speaking of the zoogeographical divisions of the Western Ghats, referred to the genus *Osteochilus*, and stated: 'It is significant that these are absent in Southern Division'. The present collection extends the distribution of *Osteochilus (Osteochilichthys) thomassi* from the Central to the Southern Division but as is the case of the preceding species, it is not found in the Periyar River drainage system. Attention has already been invited to the common watershed of the streams of the Central and

the Southern divisions of the Western Ghats which would explain the distribution of *Osteochilus* to the Southern Division of the Ghats.

Batasio travancoria Hora and Law.

1941 *Batasio travancoria* Hora and Law, *Rec. Indian Mus.*, xliii, pp. 40-42.

4 specimens—Stream at the base of the Anamalai Hills. Length 90 to 93 mm.

Previously known from southern and central Travancore, the present collection extends the distribution of *Batasio travancoria* north to the Ponnani watershed in the Anamalai Hills. The discontinuity in the distribution of the species of this genus shows its antiquity, for it represents one of the Malayan elements in the fauna of Peninsular India.

Glyptothorax prox. madraspatanus (Day).

1941 *Glyptothorax madraspatanus*, Hora and Law, *Rec. Indian Mus.* xliii, p. 255.

2 specimens. Stream at the base of Anamalai Hills. Length 50-25 and 63.25 mm.

D 1 1/6/0; A 3/6/1; P 1/8; V 6; C 17.

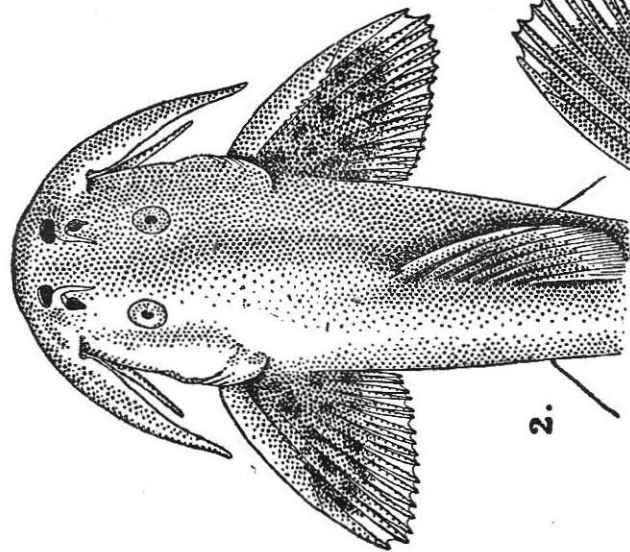
Two specimens of *Glyptothorax* collected from the stream at the base of the Anamalai Hills differ considerably in body colouration from *Glyptothorax madraspatanus* (Day) found in the hill streams of Travancore. These specimens are characterized here as follows:—

The head and the anterior part of the body are considerably depressed, the dorsal profile is slightly arched and the ventral profile flattened and horizontal. The head is slightly longer than broad, but is not as long as $1\frac{1}{2}$ times its breadth. The length of the head is contained 5 times and the depth of the body 6.5 to 8 times in the total length. The eyes are small and placed dorso-laterally, and are not visible from the ventral surface. The length of the snout corresponds to almost half the length of the head and consequently the eyes are placed more in the posterior half of the head. The inter-orbital width is contained 3.25 to 4 times in the length of the head.

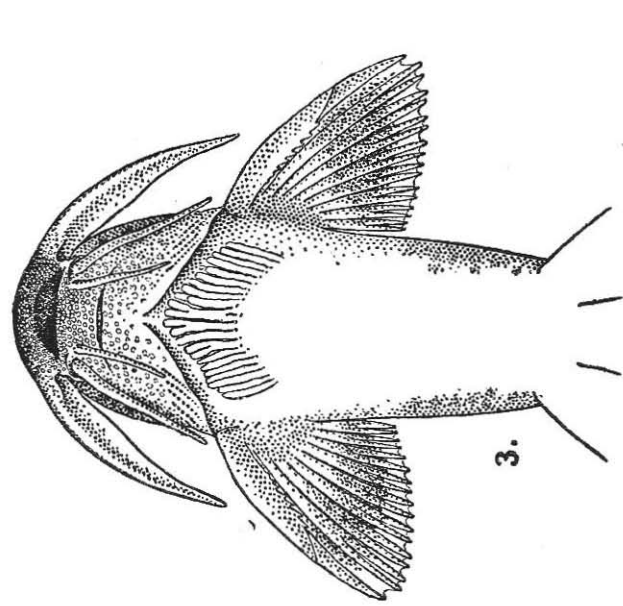
The mouth is subterminal. The teeth in the upper jaw are pointed and are placed in a transverse band. The width of the mouth is contained almost three times in the length of the head.

The flattened ventral surface between the pectorals is plaited to form an adhesive organ. The skin on the ventral surface of the outer rays of the pectorals is also corrugated so as to help in adhesion. The maxillary barbels are long and broad at their base. They extend to slightly beyond the base of the pectoral fin. The inner mandibular barbels are shorter than the outer. The gill openings are situated obliquely and extend to the ventral surface for a short distance.

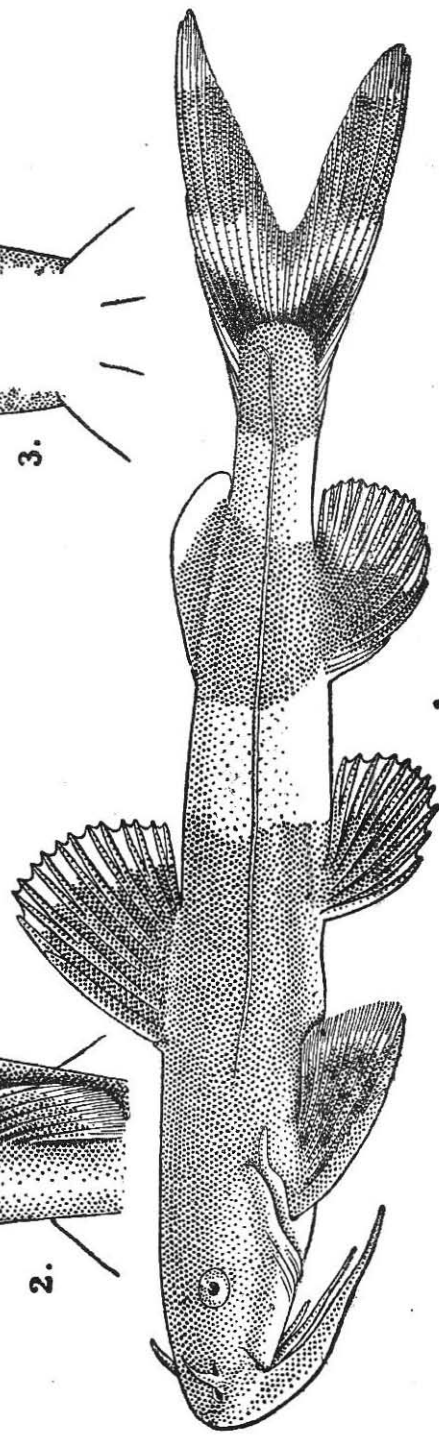
The dorsal arises closer to the tip of the snout than to the base of the caudal. The longest ray of the dorsal is much longer than the depth of the body below it. The dorsal possesses 6 branched rays. The anals are small and possess 3 simple and 7 branched rays. The paired fins are flattened and horizontal. The pectorals are broad and possess eight branched rays. The spine of the pectoral is serrated on its inner edge. The pectorals are separated from the pelvis by



1.



2.



3.

Glyptothorax prox. madraspatanus (Day)
1. Lateral view; 2. Dorsal view; 3. Ventral view

a considerable distance. The pelvics commence slightly posterior to the origin of the dorsal and are separated from the anal by a short distance and possess 6 rays. The caudal is long and deeply forked. The least height of the caudal peduncle is contained $2\frac{1}{2}$ times in its length. The vent is situated nearer the base of the caudal than to the pectorals.

The skin is tuberculated. The colour in alcohol is as follows:—The body is dark greyish with the ventral surface and the fins being paler. The adipose fin and the other fins are tipped with white. Three white transverse bands are present on the body, one below the dorsal, the second beneath the adipose dorsal and the third at the base of the caudal. A broad transverse white band is present at the bifurcation of the caudal. The caudal lobes are tipped with white.

Measurements in Millimeters

Total length	...	50.25	...	63.25
Length of caudal	...	11.0	...	14.5
Length of head	...	10.25	...	14.25
Greatest width of head	...	9.5	...	10.0
Height of head near occiput	...	5.75	...	5.75
Length of snout	...	5.0	...	6.0
Inter orbital width	...	3.0	...	3.0
Depth of body	...	6.0	...	6.25
Height of dorsal fin	...	8.0	...	9.0
Length of pectoral fin	...	10.0	...	11.0
Length of pelvic fin	...	7.0	...	8.0
Longest ray of anal fin	...	6.75	...	9.5
Length of caudal peduncle	...	8.0	...	10.5
Least height of caudal peduncle	...	3.0	...	3.5
Distance between the tip of the snout and the origin of the dorsal fin	...	15.25	...	18.0
Distance between the tip of the snout and the origin of the adipose fin	...	26.5	...	34.0
Distance between the origin of the dorsal and the adipose fin	...	14.0	...	16.0
Distance between the origin of the dorsal and the base of the caudal	...	24.5	...	32.0
Distance between the base of the dorsal and the origin of the adipose fin	...	8.75	...	11.0

ZOOGEOGRAPHICAL REMARKS

Most of the species under report have a wide distribution and hence need no special remarks. The species falling under this category are arranged here under three heads as follows:—

1. *Species widely distributed in India and further East.*

<i>Barilius barana</i> (Ham.)	<i>Barbus</i> (<i>Puntius</i>) <i>ticto</i> Ham.
<i>Danio aequipinnatus</i> McClelland.	<i>Ophicephalus gachua</i> Ham.
<i>Rasbora daniconius</i> (Ham.).	<i>Mastacembelus armatus</i> (Lacep).

2. *Species common to Peninsular India and Ceylon.*

<i>Barbus</i> (<i>Puntius</i>) <i>amphibius</i> (C. V.)	<i>Barbus</i> (<i>Puntius</i>) <i>melanampya</i> (Day).
<i>Barbus</i> (<i>Puntius</i>) <i>dorsalis</i> (Jerdon).	<i>Garra mullya</i> (Sykes).
<i>Barbus</i> (<i>Puntius</i>) <i>filamentosus</i> (C.V.)	<i>Lepidocephalus thermalis</i> (C.V.)
<i>Aplochilus lineatus</i> (C.V.)	

3. Species found in the Western Ghats and associated hills.

Chela clupeoides (Bloch.) *Barbus (Puntius) curmuca* Ham.
Barilius gatensis (C.V.) *Barbus (Tor) khudree malabaricus* (Ham.)
Glyptothorax madraspatanus (Day).

Of the remaining species, it is significant to note that some, hitherto known only from the Central Division of the Western Ghats and others from Travancore in the Southern Division, are at present found in the drainage system immediately south of the Palghat Gap. The Anamalai Hills are also characterized by the presence of two endemic species. Here, those species which are of zoogeographical importance are arranged under three groups and their significance is discussed.

1. Species hitherto known from the Central Division, and now found to occur in the Anamalai and Nelliampathi Hills:—

Chela argentea Day.
Barbus (Puntius) carnaticus Jerdon.
Osteochilus (Osteochilichthys) thomassi (Day).

2. Species previously known from Travancore and now recorded from the Cochin section of the Anamalai and Nelliampathi Hills:—

Barilius bakeri Day.
Barbus (Puntius) denisonii Day.
Travancoria jonesi Hora.
Nemachilus triangularis Day.
Batasio travancoria Hora & Law.

3. Endemic species:—

Homaloptera montana Herre.
Glyptothorax housei Herre.

Species such as *Chela argentea*, *Barbus (Puntius) carnaticus* and *Osteochilus (Osteochilichthys) thomassi*, being not highly adapted to a torrential life, are also found in the streams of the plains and, as such, it may be presumed that these species have found access from the Central to the Southern Division along some of the streams of the plains of Palghat.

The Periyar drainage system being continuous with the streams of the Nelliampathi Hills, it is but natural that species like *Barilius bakeri* and *Nemachilus triangularis* occurring in Travancore should also be found here. The presence of *Barbus (Puntius) denisonii*, *Travancoria jonesi*, and *Batasio travancoria* in the Anamalai Hills needs further explanation. It is presumed that these species which were originally found here migrated further south to the hills of Travancore prior to the severance of the connection between the watersheds. The subsequent separation of the watersheds resulted in the isolation of these species both in the north and in the south.

Two specimens of *Glyptothorax* (prox *madraspatanus*) collected by the writer from one of the streams in the Anamalai Hills differ considerably from *G. madraspatanus* found in the hill streams of Travancore. A tendency towards speciation of this sisorid catfish shows that the isolation of the species here has been of recent occurrence. It is possible that these differences indicate an incipient stage in the formation of a new species. It is also interesting to find another

sisorid, viz., *Glyptothorax housei* Herre, endemic in the Anamalai Hills. *G. housei* differs from the other South Indian species, such as *G. madraspatanus* (Day), *G. lonah* (Skyles), *G. annandalei* Hora and *G. trewasae* Hora, in possessing a smooth skin. In this feature it resembles *G. conirostre poonaensis* Hora, from which it is distinguished by the longer barbels, the size, the lesser height of the dorsal and its greater distance from the adipose fin, the size and position of the anal, the shorter head and the greater development of the adhesive organs.

Of considerable zoogeographical importance is the occurrence of a species of the genus *Homaloptera* in the Anamalai Hills. The genus *Homaloptera* is known from Eastern Burma, Siam, Malay Peninsula and the East. The presence of *Homaloptera montana* Herre in Peninsular India throws much light on the phylogeny of South Indian homalopterids and also helps in tracing the migratory

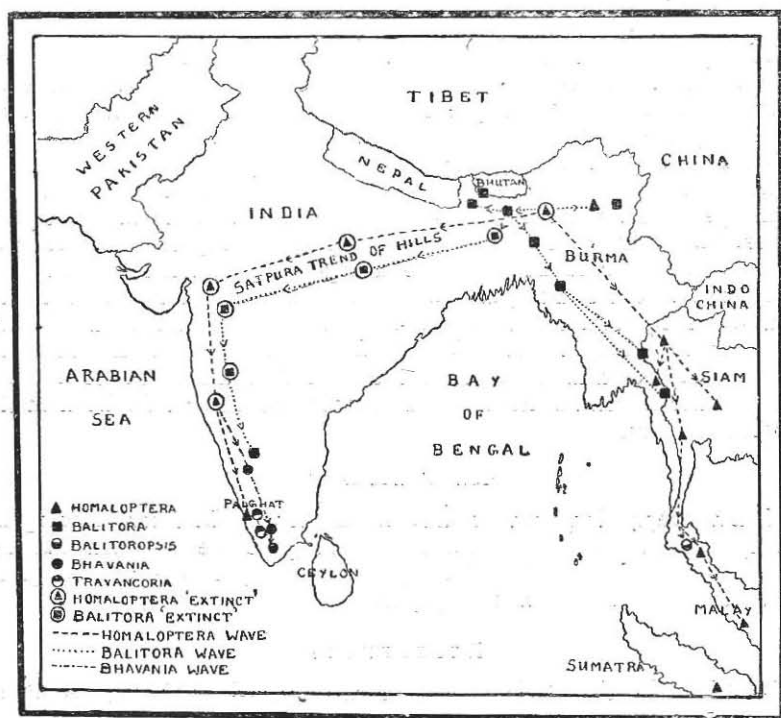


Fig. 2

Map showing the probable routes of the waves of migration of Homalopterid Fishes to peninsular India.

highroads of these torrential fishes. A certain amount of speciation of *Homaloptera* took place in the Eastern Himalayas resulting in the genus *Balitora*. It is clear that *Homaloptera*, like the other torrential fishes, reached the Western Ghats along with the first influx along the Satpura trend of mountains which was evidently continuous with the Eastern Himalayas at that time. Having reached the Western Ghats these fishes migrated to the south, in the Peninsula,

On reaching the Central Division of the Ghats, from *Homaloptera* was developed a better adapted and more evolved form as is seen in the present day genus *Bhavania*. *Homaloptera* and *Bhavania* continued the southward movement and reached the Southern Division prior to the formation of the Palghat Gap. It is now known for certain that the disruption of Ceylon from Peninsular India took place during the Pliocene and it is supposed that the formation of the Palghat Gap was later than this change. The homalopterids are absent in the mountain ranges of Ceylon. Having reached the Southern Division *Bhavania* migrated further south. The genus *Travancoria* is believed to have been a further attempt at speciation of the genus *Homaloptera* which was isolated in the Southern Division. *Homaloptera* and *Travancoria* are found in the Anamalai Hills and *Travancoria* is also found further south in Northern Travancore. *Bhavania* at present occurs both in the Central Division of the Ghats in Mysore and the Southern Division in Travancore.

No species of *Homaloptera* has so far been recorded from the Central and Northern divisions of the Western Ghats. In the east, *Homaloptera* migrated along the mountain ranges of Burma to Siam and Malay Peninsula. As it had given rise to *Bhavania* in Peninsular India, *Homaloptera* also gave rise to *Balitoropsis* in Siam.

Balitora from its original home in the mountain ranges of the Eastern Himalayas and Assam migrated along two similar lines in subsequent waves. *Balitora brucei mysorensis* found in Mysore and *Balitora brucei burmanicus* found in Burma are geographical races of *Balitora brucei* of Eastern Himalayas. *Balitora melansoma* of southern Burma is also closely related to *B. brucei*. *Balitora* is not found in the Southern Division of the Western Ghats and it is likely that the Palghat Gap acted as a barrier to the southward movement of *Balitora* and of other torrential fishes which reached the Central Division in the subsequent waves.

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II. *Glyptothorax prox madraspatanus* Day 1. Lateral view; 2. Dorsal view; 3. Ventral view.